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Pedagogical Skills in Higher Education Institutions

*It is recommended by the Academic Council of
the Kyiv National University of Technologies and Design
as a textbook for Ph.D. students*

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The textbook outlines the fundamentals of the basic educational course "Pedagogical Skills in Higher Education Institutions" for higher education applicants at the educational and scientific level of "Doctor of Philosophy." The course systematizes graduate students' knowledge in the pedagogical and psychological cycle. It helps to integrate them with the knowledge acquired while studying professional disciplines. The textbook's content is structured according to the discipline's curriculum. It contains theoretical material and practical tasks aimed at mastering: the essence of the professional activity of a teacher of a higher school; technologies for the development and self-development of personal and professional qualities; features of pedagogical communication, pedagogical aesthetics, ethics, and culture of the teacher. The manual analyzes various pedagogical situations, examples of solving pedagogical problems, etc. The textbook is applicable to graduate students and teachers of higher education institutions.

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Content

INTRODUCTION

The development and internationalization of higher education occur in the context of the development trends of world educational systems. It requires a review of academic programs, taking into account the best world experience in the content of educational components.

The textbook provides higher education graduates of the educational and scientific level "Doctor of Philosophy" with knowledge sufficient to carry out teaching activities in higher education institutions of different countries. The textbook outlines the fundamentals of the basic training course "Pedagogical Mastery in Higher Education Institutions." It summarizes and systematizes knowledge obtained from disciplines of the psychological and pedagogical cycle. It also helps to integrate them with the knowledge acquired while studying professional fields.

The textbook's content is structured according to the discipline's curriculum. In addition to theoretical material, the book contains practical tasks, analysis of pedagogical situations, and examples of solving educational problems. At the end of each section, materials useful for organizing graduate students' classrooms and extracurricular work are presented.

Chapter 1 describes the terminological apparatus of pedagogical mastery as one of the pedagogy sections. The foundations of the organization of an effective educational process and the current problems of higher education are considered. Differences in didactics in higher education are also determined. The patterns, specifics, and forms of organization of the teaching process in higher education are evaluated based on the fundamental principles of didactics and pedagogy. Factors affecting the effectiveness of training are highlighted. The role of content design and ways to avoid cognitive overload in students are shown.

Chapter 2 highlights the essence of the professional activity of a higher school teacher. It covers development technologies and self-development of his personal and professional qualities, pedagogical communication, aesthetics, ethics, and culture. Considerable attention is paid to the student-centered approach in the organization of educational activities. Ways to prevent possible conflicts between teaching and learning styles are shown. Approaches are described that are appropriate for choosing methods, forms, and means of learning, including e-resources, taking into account the educational preferences of students.

The goals of Chapter 3 are to understand and differentiate the main theories of pedagogy and learning theories, determine their influence on the educational process, and form a notion of their application in pedagogical practice.

The goals of Section 4 are to show the role of modern innovative technologies in education and their impact on the formation of the teacher's pedagogical skills. The chapter contains an analytical overview of modern educational, innovative technologies, which are the most widespread worldwide. The activity of a teacher in the organization of distance, blended, and remote learning is considered. The differences and basics of effectively applying problem-based and project-based learning are also described. The most promising

and practical teaching methods and the related activities of students are systematized.

The goals of Chapter 5 are to teach the future teacher to effectively apply various forms, methods, and means of teaching to solve various pedagogical problems. Teaching methods are classified according to multiple characteristics. Peculiarities of the teacher's actions and behavior during different types of classes are discussed. The advantages and disadvantages of organizing training in small and large groups are determined. Postgraduate students are expected to perform several tasks that will allow them in the future to: have ready organizers for preparing and conducting a lecture and seminar, create a handout for a lecture, and form a worksheet for a practical lesson.

Chapter 6 is devoted to issues of assessment of learning and teaching. This section shows the direct connection between the teacher's pedagogical skills to properly organize the evaluation of the effectiveness and efficiency of teaching and learning and ensure the quality of the educational process. Practical tasks at the end of the chapter contribute to the formation of skills in creating tasks for various types of knowledge control, developing criteria for evaluating tasks and understanding the processes of "good feedback practice" to analyze one's teaching effectiveness.

CHAPTER 1. PEDAGOGY AND DIDACTICS IN HIGHER EDUCATION: MODELS, PRINCIPLES, AND OBJECTIVES

1.1 Pedagogy as a craft, an art, and a science

The word for pedagogues derives from the Greek paid (paed, pais) for the child (boy) and agogos for leader or escort. Escort derives from the Old Italian word scorgere, meaning to perceive, guide, or observe. The word 'observe' has etymological connections to preserving, saving, regarding, and protecting. So, a pedagogue is literally one who leads or guides or serves a child. In ancient Greece and Rome, a pedagogue was a slave who accompanied children to school, but the term came to mean a 'trainer of boys'. Pedagogy moved from meaning simply instruction or knowledge itself to the art, science, or profession of teaching.

Today the term 'pedagogy' has different levels of understanding. For example:

- The function or work of teaching: the art or science of teaching, education instructional methods,[1]
- The instructional techniques and strategies that allow learning to take place. It refers to the interactive process between teacher/practitioner and learner. It is also applied to include some aspects of the learning environment (including the concrete learning environment and the actions of the family and community.[2]

Pedagogy is about learning, teaching, and development influenced by the cultural, social and political values we have for children and underpinned by a strong theoretical and practical base.[3] Therefore, the concept of 'educator' is often used to emphasize the unity of various functions in the teacher's activity.

Since education has been an Enlightenment product, the traditional concept of teaching has embraced many of its philosophies, such as the emphasis on an end-product, rationality, efficiency, scientific ideals of measurement and evidence, and both an empirical and pragmatic approach to knowledge. Significantly, learners were treated almost as passive recipients of the information they received; they could be treated almost as inanimate objects. Teaching could be examined the same way as material objects so that the techniques by which knowledge was transmitted were considered crucial. Teaching as we have traditionally known it might be regarded as the product of the era of Modernity. This activity had to fit this paradigm to call for a discussion of at least three aspects

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[1] *Department of Education, Employment and Workplace Relations. Towards a national quality framework for early childhood education and care: The Report of the Expert Panel on Quality Early Childhood Education and Care. Commonwealth of Australia. Commonwealth of Australia. 2009*

[2] *Siraj-Blatchford I., Sylva K., Muttock S., Gilden R., Bell D. Brief No: 356 Researching Effective Pedagogy in the Early Years. 2002. URL: www.ioe.ac.uk/REPEY_research_brief.pdf*

[3] *Education Scotland. Let's talk about pedagogy. 2005. URL: https://www.childaustralia.org.au/wp-content/uploads/2017/02/CA-Statement-Pedagogy.pdf*

of teaching: the end product of teaching, the means to the end, and an assessment of the process.

Since the emphasis of teaching has been placed on instrumentals, it is little wonder that one of the ways of measuring teaching success has been on the outcomes of the process. Teachers must be effective if they produce students with good grades – a measurable outcome. But there is no direct evidence to indicate that the teaching process has actually been the cause of the measurable outcome! It might have been, but we do not know whether the teaching process, the teacher's personality, or the learners and their efforts help achieve success.

What we have begun to question in each of these points is the idea that teaching is just about technique. It is technology but is this all it needs to be to provide learning opportunities intentionally? Is the teacher merely the instrument choosing the right methods, communicating the 'correct' knowledge, and getting the desired results? In this process, the students are treated as passive. They are molded like materials in other production processes – but this does not exhaust the teaching process since students need individual help, motivation, and so on. Learning and teaching need a personal relationship to achieve the best outcomes. It is also recognized that many distance education institutions also provide opportunities for face-to-face contact.

More works now focus on teaching style and method than previous generations – style is about the art of teaching rather than science. It is also about the teachers' humanity and personality. Style overlaps with the method but is still different from it. Consequently, teachers should be concerned for their students, but students should also be concerned for their teachers. Many books and papers have sought to demonstrate the significance of the moral relationship in teaching and recount the lengths teachers should go to help students achieve their fulfillment through teaching and learning. It is the vocation of teaching[4].

Most academic researchers can identify with one of three core teaching philosophy streams, captured here as a set of three 'pedagogic practice algorithms' to aid readers in identifying their selves within one of these streams when linking their teaching with their pedagogic research (Fig. 1.1).

The CRAFT of teaching

The core idea behind teaching as a craft is that practice leads to reflection, which contributes to awareness of ways to improve. The optimization process is the key point of the craft. As indicated by the broken (yellow) arrow in the illustration, this stream does not always culminate in the skilled practitioner reporting or sharing their reflections as a fundamental part of their crafting ethos.

The SCIENCE of teaching

In essence, a practitioner, who approaches teaching as a science, will mirror some aspects of the crafting stream in their "evaluation-review" loop. A core difference is as follows. Those adopting a scientific approach to pedagogy start

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[4] *Jarvis P. Teaching, Learning and Education in Late Modernity. London^ Routledge, 2012. 240 p.*

with a more solid underlining of learning theory used to perform their practice before the evaluation steps begin.

Once the learning philosophy underpinning their thinking is in place, the evaluation and optimization cycle can begin. One of the hallmarks of this stream is that practitioners will remain inwardly self-directed, leading to potential missed opportunities (again, indicated by the broken yellow arrow) to share valuable evidence-informed lessons. In this way, the logical endpoint of the 'science' of teaching focuses on the how rather than reflexively sharing best practices. It can sometimes be expanded to mean 'control' of the classroom environment.
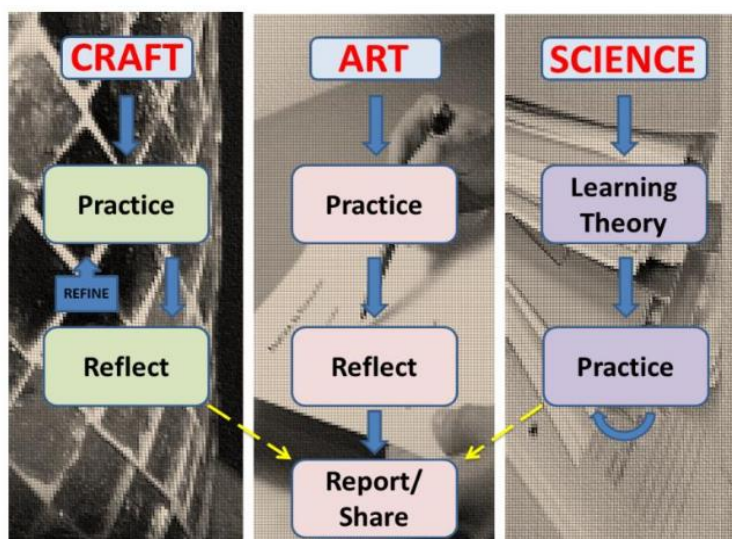
Figure 1.1 Three pedagogic practice algorithms

The ART of teaching

Teaching as an art generally mirrors the optimization loops of the other two streams but, uniquely, will always result in sharing of good practice as an integral end-point before starting the process over due to an inherent requirement within this stream for validation of ideas as a core part of the responsive, creative and intuitive nature of approaching teaching practice as an 'art form.'

The philosophy underpinning teaching as an art stream is the fundamental 'why' of teaching, which logically results in sharing best practices as an automatic mechanism inherent to this stream. This algorithm most closely mirrors the in-built reflective practice of many post-graduate level learning and teaching courses, which is why these courses can be useful to assist professional teachers in recognizing and developing their reflective practices while adding to a nascent but growing evidence base of academic knowledge[5].

As a science, pedagogy has its laws and regularities, conceptual-categorical apparatus, content, principles, forms, methods, etc. As an art, it reveals the mechanisms of practical pedagogical activity-action to master which little

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[5] *Crawford R. A Pedagogic Trinity – Exploring The Art, Craft and Science of Teaching Journal of Pedagogic Development 2014. Vol.4. No2. URL: https://www.beds.ac.uk/jpd/ volume-4-issue-2/pedagogic-trinity/*

knowledge of laws is required. Still, educational skills, pedagogical intuition, and pedagogical talent are necessary.

This level is reflected in pedagogical art, which embodies the understanding of a high level of practical pedagogical activity, which has both creative and unrestricted and aesthetic character. It is not for nothing that we talk about the beauty of pedagogical action, which is a criterion for skillful performance.

Art pedagogy is a generalization of all the potentials of art, the theory, and practice of using the pedagogical potential of art in general and professional education for general and creative personality development. Art pedagogy brings new nuances to the relationship between the teacher and students, establishing mutual trust, openness, and mutual respect. Pedagogical art is the perfect mastery by a teacher of the entire set of psychological and pedagogical knowledge, abilities, and skills, combined with professional enthusiasm, developed pedagogical thinking and intuition, moral and aesthetic attitude to life, deep conviction, and the firm will[6].

Pedagogy is an integrated humanistic and social science that investigates regularities of combined and unique, focused on the content of learning interactions, communication, and mutual relations that occur in this process and constitute a specific research object. Pedagogical practice is mainly represented by organized pedagogical processes created on the background of pedagogical theories and specifically aims at achieving an educative goal. Realization of this deliberate goal occurs through internal, dynamic connections activated by targeted, organized, goal-oriented educational processes, which transform mankind's intellectual and cultural values into meaningful educational, developmental, and educative content to facilitate the acquisition of these values by participants of the process and to foster their personal development and self-actualization[7].

> "It is necessary to build a holistic process of acquiring knowledge, adequate for life, building an organic complex of humanitarian, social-historical, natural-scientific and artistic disciplines, united by the unity of humanistic meanings and spiritual and moral goals."[8]

The interpretation of the purpose of pedagogy as a strategy for the formation of valuable humanistic foundations in the Ukrainian philosophy of education was developed by I. Zyazyun.

> ***Further Reading****: Pedagogical skill: textbook, 3rd ed. K.: SPD Bohdanova A.M., 2008. 376 p. (in Ukrainian)*

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[6] *Otych O. M. Basics of pedagogical skill of a professional school teacher. Kirovohrad: Imex-LTD, 2014. 208 p. (In Ukrainian)*

[7] *Zogla I. Pedagogija and educational sciences: Competing traditions in the study of education in Latvia. In: Knowledge and the study of education ñ an international exploration. Eds, G. Whitty, J. Furlong. Oxford Studies in Comparative Education. 2017. 27(1). P. 101 – 121. Symposium Books.*

[8] *Pedagogical skill: textbook, 3rd ed. K.: SPD Bohdanova A.M., 2008. 376 p. (in Ukrainian)*

1.2 Pedagogy vs andragogy

The National Center for Education Statistics National Household Education Surveys Program defines the adult learner as a civilian, non-institutionalized adult, 16 years and older, pursuing formal education[9]. Andragogy is actually a European concept that means "the art and science of helping adults learn."

The term andragogy can be supposedly equivalent to the term pedagogy. Andragogy in Greek signifies man-leading compared to pedagogy, which means child-leading. However, it should be noted that the term pedagogy has been used since the Ancient Greek times, while Alexander Kapp, a German educator, first used the term andragogy in 1833.

Later on, it was suggested four principles that are applied to adult learning:
1. Adults need to be involved in the planning and evaluation of their instruction.
2. Experience (including mistakes) provides the basis for the learning activities.
3. Adults are most interested in learning subjects that have immediate relevance and impact on their job or personal life.
4. Adult learning is problem-centered rather than content-oriented.

Andragogy differs from pedagogy, linked strongly to experiential and self-directed learning concepts. The latter encompasses methodologies specific to how children learn (Table 1.1).

Table 1.1

Comparative table for andragogy and pedagogy

Andragogy	Pedagogy
Self-directed learner	Learners depend on the decision of the teacher
A larger amount of life experiences	Few life experiences
Learning needs closely related to social roles	Learning needs are dictated by the teacher
Problem-centered	Subject/content centered
Intrinsically motivated	Extrinsically motivated

There is no empirical evidence to support this differentiation from childhood learning. The 'theory' of andragogy was criticized for implying that all adult learners are self-directed and that children are not, and for lacking "the reflective, personal and serendipitous aspects of adult learning while suggesting a reductionist and behavioristic, competency-based approach to practice."[10]

Despite many critiques of andragogy, it has had considerable influence because many university lecturers recognize characteristics they have seen their

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[9] *Creighton S., L. Hudson. Participation Trends and Patterns in Adult Education: 1991 to 1999. Washington: National Center for Education Statistics, 2002.*

[10] *Tight M. Key Concepts in Adult Education and Training. 2nd ed. London: Routledge Falmer, 2002. P. 113.*

learners exhibiting. Many 'types' of learning often used and discussed in higher education, including experiential learning, student autonomy, and self-directed learning, belong to or derive from the tradition of adult education. Furthermore, considerable areas of work in higher education around the student experience, supporting students, and widening participation are closely linked to work and ideas in adult education.

According to the researchers, forms of psychology, especially humanistic versions, have influenced much of pedagogy in adult education. Humanistic education emerged as a reaction to the behaviorist concern with the external environment. The underpinning philosophy of humanistic education is that each individual must determine and control his/her development path. Andragogy is based on humanistic assumptions that the adult learner is a self-directed human being who possesses rich prior experiences, has a readiness and orientation to learn related to the roles and responsibilities of adult life, and is internally motivated.

Andragogy is based on the following four assumptions. The assumptions are those, as a person matures,

1. his/her self-concept moves from one of being a dependent personality toward one of being a self-directed human being;

2. s/he accumulates a growing reservoir of experience that becomes an increasing resource for learning;

3. his/her readiness to learn becomes oriented increasingly to the developmental tasks of his/her social roles;

4. his/her time perspective changes from the postponed application of knowledge to the immediacy of application, and accordingly, his/her orientation toward learning shifts from subject-centeredness to problem-centeredness.

> "I have described this faith in the ability of the individual to learn for himself as the 'theological foundation' of adult education."[11]

> *Further Reading: Knowles M. et al. S. The Adult Learner. 5th ed. Houston: Gulf Publishing Company, 1998.*

1.3 Pedagogical process: a broad and narrow meaning

In general, the pedagogical process is a process of purposeful formation of a personality under conditions of a specially-organized educational system. In a narrow pedagogical meaning: the purposeful interaction of teachers and students to form qualities, properties, and relationships.

The pedagogical process consists of two fundamental components

Education is the process and the result of an individual's mastering experience, achieving a significant educational level, and introducing an

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[11] *Knowles M. et al. S. The Adult Learner. 5th ed. Houston: Gulf Publishing Company, 1998.*

individual to the cultural values of mankind. In a broad social sense, education transfers accumulated experience from older to younger generations.

In a narrow social sense, education is understood as a deliberate impact on a person by social institutions to form a certain system of knowledge, attitudes, beliefs, and moral values.

In a narrow pedagogical sense, education is a process that results from educational work aimed at solving specific educational problems. Education results in changes in students' understanding of the world and attitudes towards people and themselves. Nowadays, pedagogy is understood as a system of human education sciences.

Education sciences can be classified according to their relations to the process of obtaining education:

1. Pedagogy is the theory and practice of formal and non-formal (organized) education. It has developed general pedagogy and its sub-branches with two common essential features:

(a) the object of investigation is dynamic links between the learners, teachers, and the subject matter with teacher-learner mutual relations in the center;

(b) the data are analyzed according to pedagogical criteria, denoted by the dynamic links.

Science and practice of pedagogy exist and develop by elaborating its theory, methodology, profession and tertiary programs, rigorous scientific method of investigations, international cooperation of professionals and research, professional working area, history, tertiary educational institutions to obtain professions, the discipline of universities and colleges.

2. Essential parts of pedagogy, especially in Anglophone countries, are considered Education Sciences in lesson planning, lesson design, strategies/methods of teaching, and evaluation. These items can be investigated, and appropriate objects of research defined. Still, they will have lost their value if not related to the pedagogical process as a whole: target, learners and teachers activities, mutual relations, the priority of self-evaluation and achievements at all what the science of pedagogy deals with as philosophy-in-use, as well as investigates the educational process as a system.

3. Pedagogical disciplines related to the pedagogical process, contextualized or integrated into the science and practice of pedagogy, constitute the core part of teacher educational programs, including those that aim to work with learners with special needs and specialized goals.

4. Education sciences consider and incorporate many other sciences, which in a way, are related to some important areas of education, for instance, educational psychology, education policy, educational philosophy, etc. These branches of science investigate their specific object in education and analyze data according to their specific criteria.

These can only inform pedagogy and the field of education about some of its contexts but will never solve specific pedagogy problems or the process of obtaining an education. Therefore, it will never function instead of pedagogy, be it science, practice, or academic discipline.

5. Targeted branches of sciences or techniques that the learners acquire in an organized process by using specific teaching-learning methods belonging to the subject didactics (by non-professionals often hastily considered an old-fashioned notion). Any branch of science offered to learners authentic or transformed into a subject matter for their acquisition (transformed according to stable and developing didactic principles into the content to be learned) become a pedagogical/didactic reality and category and add to the learning content.

Thus, other sciences and practices designed as a formal setting for the learner's knowledge creation, development of skills, and attitudes can be called education sciences. In reality, these sciences being transformed into learning/study content are thus turned into a pedagogic category of content and become a pedagogical/didactic process component.

6. Context sciences are also transformed and integrated into the aims, content, methods/strategies, and evaluation and therefore belong to pedagogy's teaching/learning or practice (for instance, history, economy, literature, etc.). Their functions within the program are denoted by their relations to the target academic education or degree and/or qualification students obtain.

Curricula or programs comprise many branches of sciences and techniques to be acquired. They belong to the content and cannot be called education sciences; these simply cannot be in this capacity without pedagogical modifications[12].

1.3.1 Philosophical foundations of education

Philosophy of education is a branch of philosophy devoted to studying education, its goals, nature, and values. It examines education's basic principles and concepts in its relationship with society. One of the fundamental questions is what education is. Education is not only the acquisition of knowledge and skills, and it is primarily the formation of values and attitudes that will influence the development of society.

A significant issue is the essence of knowledge and how it is organized, assimilated, and transmitted. Knowledge is not a set of facts but a dynamic system that is constantly changing. The value of critical thinking is also one of the important questions of the philosophy of education. This branch of philosophy also focuses on understanding the role of the teacher and student in the educational process.

The following philosophical schools affected pedagogical theories (Table 1.2). The directions of the philosophy of education are not limited to those shown in the table, and they continue to develop but are mainly based on the four mentioned schools.

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[12] *Zogla I. Science of Pedagogy: Theory of Educational Discipline and Practice Journal of Teacher Education for Sustainability. 2018. vol. 20, №. 2, P. 31 – 43.*

Table 1.2

Characteristics of philosophic schools[13]

Key Philosophers	Main Features	Educational Implications
School of thought: IDEALISM		
Plato, Socrates, Immanuel Kant	Encourage conscious reasoning in the mind. Look for and value universal or absolute truths and ideas. Believe that ideas should remain constant throughout the centuries.	The curricular focus is on ideas rather than the student or specific content areas. Learning is also intrinsically motivated. Teaching methods include lectures, discussions, and Socratic dialogue. Essential to these teaching methods is posing questions that generate thoughts and spark connections
School of thought: REALISM		
Aristotle, John Locke	Argue for using the senses and scientific investigation to discover the truth. Applying the scientific method also allows individuals to classify things into groups based on their essential differences.	The curricular focus is on scientific research and development. Outcomes of this thinking in classrooms today include the appearance of standardized tests, serialized textbooks, and specialized curriculum Teaching methods used in realism include: demonstration, recitation, critical thinking, observation, experimentation
School of thought: PRAGMATISM		
Charles Sanders Peirce, John Dewey	Believe that reality is constantly changing, so we learn best through experience. The learner is constantly conversing and being changed by the environment with whom he or she is interacting Based on what is learned at any point and time, the learner or the world in which he or she interacts can be changed.	Calls for teachers who can support students learning by promoting questioning and problem-solving during lesson delivery. The curriculum is also interdisciplinary. Teaching methods used in pragmatism include: Hands-on problem-solving, Experimenting, Projects, Cooperative Learning
School of thought: EXISTENTIALISM		
Soren Kierkegaard, Friedrich Nietzcshe	Believe that our reality comprises nothing more than our lived experiences. Therefore, our final realities reside within each of us as individuals. The physical world has no real meaning outside our human experience.	The subject matter should be a matter of personal choice, as the teacher views each student as an individual. Answers come from within the individual in an existential classroom, not from the teacher. By examining students, lives through authentic thinking, students are actively involved in the learning experience. They are opposed to thinking about students as objects to be measured, tracked, or standardized.

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[13] *The comparative table based on Perez D. Social Foundations of K-12 Education. 2022. URL: https://kstatelibraries.pressbooks.pub/dellaperezproject*

In particular, progressivism, which spread in the middle of the 20th century, is based on the philosophy of pragmatism. Perennialism absorbs the ideas of idealism and realism. Nowadays, the direction of postmodernism is generated based on the concepts of pragmatism and existentialism. Affirming the subjectivity of reality, representatives of this school (Michael Apple, Stanley Aronowitz, Jacques Derrida, Henry A. Giroux, Joe Kincheloe, and Peter McLaren) argue for the value of individual experience. Critical thinking and critical pedagogy are the centers of this philosophy.

The meaning, nature, and dynamics of the philosophy of education

> **Further Reading**: Perez D. Social Foundations of K-12 Education. 2022. URL: https://kstatelibraries.pressbooks.pub/dellaperezproject/

1.3.2 Educational paradigms

After the first industrial revolution at the end of the 18th century, the education sector increased, beginning the period of Education 1.0. It was characterized by systems mechanization that resulted in the emergence of enabling technologies for education, such as the paper-making machine, mechanical printing, the graphite pencil, the ballpoint pen, and the typewriter.

During this period, they stood out due to educational philosophies based on essentialism, behaviorism, and instructivism. The educator was seen as a sage, and the student had a mostly passive role. Therefore, in the Education 1.0 period, the teacher was the center of education, tasked with determining and disseminating the essential information the students needed.

Education 2.0 coincided with the second industrial revolution in the early 20th century, characterized by mass production, industrialization, and electricity. In this period, the primary information sources were open-source materials from libraries. The technological advancement in Education 2.0 brought relevant contributions to this sector, and the first electronic devices used in education, such as printers, calculators, and computers, emerged. The educational philosophies in this period were mainly andragogical and constructivist. The teacher's role changed from a sage to a reference and information source to help develop the tools for professional implementation, and the student's role continued to be passive. Nevertheless, an active role for students emerged, where students became 'owners of the knowledge.'

Idealism in education

Realism in education

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The learning approach was also teacher-centered, but peer assessment was encouraged, with the teacher still being fundamental. Also, in this period, practices such as correspondence education and broadcast education appeared.

Education 3.0 emerged in the third industrial revolution at the end of the 20th century and revolved mainly around computerization, automation, and control. In this new communication era, the student and teacher began transitioning to a vision in which they no longer needed to participate in a synchronous session for learning to happen. The teaching-learning processes were supported by multiple resources such as multimedia, online tools, and virtual laboratories. This teaching-learning approach was more heutagogical and connective. Each teacher was considered an orchestrator, curator, and collaborator, and the students were empowered to build their knowledge

Pragmatism in education

Existentialism in education

The fourth industrial revolution and the technologies, innovative pedagogical procedures, and best practices that characterize this period comprise what is known as Education 4.0. The authors of the research of Education 4.0. and its components suggest the following definition:

> *"Education 4.0 is the current period in which Higher Education institutions apply new learning methods, innovative didactic and management tools, and smart and sustainable infrastructure mainly complemented by new and emerging ICTs (Information and Communication Technologies) to improve knowledge generation and information transfer processes. Combining these resources during teaching-learning processes will support the training and development of desirable critical competencies in today's students".*[14]

This RSA Animate was adapted from a talk given at the RSA by Sir Ken Robinson (1950-2020), world-renowned education and creativity expert and recipient of the RSA's Benjamin Franklin Award. He was a British author, speaker, and international advisor to the government on education in the arts.

The RSA is a 258-year-old charity that drives social progress and spreads world-changing ideas., non-profits, education, and arts bodies.

Changing Education Paradigms

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[14] *Miranda J., Navarrete Ch., Noguez J., Molina-Espinosa J.-M., Ramírez-Montoya M.-S., Navarro-Tuch A.S., Bustamante-Bello M.-R., José-Bernardo Rosas-Fernández J.-B., Molina A. The core components of education 4.0 in higher education: Three case studies in engineering education. Computers & Electrical Engineering. 2021, Volume 93.*

The diagram (Fig. 1.2) compiles the relevant concepts of the higher education transition from Education 1.0 to the current industrial and educational paradigm of Education 4.0.[15]

	Education 1.0	Education 2.0	Education 3.0	Education 4.0
Period	Late 18th Century	Early 20th Century	Late 20th Century	Present
Philosophy	Essentialism, behaviorism, and instructivism	Andragogical, constructivist	Heutagogical, connectivist	Heutagogical, peeragogical and cybergogical
Educator role	Sage	Guide, information source	Orchestrator, curator and collaborator	Mentor, coach, collaborator, reference
Student role	Largely passive	Emerging active "owning of the knowledge"	Active, "Knowledge ownership", initial independence	Active, high independence, trajectory designer
Approach	Teacher-centered	Peer assessment encouraged, high teacher importance	Co-constructed, first student-centered	Mostly student-centered
Learning outcome	Grades, graduation degree	License to professional practicing	Prepared for practice and scenario analysis	Training of key competencies both soft and hard
Enablers	Mechanical printing, graphite pencil, ballpoint pen, typewriter	First computers, electronic devices and calculators	Computers and widespread use of the internet	ICTs tools and platforms powered by IoT
Information source	Standard texts	Adopted texts and open-source material (physical)	Texts, case studies, second hand experience	Based on online sources
Facilities	Universities / classrooms	Blended laboratories and classrooms	Blended and flexible physical shared spaces	Cyber and physical spaces both shared and individual
Industrial technology	Mechanical systems, steam powered	Mass production, industrialization and electricity	Internet access, automatization and control	Connectivity, digitalization and virtualization

Figure 1.2 Concepts of the higher education transition
from Education 1.0 to Education 4.0

1.3.3 Learning concepts of the 21st century

Learning Society concept

Learning is the process of assimilation of social experience by an individual. In the 21st century, cognitive and social theories are the best known. Many ideas about learning in the early twentieth century tended to consider the development of the individual in isolation. By the first half of 20-century, ideas looking at the influence of the wider context in which learning occurs and at emotional and social impacts and effects became more common.

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[15] *According to: Miranda J., Navarrete Ch., Noguez J., Molina-Espinosa J.-M., Ramírez-Montoya M.-S., Navarro-Tuch A.S., Bustamante-Bello M.-R., José-Bernardo Rosas-Fernández J.-B., Molina A. The core components of education 4.0 in higher education: Three case studies in engineering education. Computers & Electrical Engineering. 2021, Volume 93.*

Learning (whether in cognitive, affective, or interpersonal domains) involves a process of individual transformation. Thus, people actively construct their knowledge.

> "The term '21st-century learner' emerged at the turn of the millennium and evoked a certain type of learner – one who holds a suite of new' 21st century skills that are strongly connected to digital technology, digital communication, and notions of flexible approaches to knowledge. <…> The 21st-century learner has become in many ways a catch cry for the changes that some say are needed in schools to meet the demands of a rapidly changing globalized and digital society. Such changes require new ways of learning, new skills, new approaches to knowledge and new pedagogies."[16]

The concept of 'learning society' can be traced back to ancient Greece in the West and to Confucius in the East. There has been a modern re-emergence and renewed interest and focus on the learning society since the later part of the twentieth century, based on changing notions of learning, which go beyond the conventional distinction between the formal sectors of education and continuing education, to embrace lifelong learning and learning throughout life.

Two key reports commissioned by the United Nations Educational, Scientific and Cultural Organization (UNESCO) have been important catalysts for renewed thinking on the meaning of learning society in modern times:

- The first is "Learning to Be: The World of Education Today and Tomorrow," known as the Faure Report, which proposed that lifelong education is a "master concept" at the heart of learning societies.
- The second report, "Learning: The Treasure Within," commonly known as the Delors Report, highlighted the importance of learning throughout life through its 'four pillars of learning.'

The enhanced Delors framework demonstrates the importance of learnability of the individual or learning to learn—the skills that can be applied to the collective (i.e., the workplace and education systems); the family; the community; the importance of civil society; and caring for our world.

Learnability is a critical feature of ensuring that learners in schools, training institutions, universities, and other settings become capable of keeping pace with change, adapting to emerging needs of the economy and society, and productively navigating their lives. Longevity is an important aspect of a learning society since people live longer and remain productive members of the labor force much longer. There is, therefore, an increasing need for them to be effective participants in lifelong learning for a longer period and be fully contributing members of a learning society.

Life-Long Learning concept

Education policymakers, researchers, and other informed commentators refer to the COVID-19 pandemic as a catalyst for the biggest revolution in

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[16] *Hirschmana K., Wood E. B. 21st Century Learners: Changing Conceptions of Knowledge, Learning and the Child. New Zealand Annual Review of Educ. (2018) 23. P. 20.*

education, a once-in-a-lifetime opportunity for re-imagining education and schooling notion of learning societies. Lifelong learning systems such as learning communities, learning cities, and learning regions (under the umbrella of a learning society) are an important part of this revolution.

There is also a growing body of knowledge on developing and sustaining a learning city.[17]

The concept of lifelong education, market changes, and challenges of the information society are changing and diversifying forms of education. Recently, the problem of non-formal education, its processes, meaning, and recognition has been hotly discussed. This form of education is closely related to lifelong learning.

Life-long learning

Formal/Informal Learning concept

Formal learning occurs in a structured and organized environment like a training/education institution or on the job (Fig. 1.3). It is explicitly designed as education regarding time, objectives, and resources. It is intentional learning from the learner's perspective, leading to degrees and certifications. Formal learning is a structured model that presents a rigid curriculum corresponding to laws and norms, and it is rather presentational education.

Informal learning is education beyond limitations and goes on outside a traditional formal learning environment like a university, school, or college. It is an education that is seen as learning which goes on in our daily life or learning projects undertaken by us to teach ourselves

Formal learning is not a life-long process but offers results in a pre-defined time frame. For instance, students are taking a particular certification course for two months, which is not a learning process that would continue throughout life. The program is designed for a particular duration, with guidelines to achieve the targeted objective.

Informal learning is a spontaneous and lifelong learning activity. At an early age, we learn as a kid from our parents, and we learn from peers, friends, a job, or co-workers as we age. As you age, the learning process continues, and you continue to learn from younger, for instance, the use of new technology.

> *Further Reading: Movchan S. Difference Between Formal and Informal Learning. Raccoon Gang. 2023. February. URL: https://raccoongang.com/blog/difference-between-formal-and-informal-learning/*

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[17] *Maclean R., Wheeler L. Conceptualizing the Meaning, Theory, and Practice of Learning Societies During an Age of Disruption. In: Powering a Learning Society During an Age of Disruption. Education in the Asia-Pacific Region: Issues, Concerns and Prospects. Vol. 58.2021. URL: https://link.springer.com/chapter/10.1007/978-981-16-0983-1_2*

Formal learning	Non-formal learning	Informal learning

Learning is deliberate	⟺	Learning is non-intentional
Learning is strongly structured by discipline or field	⟺	Learning is not structured by discipline or field
Learning is strongly structured in circular items	⟺	Learning as such is not planned and has no formal designation
State regulation	⟺	Open market
Providers are public or state-accredited	⟺	Private providers volunteer organisations with no restricted market entry
Quality assurance mechanisms	⟺	No quality assurance mechanisms

Figure 1.3 Characteristics of formal, non-formal, and informal learning[18]

1.3.4 Learning models

Learning Pyramid model

The National Training Laboratories Institute developed a pyramid model in the early 1960s (Fig. 1.4). The Learning Pyramid recognizes the different learning methods. It evaluates their percentage effectiveness in terms of learning retention. It is displayed visually as a pyramid but is broken down as follows:

• Lecture (5% Retention) – This is the most passive form of learning as a student sits back and receives this with no requirement to display any understanding or application of the knowledge. However, it is the most effective way to deliver information to students quickly.

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[18] *Werquin P. Recognising non-formal and informal learning: outcomes, policies and practices. 2010. URL: https://www.researchgate.net/publication/291725145_ Recognising_Non-Formal_and_Informal_Learning_Outcomes_Policies_and_Practices*

- Reading (10% Retention) – Although still passive, reading is considered a slightly more effective learning mode. A student can regularly refer to the material as a reference and potentially highlight key learning sections.

The Learning Pyramid is a methodology that identifies the different ways of learning, and measures as a percentage the effectiveness of each method in terms of an individual retaining the knowledge they have learnt. In broad terms, it gives lower percentage effectiveness to passive forms of learning (lectures, reading) and much higher percentage effectiveness to active forms of learning (group discussion, practice by doing).

The Learning Pyramid

Average Learning Retention Rates

LECTURE 5%
READING 10%
AUDIO VISUAL 20%
DEMONSTRATION 30%
DISCUSSION GROUP 50%
PRACTICE BY DOING 75%
TEACHING OTHERS 90%

Figure 1.4 The Learning Pyramid

- Audio-visual (20% Retention) – With the growth of digital technology and digital learning, this has become an increasingly common learning mode. Although still defined as passive learning, it is considered more effective because it incorporates other learning elements. It is most often still a lecture, but using visual tools which are considered to enhance learning retention.
- Demonstration (30% Retention) – Demonstration is considered the first active learning method in The Learning Pyramid. In short, it means a teacher showing a student something practically step-by-step. A common working example is teaching how to change a flat tire, and showing this in practice is much more effective than simply describing the process.
- Discussion (50% Retention) – This is sometimes called cooperative learning. It involves a larger group being broken into smaller groups to engage with a subject actively. Listening to others give their interpretation of learning allows individuals to consider their understanding of the subject. It develops their critical thinking and deepens knowledge retention.
- Practice Doing (75% Retention) – This might also be called 'hands-on' experience. It is considered one of the most effective learning methods, allowing individuals to apply their knowledge in practice. The practical application helps to recall information in the long term, leads to deeper critical thinking and understanding of knowledge, and, therefore, higher learning retention. Returning to the flat tire as an example – in terms of knowledge retention, it is even more

effective to practice changing a tire oneself than to watch a demonstration of the process.

- Teach Others (90% Retention) – This is considered the highest method of learning retention on The Learning Pyramid. To pass on knowledge to others, an individual must thoroughly understand the concepts and details around a subject and can easily recall it. It is also considered that engaging with students and responding to questions deepens an individual's critical thinking and cements knowledge retention.

This model is consistent with the current approach of modern pedagogy, which emphasizes a student-oriented approach and active learning methods. But, there is an ongoing debate around this model. Many researchers deny its effectiveness, admitting that it makes sense for solving some pedagogical tasks. In the 21st century, this model is being rethought in the context of postmodernist theory and a lifelong approach to education. For example, reading is one of the effective methods of forming lifelong education skills.

"If we were to draw any conclusion based on the pyramid, it would be that the methods be thought of as on a continuum as opposed to in a hierarchy. Therefore, the less prior knowledge students have the more likely it is that effective methods would be found toward the direct instruction end of the continuum, and as students' knowledge increased, they would be more capable of learning with methods involving discussion and teaching. However, because learning is an ongoing process, this will not preclude that further learning will take place with more direct methods. Thus, even the most experienced learners, such as successful heart surgeons, could learn from a more experienced learner, a surgeon with a new technique, and the best initial methods would likely be lecture/demonstration which would lead to practice by doing, and possibly teaching others."[19]

Bloom's taxonomy system

Bloom's Taxonomy is a system of models (arranged in a rank, with some elements at the bottom and some at the top) used to categorize learning objectives into varying levels of complexity. Benjamin Bloom led a team of researchers in the 1950s to establish behaviors associated with learning; the outcome of this study was Bloom's Taxonomy of Learning. Educators using Bloom's taxonomy aim to encourage higher-order thinking in their students by building up lower-level cognitive skills.

The key phrases can be used (e.g., Example Assessments) to prompt for these skills during the assessment process. Bloom's taxonomy specifically targets these by seeking to increase knowledge (cognitive domain), develop skills, or develop emotional aptitude or balance (affective domain). Learning outcomes might be identified by someone outside the teacher, such as state-wide or departmental standards.

The taxonomy provides a basis for developing sub-goals and assessment methodology to meet these goals. It is important to note that learning outcomes

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[19] *Lalley P.J., Miller H.R. The Learning Pyramid: Does It Point Teachers In The Right Direction? Education. 2007. V.128. №1. P. 76.*

are goals and are not the activities performed to achieve those goals. Outcomes can be categorized into broad, global outcomes that may take many years to achieve and provide direction for education, educational purposes that guide curriculum development over the weeks or months it takes to complete a specific course, and instructional goals that narrowly focus on the daily activities, experiences, and exercises used in a particular lesson plan.

Thanks to Bloom's Taxonomy, teachers nationwide have a tool to guide the development of assignments, assessments, and overall curricula. This model helps teachers identify the key learning objectives they want a student to achieve for each unit because it succinctly details the learning process.

The taxonomy explains that

1) before you can understand a concept, you need to remember it;

2) to apply a concept, you need first to understand it;

3) to evaluate a process, you need first to analyze it;

4) to create something new, you need to have completed a thorough evaluation. This hierarchy takes students through a process of synthesizing information that allows them to think critically. Students start with a piece of information and are motivated to ask questions and seek out answers.

Further, L.W. Anderson and D.R. Krathwohl revised Bloom's Taxonomy framework, replacing Knowledge with Remembering, Synthesis by Evaluating, and Evaluation by Creating[20].

Bloom's Taxonomy includes six levels.

The first level is to Remembering. Example activities at the Remembering level: memorize a poem, recall state capitals, remember math formulas.

The second level is to Understand. Example activities at the Understanding level: organize the animal kingdom based on a given framework, illustrate the difference between a rectangle and a square, summarize the plot of a simple story.

The third level is to Apply. Example activities at the Application level: use a formula to solve a problem, select a design to meet a purpose, reconstruct the passage of a new law through a given government/system.

The fourth level is to Analyze. Example activities at the Analysis level: identify the 'parts of' democracy, explain how the steps of the scientific process work together, identify why a machine is not working.

The fifth level is to Evaluate. Example activities at the Evaluation level: make a judgment regarding an ethical dilemma, interpret the significance of a given law of physics, illustrate the relative value of technological innovation in a specific setting—a tool that helps recover topsoil farming, for example.

The sixth and highest level is Creation. Example activities at the Creation level: design a new solution to an 'old' problem that honors/acknowledges the previous failures, delete the least useful arguments in a persuasive essay, and write a poem based on a given theme and tone.

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[20] *Anderson L.W., Krathwohl, D.R. A taxonomy for learning, teaching, and assessing, abridged edition. Boston: Allyn & Bacon. Wheel adapted from: Edutechalogy. 2001. URL: http://eductechalogy.org/swfapp/blooms/wheel/engage.swf*

Therefore, a 21st Century version was adopted and is now more commonly used as a taxonomy for use in business, see Table 1.3 below.

Table 1.3

Revised Bloom's taxonomy action verbs

Remembering	Understanding	Applying	Analyzing	Evaluating	Creating
Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers	Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	Solve problems in new situations by applying acquired knowledge, facts, techniques, and rules differently.	Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations.	Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria.	Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.
Choose	Classify	Apply	Analyze	Agree	Adapt
Define	Compare	Build	Assume	Appraise	Build
Find	Contrast	Choose	Categorize	Assess	Change
How	Demonstrate	Construct	Classify	Award	Choose
Label	Explain	Develop	Compare	Choose	Combine
List	Extend	Experiment with	Conclusion	Compare	Compile
Match	Illustrate	Identify	Contrast	Conclude	Compose
Name	Infer	Interview	Discover	Criteria	Construct
Omit	Interpret	Make use of	Dissect	Criticize	Create
Recall	Outline	Model	Distinguish	Decide	Delete
Relate	Relate	Organize	Divide	Deduct	Design
Select	Rephrase	Plan	Examine	Defend	Develop
Show	Show	Select	Function	Determine	Discuss
Spell	Summarize	Solve	Inference	Disprove	Elaborate
Tell	Translate	Utilize	Inspect	Estimate	Estimate
What			List	Evaluate	Formulate
When			Motive	Explain	Happen
Where			Relationships	Influence	Imagine
Which			Simplify	Interpret	Improve
Who			Survey	Judge	Invent
Why			Take part in	Justify	Make up
			Test for	Mark	Maximize
			Theme	Measure	Minimize
				Perceive	Modify
				Prioritize	Originate
				Prove	Plan
				Rate	Predict
				Recommend	Propose
				Rule on	Solve
				Select	Suppose
				Support	Test
				Value	Theory

Taken from: Anderson, L.W., & Krathwohl, D.R. (2001). A taxonomy for learning, teaching, and assessing, Abridged Edition. Boston, MA: Allyn and Bacon

Surface/deep approaches to learning

The researchers, investigating the interaction between a student and a set learning task, led to the conclusion that students' approaches to the task (their intention) determined the extent to which they engaged with their subject, and this affected the quality of outcomes. These were classified as deep and surface approaches to learning (Fig. 1.5).

The deep approach to learning is typified by an intention to understand and seek meaning. It leads students to attempt to relate concepts to existing understanding and each other, to distinguish between new ideas and existing knowledge, and to evaluate and determine key themes and concepts critically. In short, such an approach results from the students' intention to gain maximum meaning from their studying, which they achieve through high levels of cognitive processing throughout learning. Facts are learned in the context of meaning.

Learning
Is the process of assimilation of social experience by an individual

Deep approach to learning
Facts are learnt in the context of meaning.

Surface approach to learning
Facts are learnt without a meaningful framework.
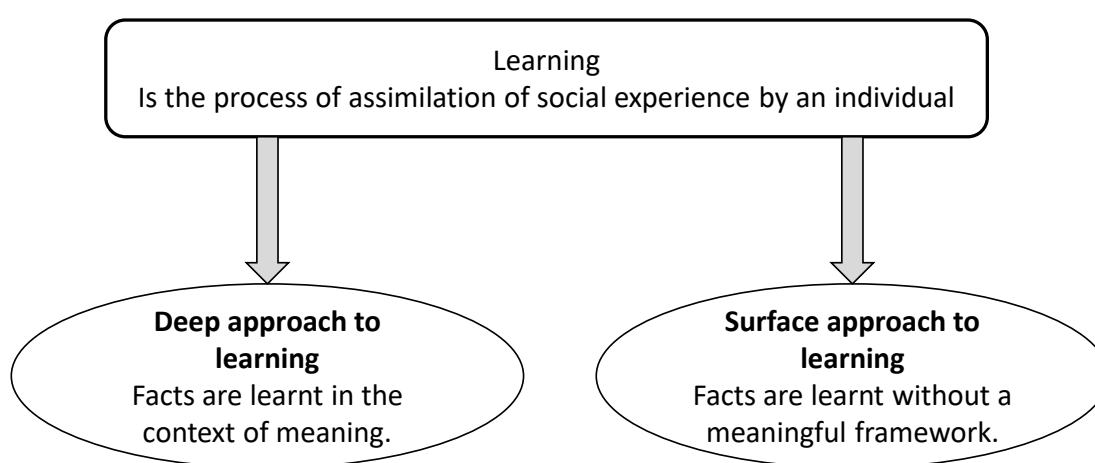
Figure 1.5 Classification of deep and surface approaches in learning[21]

There is some evidence that lecturers who take a student-focused approach to teaching and learning will encourage students toward a deep approach to study. The surface approach to learning is typified by an intention to complete the task, memorize information, make no distinction between new ideas and existing knowledge, and to treat the task as externally imposed. Rote learning is the typical surface approach. Such an approach results from students' intention to offer the impression that maximum learning has occurred, which they achieve through superficial levels of cognitive processing. 'Facts' are learned without a meaningful framework.

The following illustrates these concepts. The learning outcomes for social science students, who adopt a deep approach to reading a set text, include full engagement with the text's central theme and an understanding of contributing arguments. In contrast, those who adopt a surface approach would fail to identify the central themes – primarily because they would be engrossed in progressing through the text sequentially, attempting to remember the flat landscape of facts.

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[21] *Biggs J. Tan C. Teaching for Quality Learning at University What the Student Does. 4th edition. New York: Open University Press, 2011.P. 24 – 27.*

Maintaining standards when students' commitment and range of ability are so varied presents an interesting teaching challenge that, in previous editions, they have called the 'Robert and Susan problem' (Fig.1.6).
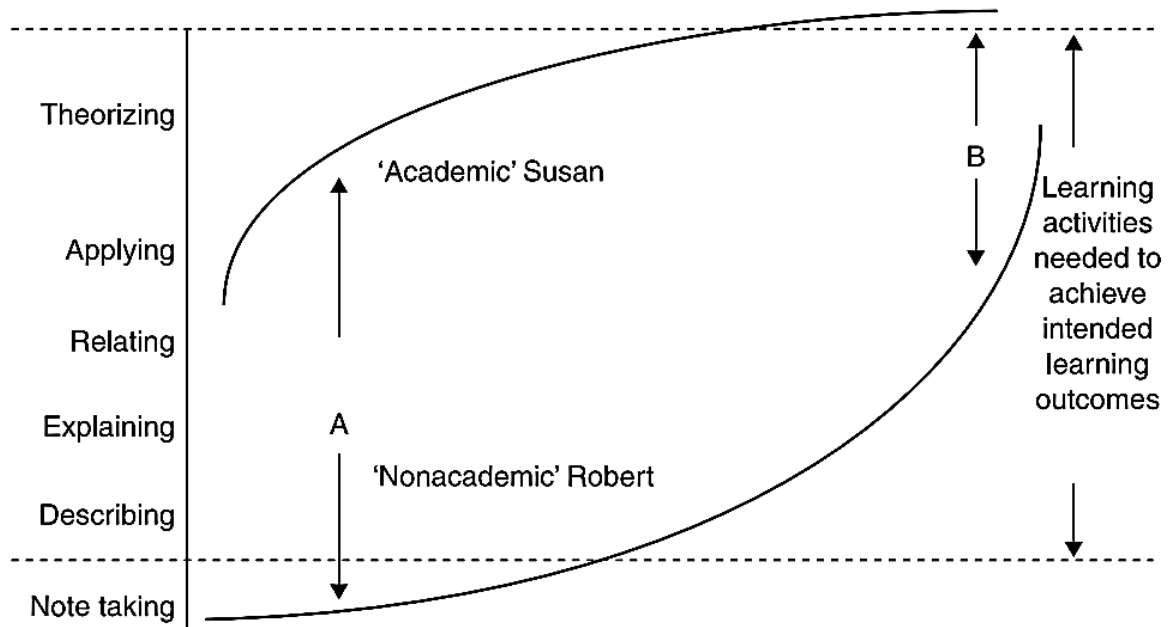
Figure 1.6 The Figure of "Robert and Susan Problem"

Let us look at two students attending a lecture. Susan is academically committed, bright, interested in her studies, and wants to do well. She has clear academic or career plans, and what she learns is important to her. She goes about it in an 'academic' way when she learns. She comes to the lecture with sound, relevant background knowledge and possibly some questions she wants to be answered. In the lecture, she finds an answer to a preformed question; it forms the keystone for a particular arch of knowledge she is constructing. Or it may not be the answer she is looking for, and she speculates, wondering why it is not. In either event, she reflects on the personal significance of what she is learning. Students like Susan virtually teach themselves; they do not need much help from us. Academics like the Susans – indeed, they were once Susans themselves – tend to assume that she represents how most students learn, and they teach accordingly.

Now take Robert. He is at university not out of a driving curiosity about a particular subject or a burning ambition to excel in a particular profession but to obtain a qualification for a decent job. A few years ago, before the Bologna Process says (see below), he would never have considered going to university. He is less committed than Susan and possibly not as bright academically. He has little background or relevant knowledge. He comes to lectures with no or few questions. He wants only to put in sufficient effort to pass and obtain that meal ticket. Robert hears the lecturer say the same words as Susan is listening, but he does not see a keystone, just another brick to be recorded in his lecture notes. He

believes that if he can record enough of these bricks and remember them on cue, he will keep out of trouble come exam time.

Students like Robert are in higher proportions in today's classes, and they need help to reach acceptable levels of achievement. To say that Robert is 'unmotivated' may be true, but it is unhelpful. All it means is that he is not responding to the methods that work for Susan, the likes of whom were sufficiently visible in most classes in the good old days to satisfy us that our teaching did work. But, of course, it was the students who were doing the work and getting the results, not our teaching.

The teacher's challenge is to teach so that Robert learns more like Susan. Figure 1.6 suggests that the present differences between Robert and Susan (point A) may be lessened by appropriate teaching (point B).

A lecture would be an example of such passive teaching, and we get the picture just described: Susan working at a high level of engagement within the target range of learning activities, Robert taking notes and memorizing activities below the target range activities. Susan uses a 'deep' approach, comprising learning activities appropriate to the outcomes, while Robert uses a 'surface' approach, meaning that he is operating below the required cognitive level. The changing scene in university teaching is needed to achieve the intended learning outcomes.

Problem-based learning would be an example of an active teaching method because it requires students to question, speculate, and generate solutions. Robert is encouraged to use the higher-order cognitive activities that Susan uses spontaneously. The teaching has narrowed the gap between their learning methods and their respective performances.

The principle of optimality leads to the maximum possible results for a minimally required expenditure of time and effort. It requires a vision of the main thing in the systematic selection process. Choosing the best variant is carried out by the pedagogical search style thinking. In short, no universal solutions can solve every problem, and there are defining prescriptions within which you, as a teacher, look for individual solutions.

Constructive alignment approach

Constructive alignment refers to a specific approach to designing courses. The term constructive alignment describes congruence between what the teacher intends learners to be able to do, know or understand, how they teach, and what and how they assess (Fig. 1.7).

The goal is to align learning outcomes, activities, and assessment tasks. The following steps must be taken to do that: describe the intended learning outcome in the form of a verb (learning activity) and its object (the content) and specify the context and a standard the students are to attain; create a learning environment using teaching/learning activities that address that verb and therefore are likely to bring about the intended outcome; use assessment tasks that also contain that verb, thus enabling you to judge with the help of rubrics if and how well students'

performances meet the criteria; transform these judgments into standard grading criteria.

Learning objectives
What should the student
know or be able to do?

Assessment
How are knowledge
& abilities measured?

Learning activities
How does the student
reach the final level?
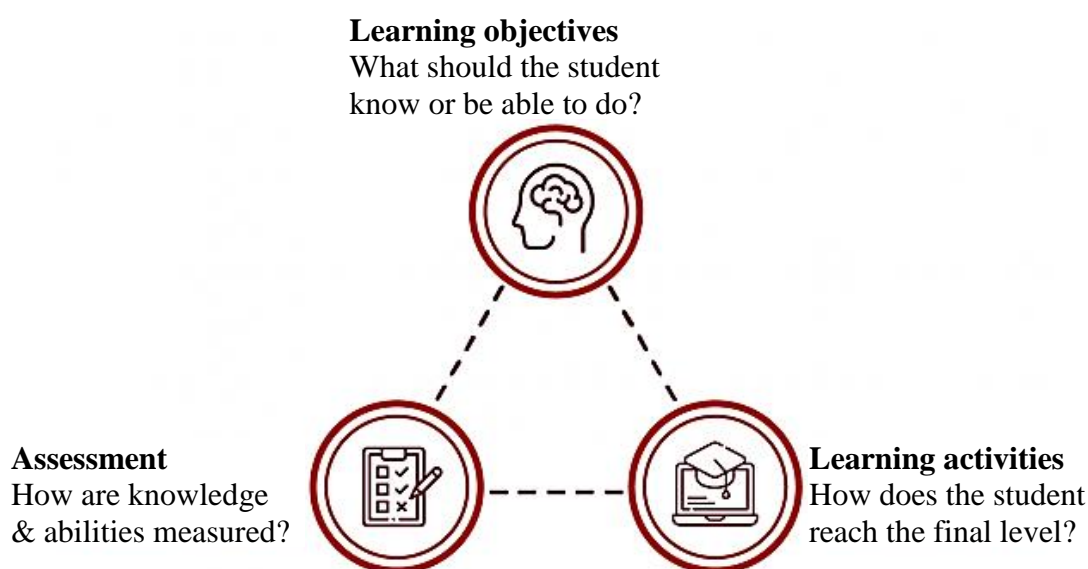
Figure 1.7 Constructive alignment scheme

It is suggested that approach to learning was not implicit in the make-up of the student but something between the student and the task and thus was both personal and situational. Therefore, an approach to learning should be seen not as a pure individual characteristic but rather as a response to the teaching environment in which the student is expected to learn. The term constructive alignment has been popularized to describe congruence between what the teacher intends learners to be able to do, know or understand, how they teach, and what and how they assess.

> ***Further Reading***: *A Handbook for Teaching and Learning in Higher Education Enhancing Academic Practice. 3d edition. Ed. Heather Fry. New York, London: Routledge, 2008. P. 45 – 55.*

1.4 Didactics: the meaning and main categories

The word didactics emanates from the Greek word 'didaskein,' which means to teach or to know how to teach didactic structures comprised of a three-fold relationship, called the didactic triangle or triad (Fig. 1.8). This triad is made up of the teacher, the learner, and the content who actively engage in interwoven activities in the classroom. For the first time, this word appeared in the works of the German teacher Wolfgang Rathke (1571–1635) to denote the art of learning.

The classical pattern used to conceptualize teaching and learning is a didactic triangle in which the student, teacher, and content form the vertices of a triangle. It is usually depicted as a triangle to show that all three relations are equally important or should be considered equal. In teaching/learning, everything is important in all three links of these points to each other and in the field determined thereby.
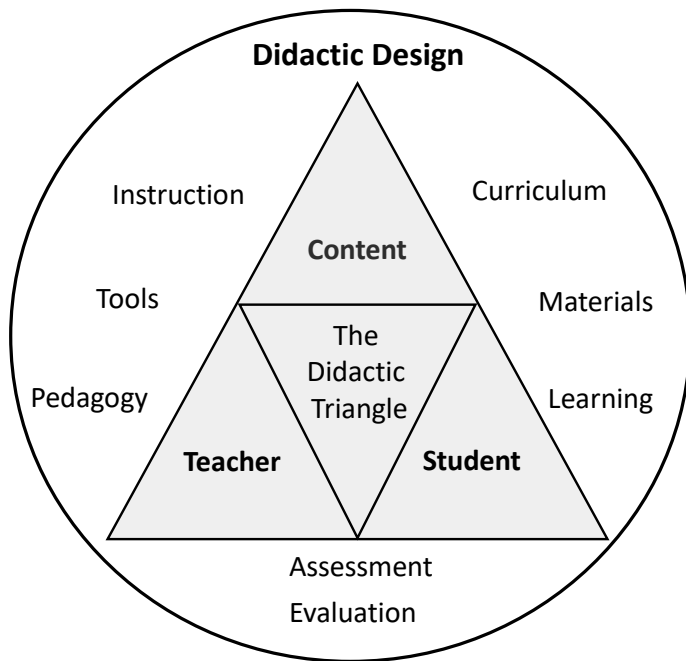
Figure 1.8 The Didactic Triangle   The Didactic Triangle

An important aspect of German Didaktik tradition and pedagogy is that it has both descriptive and normative aspects, science and art of teaching. In a descriptive sense, Didaktik means the science of teaching. It is research on the instructional process in its wholeness: the key actors—teachers and pupils—in institutional and educational contexts and the relationships between the key actors and procedures related to learning, studying, and teaching. The descriptive Didaktik also informs the instructional practice and normative aspects of it. Pedagogy emphasizes values in the teaching-studying-learning process, and they are also important issues in teachers' planning, action, and reflection. It means that education is normative, and teachers have important roles as moral educators. Regardless of the subject matter or grade level taught, teachers are moral educators. Pedagogy also differs from educational psychology in its context dependency. It has implications for the teaching-studying-learning process, which is intentional in nature. Teachers' actions are based on values and purposes, and the whole process is located in an educational institution. Moreover, the teachers are educated in established educational programs, and the studying and learning are guided by a curriculum that defines learning goals[22].

The relations between the basic elements in the didactical triangle play an important part. Naturally, teachers have a link to the curricular contents they teach. This aspect especially means teachers' mastery of the discipline-specific knowledge and skills illustrated in the curricula. Also, students have a relation to the curricular contents they are about to learn. It covers students' attitudes,

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[22] *Kansanen P. Didactics and its relation to educational psychology: Problems in translating a key concept across research communities. International Review of Education. 2002; 48(6). P. 427-441.*

motivations, conceptions, and experiences of curricular themes. This relation is realized in students' content learning.

The special qualities of pedagogical relation between the teacher and student stem from the teacher's and student's roles in the didactical context. Interaction between the teacher and students is necessary for the teaching-studying-learning process and for the best of student learning. The pedagogical relation is asymmetrical by nature in the sense that the teacher being more experienced, aims to support students in learning certain capabilities.

The pedagogical relationship is always interactive and dialogical, not one-way influencing or forcing a student to learn. The teacher acts altruistically by caring for and encouraging students. The pedagogical relationship is always impermanent, which characterizes the relationship from the beginning. The relationship changes and becomes gradually unnecessary while students learn, develop, and become independent and mature. Related to this aspect, pedagogical relationship is always future-oriented. The aim is to support student learning toward future possibilities and challenges by trusting in students' capabilities and success.

The didactical relation meaning the teacher's relationship to the student's relation to content is the core of the teaching-studying-learning process in the pedagogical core context. It combines the teacher's relation to the content and students and basically describes the teacher's main task in an institutional, educational context. This relation covers all the teacher's actions to promote student learning[23].

1.5 Curriculum practice and didactic principles

The term curriculum refers to the lessons and academic content taught in a school or a specific course or program. In dictionaries, the curriculum is often defined as the courses offered by a school, but it is rarely used in such a general sense in schools.

Depending on how broadly educators define or employ the term, curriculum typically refers to the knowledge and skills students are expected to learn, which includes the learning standards or learning objectives they are expected to meet; the units and lessons that teachers teach; the assignments and projects given to students; the books, materials, videos, presentations, and readings used in a course; and the tests, assessments, and other methods used to evaluate student learning. For example, an individual teacher's curriculum would be the specific learning standards, lessons, assignments, and materials used to organize and teach a particular course[24].

In framing curriculum aims, three particular features bear on formative assessment practice in the intended curriculum. The first of these has to do with those general aims concerned with the habits and capacities for learning that

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[23] *Tirri K., Toom A. The Moral Role of Pedagogy as the Science and Art of Teaching. URL: https://www.intechopen.com/chapters/70433*
[24] *The Glossary of Education Reform. URL: https://www.edglossary.org/*

should be developed in the students. Life-long learning focuses on a very important aim that contributes to their ability to learn in the long term. Specific examples of such contributions are:

- capacity to work strategically by first clarifying the aims of a learning activity and then auditing the present state of one's understanding of these aims;
- developed habits of productive engagement in dialogue so that one can use discussion to try out and reformulate one's ideas, learning from the reactions of others and deriving benefit from their feedback;
- a realization, learned from experience, that task-related feedback is a help to one's learning and that one should not react to it as if it were an attack on one's ego;
- confidence, arising from the experience of success, in one's capacity to learn.

The second feature relates to curriculum content. The obvious need to define aims clearly has rather demanding implications. The planning of progression is an essential part of any teaching plan, and the assessment of one's progress against aims by a learner both call for a framework or model of progression in learning relevant to each particular content, conceptual understanding, or skill.

An overcrowded curriculum, where teachers feel compelled to 'cover' all topics, obviously contributes to difficulties. When a student has been given too much information, we call it 'cognitive overload.'

Educational psychologists and cognitive scientists make the distinction between

(1) intrinsic load on the working memory, determined by the nature of the information to be learned (for example, the difficulty of a task),

(2) extraneous load, which is caused by unnecessary or distracting information that is not essential to the learning of the target information,

(3) germane load is specifically used for developing knowledge (via the construction or alteration of schemas) in long-term memory.

Managing cognitive load is not a task of minimizing cognitive load but rather optimizing it. Theoretically, for optimal learning, educators should seek to minimize extraneous load while maximizing intrinsic (or germane) load while not exceeding working memory capacity. As working memory is overwhelmed, the task becomes less manageable, and the student becomes increasingly distractable and unable to attend to the task requirements.

There is a relationship between the principle of split attention, where integrating information in one place leads to lower cognitive load, and sequencing, where splitting up a problem helps manage the overall cognitive load.

Sequencing and chunking:

- Break coursework or essays into manageable sections; teach each section explicitly, with work, narrated examples, exemplars, and then scaffolds, which are slowly removed then all elements of the piece of work are put together for independent practice.

- Scaffold exam answers: Break the answer into chunks or paragraphs. Complete each section as a class to create a model answer. Students do the same thing for the same question but for a different text part.
- Chunking the subject knowledge helps to acquire new skills and knowledge.
  Reducing extraneous load:
- Reducing cognitive load by supporting students with a selection of relevant information, clear instructions, and modeling of processes to take notes of answer questions.
- Keywords for the topic on the wall to ease the cognitive load.
- Managing cognitive load through modeling using a visualizer.
- Integrated instructions, including equations on the question sheets, to reduce cognitive load.
- Integrated instructions for science practicals to reduce extraneous cognitive load[25].

The third feature relates to the different possible learning activity types and styles. For example, if the capacity to carry out holistic, authentic, and thereby complex tasks, for example, solving real mathematics problems or carrying out realistic science investigations, is an aim of the curriculum, then practice in component knowledge and skills is not enough—learners also have to experience the real complex activity. It follows that formative and summative assessments must have such holistic activity as their focus[26].

While the teacher has a central role in the didactic tradition, the curriculum tradition mainly develops a system perspective on education. Also, when the curriculum tradition discusses content as objectified content, the didactic tradition emphasizes subjective content's purpose and meaning. The dominant tradition of curriculum theory has been primarily concerned with curriculum development at the institutional and programmatic level, while didactics is centered upon curriculum making at the classroom level.

Content – knowledge selected into the curriculum – is indispensable in talking and thinking about classroom teaching. In common language, the term 'teaching' means imparting content or knowledge. In the German Didaktik tradition, teaching is conceptualized using the Didaktik triangle – comprised of three general, essential elements: content, teacher, and student. In US curriculum theory, teaching consists of four indispensable and equally important curriculum commonplaces: subject matter (content), teacher, learner, and milieu[27].

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[25] *Perry T., Lea R., Jorgensen C. R., Cordingley P., Shapiro K., Youdell D. Cognitive Science in the Classroom. London: Education Endowment Foundation (EEF). 2021. URL: https://educationendowmentfoundation.org.uk/evidence-summaries/evidencereviews/cognitive-science-approaches-in-the-classroom/*

[26] *Black P. Formative Assessment and Curriculum Consequences. In: Curriculum and assessment / edited by David Scott. Westport, Connecticut, London. Ablex Publishing, 2001. P. 7–25.*

[27] *Deng Z. Brining content back in: rethinking teaching and teachers. In: Didactic and Curricullum in Ongoing Dialogue. Eds. E. Krogh, A. Qvortrup, S. T. Graf. New York, London. Routledge. 2021. P. 25.*

Michael Young formulates 'powerful knowledge' as a curriculum principle. The researcher characterizes powerful knowledge in the following ways:

• It is distinct from 'common sense' knowledge acquired through everyday experience, limited and context-bound.

• It is systematic; therefore, its concepts are systematically related to each other as part of a discipline with specific rules and conventions. It can be the basis for generalizations and thinking beyond particular cases or contexts.

• It is specialized and developed – and developing – by specialists within defined fields of expertise and inquiry.

• It is revisable and open to criticism.[28]

Wolfgang Klafki (1927–2016) was a prominent researcher in German didactic theory. Building on his general Didaktik and Bildung theories, he presented a model of categorical Bildung, which he developed into a model for critical-constructive didactics in the 1970s. The objective of the theory of categorical Bildung or formation, which he designed, is found in the concept of 'educational potential.' It is a concept indicating that in their 'didactical analysis,' teachers should reflect on the knowledge aspects, meanings, and values, that their selected content and chosen teaching methods could have for their students in a broader and deeper sense. In the model of categorical Bildung, he distinguishes between the material and formal theories of the formation and their respective educational content. Material formation theories center on objective knowledge content (Bildungsinhalt), while formal theories prioritize subjective content, which is its educational substance (Bildungsgehalt).

Bildung-centered Didaktik provides a theory of teaching and learning about implementing the state curriculum in the classroom. The concept of Bildung and the theory of educational content are central to the theory. Standing for the German ideal of (liberal) education, Bildung refers to the formation of the full individual, the cultivation of human powers, sensibility, self-awareness, liberty, freedom, responsibility, and dignity. Klafki extends the concept to include the development of self-determination (autonomy), co-determination (participation), and solidarity.

German Didaktikers establish a theory of educational content that informs Bildung's curriculum planning and classroom teaching. It consists of four related concepts: contents of education (Bildungsinhalt), educational substance (Bildungsgehalt), the elemental (das Elementare), and the fundamental (das Fundamentale). The contents embodied in the state curriculum are characteristically called by curriculum designers 'contents of education' that result from a deliberative process of selection and organization of Bildung's wealth of academic knowledge, experience, and wisdom.[29]

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[28] *Young M. Powerful knowledge as a curriculum principle. In: Young M., Lambert D., Roberts C., Roberts M. Knowledge and the Future School: Curriculum and social justice. London. Bloomsbury Academic, 2014. P. 65–88.*

[29] *Deng Z. Brining content back in: rethinking teaching and teachers. In: Didactic and Curricullum in Ongoing Dialogue. Eds. E. Krogh, A. Qvortrup, S. T. Graf. New York, London. Routledge. 2021. P. 25 – 41.*

The content is essential in Klafki's analysis; the basic model consists of five questions that could be applied in analyzing the didactic situation from the perspective of the teacher:

1. What general sense, basic phenomena, or fundamental principle does this content exemplify and open up to the learner? (exemplary significance)?

2. What significance does the content in question already have in the students' minds in my class? (contemporary significance)?

3. What constitutes the topic's significance for the student's future? (future significance)?

4. How is the content structured (which has been placed in a specific pedagogical perspective by questions 1, 2, and 3)? (the structure of the content)?

5. What are the special cases, phenomena, situations, experiments, persons, elements of aesthetic experience, and so forth, in which the structure of the content in question can become interesting, stimulating, approachable, and conceivable?[30]

1.6 Principles of higher school pedagogy

The aim of helping students inspires higher education for sustainable development (HESD)

- develop sustainability attitudes, skills, and knowledge that inform decision-making for the benefit of themselves and others, now and in the future,
- act upon these decisions.[31]

Therefore, high school pedagogy is the science of the regularities of studying and educating. Let us consider the subject of high school pedagogy, which includes the following links:

- higher education institution as a pedagogical system,
- effectiveness of the pedagogical process,
- pedagogical and scientific activity, their professional pedagogical training,
- formation and development of student's personalities,
- education and self-education of students,
- forms, methods, and pedagogical technologies in a high educational institution,
- pedagogical aspects of the continuous independent work of the students,
- scientific and pedagogical interaction in the pedagogical process.

Therefore, pedagogy is considered a science and practice of teaching and educating a person at all personal and professional life stages.

The structure of pedagogical activity relies on the functions of a high educational system:

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[30] *Bladh G., Stolare M., Kristiansson M. Curriculum principles, didactic practice and social issues: Thinking through teachers' knowledge practices in collaborative work London Review of Education, 2018. 16(3): 398-413.*

[31] *UNESCO. UNESCO World Conference on Education for Sustainable Development. 2009. URL: http://unesdoc.unesco.org/images/0018/001887/188799e. pdf*

1. The gnostic component (from the Greek gnosis - knowledge) refers to the sphere of knowledge of the teacher, and it corresponds to the analytical functionality.

2. The prognostic component includes ideas about the promising tasks of training and education and the strategies and ways to achieve them.

3. The communicative component is the features of the teacher's communication activity, the specifics of his interaction with students.

4. The organizational component is a system of teacher skills to organize their activities, as well as the activity of students. These components correspond to the prognostic functionality.

5. The research component as a basis for the constructive function.

The principles of education are scientific, systematic, connection with life, practice, consciousness, learning activity, the unity of concrete and abstract, availability, the strength of knowledge, humanization, culture compatibility, visibility, and differentiation.

The scientific principle requires that the content of education in high school correspond to the achievements of science in the relevant fields of knowledge. The students should learn reliable, scientifically based facts, phenomena, and processes to understand the essence of scientifically based laws, features development, and establishment of scientific discoveries, to possess methods of scientific research, to get to know different directions of scientific research, and to get acquainted with the prospects for the development of scientific hypotheses.

This issue is notably at the core of the notion of 'recontextualization' developed by Basil Bernstein[32]. This term refers to the mechanisms by which knowledge (scientific, professional, experience-based…) is selected – or excluded – in teaching and how it is shaped, retranslated, and reformulated throughout the process. For example, the physics taught at university is not an exact reflection of the scientific knowledge researchers use in physics. It is a reconstruction designed according to specific pedagogical means and objectives, produced by various social actors: government departments, learned societies, and teachers. This recontextualization does not just boil down to 'technical' or 'neutral' processes, which would consist, for example, of 'simplifying' knowledge to make it teachable.

It is necessary to form cognitive interests in students, teach them to master modern research methods, be systematically involved in various forms of scientific research, and stimulate interest in such activities.

The principle of systematic follows from that knowledge of the surrounding world is possible only in a certain system. Each science constitutes a system of knowledge united by internal connections. Therefore, this principle means consistent, taking into account the logic of a particular science and thinking capabilities of the students, deployment content of knowledge, methods of activity in educational programs, textbooks, manuals, etc., compliance with the same

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[32] *Bernstein B. Pedagogy, Symbolic Control and Identity (Revised Edition). New York and Oxford. Rowman & Littlefield Publishers. 2000.*

order of knowledge acquisition, formation of abilities and skills. The previous level of knowledge should act as a foundation efficiency of assimilation of the next part of knowledge.

- on the one hand, a 'systemic' dimension (the fact that a program includes a multiplicity of clearly differentiated and more or less strongly linked components)
- on the other hand, a sequential dimension (the fact that teaching each of these components follows a programming and progression plan according to an explicitly planned temporal order).

Teaching builds on the known. It must not reject it – proceed from the known to the unknown. In deep learning, new learning connects with old, so teaching should emphasize the interconnectedness of topics

The principle of connection with life, practice. The study is successful when the individual feels useful and needs learned knowledge. After all, the essential activities of professional educational institutions are reduced to prepare a person for active, productive work in the sphere of the creation of spiritual and material values.

The principle of consciousness and learning activity emerges from an important regularity of a person's cognitive activity. Only mental work guarantees intellectual development, acquired strength, knowledge, and effective learning motives. Therefore, the teacher should consider this regularity and involve students in active educational work at all stages of the educational process. The teacher's attempts to explain exhaustively to oversimplify the educational work of the students are led to the deterioration of a person's intellectual development and make the personality incapable of independent, productive professional activity.

The principle of the unity of concrete and abstract means that in education, it is necessary to follow the sequence of the process of knowledge acquisition at each stage of education, find its origin in facts and observations, scientific concepts and theories, after which to determine a natural transition from the perception of a single, specific, subject to general, abstract, or, conversely, from general, abstract, to single, concrete.

The principle of accessibility. Availability depends on the organization of the educational process, teaching methods, etc., related to education conditions. Accessibility is determined by the fact that the higher the mental level, the more successful the master's student is. This principle is based on a gradual increase in learning difficulties.

The principle of strength of knowledge. Fixed regularities of assimilation of the content of education and development of cognitive powers are two interconnected sides of the process of teaching; the strength of students' learning depends not only on objective factors but also on the subjective attitude of the students to studies; the students' memory is selective; the more important and interesting the material is, the better it is assimilated.

The principle of humanization is the disclosure of the human dimension and human-oriented potential of teachers and graduate students. In short, we should

help to create personal philosophy, a general orientation in life. Humanists believe individuals can set goals, solve problems, and achieve their potential.

The principle of cultural compatibility provides the inextricable connection between education and the cultural heritage of humanity, particularly with knowledge about common human wealth in the spiritual and material culture realm and about the peculiarities of the development and formation of national culture. This principle permeates all spheres of human life: everyday life, relationships, production activity, radio, cinema, television, theatre, and books. And above all – the field of education and upbringing. Some people in the education system spend a lot of effort mastering the complex to learn the basics of theoretical knowledge. And as a result, only a small part of what remains in memory is provided by educational programs. Out of attention, by in fact, such layers of culture as the visual arts remain art, music, the culture of life and behavior, and applied art. These means of education have an effect primarily not so much on the mind as on the sensual sphere. They contribute to the formation and elevation of the spiritual personality culture.

The principle of visually involves learning based on a live perception of specific objects and phenomena, reality, or their images. Visualization helps students' minds develop, helps reveal the connection between scientific knowledge and everyday practice, facilitates the process of assimilation of knowledge, and stimulates interest in them (develops students' motivational sphere).

The principle of differentiation is the orientation of educational institutions on the students' achievements, considering their interest in education and the development of their interests, inclinations, and abilities.

Differentiation can be embodied in practice by grouping students according to their knowledge and practical experience and creating individual programs for the students according to their interests and professional orientation. Differentiation implies poly variance - creating conditions in the educational system selection and giving each person a chance for success, encouraging the students to make independent choices and responsible decisions, and providing development of alternative and independent thinking.

The activity of the teacher develops in the established pedagogical patterns and principles. However, there is no universal recipe that could solve all problems. In higher education, the student's individuality, knowledge level, and motivation play an important role and should be considered when planning the educational process. The main tasks of this process are not only to transfer knowledge but to ensure the connection between theory and its practical applications and contribute to the formation of values and creative activity of the future specialist.

1.7 Self-assessment questions

1. How can the role of the teacher and the relationship between the teacher and the learner be defined within the concept of pedagogy as an art?
2. What are the differences between andrology and pedagogy?

3. Explain the differences between idealism and realism as philosophical approaches to education.
4. What philosophical approaches to education prevail in modern society?
5. What is the essence of the concept of Education 4.0?
6. What is the main sense of the didactic triangle?
7. What is the difference between learning and education?
8. What are the disadvantages of the learning pyramid model?
9. What is the significance of Bloom's taxonomy?
10. How was it transformed in new educational conditions?
11. How can you explain the "Susan-and-Robert" case?
12. How to avoid surface approaches as well as cognitive overload?
13. What is the curriculum?
14. What features of curriculum design do didactics emphasize?
15. What term refers to how knowledge (scientific, professional, experience-based…) is selected in teaching?

1.8 Practice exercises

1.8.1 Bloom's taxonomy. Forming goals, objectives, and outcomes

Design of the curriculum

STEP 1

Find out as much as you can about the students. If you are new to teaching the course, consider consulting with colleagues who have previously taught the course.
- Are your students new to the course topic? New to the discipline?
- What motivates students to take your course?
- What knowledge/skills might you expect students to have before the first class?
- What problems do students typically have with this material at this level?

STEP 2.
Consider your general aims for the course/program.

STEP 3.
Write specific learning outcomes (objectives).
We might ask: What do students know that they did not know before, and what can students do that they could not do before?
Affective outcomes are also important in eliciting questions such as: How has their learning experience impacted students' values, goals, attitudes, self-concepts, worldviews, and behaviors? How has it developed their potential?
To have students achieve high-quality learning outcomes is one of the aims of most university teachers. Ideally, we want our students to engage in deep (as opposed to surface) learning.
A learning outcome is a simple, concise statement that tells students what they should be able to do after working through your course. Developing

measurable learning outcomes can help instructors and programs determine if learners are achieving the goals we've set for them.

To understand whether students possess the knowledge or skills we want them to have, we need to observe them doing something, such as correctly identifying something or performing some action.

Recollect the Bloom taxonomy and your objectives for the course

Level	Question	Implementation (what do you want students to learn?)
Knowledge	What do we expect learners to know?	
Comprehension	Can learners interpret what they know? Can they extrapolate from what they know?	
Application	Can learners see the relevance of this idea to that situation?	
Analysis	Can learners analyze elements of the subject field? Can they analyze relationships in the field? Can they analyze organizational principles?	
Evaluation	Can learners make judgments based on internal evidence? Can they make judgments based on external evidence?	
Creation	Can learners produce unique communication in this field? Can they develop a plan or a proposed set of operations? Can they derive a set of abstract relationships?	

Plan the assessment framework to match your objectives.
Reflect on the following questions:

- What type of assignment or assessment would best help me confirm that my students know X or can do Y? What are options beyond the multiple choice quiz, midterm/final, or term paper?
- What assessments can I design to check students' understanding during the course? What about at the end of the course?

STEP 4.
Plan the content, i.e., sequence of topics/readings.

The greatest enemy of understanding is coverage. If you're determined to cover a lot of things, you are guaranteeing that most students will not understand because they haven't had time enough to go into things in depth, figure out what the requisite understanding is, and be able to perform that understanding in different situations

One way to address a topic's importance is to spend more or less time on it. A better way is that important topics should be understood at a higher level than less important topics. An important topic might be understood so that students can use it or solve problems with it; a less important topic, just that it is recognized.

Select an important topic from the less important from your list of topics of your course.

Recommendations for selection.

The more links you can establish, the more you and your students are engaging with a set of pre-existing knowledge rather than just memorizing material.

Some useful questions:

the kind of knowledge to be learned (declarative or functioning)

the level of understanding or performance to be achieved

STEP 5

Plan the teaching/learning design – what kinds of activities will you and your students engage in together?

It may help to ask yourself these questions:

What are students going to get out of this particular case or assignment?

Why were these cases or assignments all put together?

Why in this sequence?

What are they going to get out of this module as a whole?

Why were these modules all put together?

CHAPTER 2. PEDAGOGICAL PROFESSIONALISM

2.1 Defining teaching

Since education has been an Enlightenment product, the traditional teaching concept has expectedly embraced many of its philosophies, such as the emphasis on an end-product, rationality, efficiency, scientific ideals of measurement and evidence, and an empirical and pragmatic approach to knowledge. Significantly, learners were treated almost as passive recipients of the information they received; they could be treated almost as inanimate objects. Therefore, teaching could be examined in the same way as material objects. Thus, the techniques by which knowledge was transmitted were crucial to the process. Therefore, teaching as we have traditionally known it might be regarded as the product of the era of Modernity. This activity had to fit this paradigm to call for a discussion of at least three aspects of teaching. They are the end product of education, the means to the end, and an assessment of the process.

The origin of the word 'teach' lies in the Old English tæcan meaning 'show, present, point out,' which is of Germanic origin; and related to 'token,' from an Indo-European root shared by Greek deiknunai 'show,' 'deigma' sample. Some other words with related meanings are 'educator,' 'instructor,' 'trainer,' 'tutor,' 'lecturer,' and 'facilitator.'

Since the emphasis of teaching has been placed on instrumentals, it is little wonder that one of the ways of measuring teaching success has been on the outcomes of the process. Teachers must be effective if they produce students with good grades – a measurable outcome. But there is no direct evidence to indicate that the teaching process has actually been the cause of the measurable outcome! It might have been, but we do not know whether the teaching process, the teachers' personalities, or the learners and their efforts help achieve success.

Is the teacher merely the instrument choosing the proper methods, communicating the 'correct' knowledge, and getting the desired results? In this process, the students are treated as passive. Learning and teaching need a personal relationship to achieve the best outcomes. This idea is recognized because many distance education institutions provide face-to-face contact opportunities.

Consequently, teachers should be concerned for their students, but students should also be involved with their teachers. Many books and papers have sought to demonstrate the significance of the moral relationship in teaching. They recount the lengths teachers should go to help students achieve fulfillment through teaching and learning. It is the vocation of teaching:
- Teaching is imparting knowledge or skill,
- teaching as success,
- teaching as an intentional activity,
- teaching as normative behavior, and
- teaching as the promotion of learning.

A descriptive definition of teaching is "imparting knowledge or skill." Traditionally the teacher's role has been as a purveyor of information; the teacher

was the fount of all knowledge. The traditional method of imparting education involves establishing educational institutions wherein students attend classes, and a single teacher or several teachers teach individual courses for one or more courses. This education system is almost universally followed and remains an efficient method for imparting education. The system allows peer interaction between students and creates competition between them.

Students also have the opportunity to contact the teacher immediately for clarification of their doubts, and feedback and response are received immediately. The sessions are interactive, the students are attentive, and subject comprehension is high. The teacher knows each student individually and their potential and limitations, especially if the class size is small.

However, the traditional system, as outlined above, has several disadvantages. One major drawback is that a single teacher is expected to impart knowledge to many students. As a result, attention given per student decreases with an increased number of students.

"Differentiating between 'telling' and 'teaching' needs to be clear if the following principles of pedagogy are to have meaning. For me, teaching is based on understanding oneself and others <…>; hence, the heart and soul of teaching begin with relationships. Teaching is a relationship, and without building relationships, the purpose of teaching is diminished. Other principles of pedagogy are enhanced through relationships; therefore, not surprisingly, although I do not view my list of principles of pedagogy as a checklist to be considered in rank order, the first principle (relationships) is foremost."[33]

The modern teacher is a facilitator who assists students in learning for themselves. Instead of sitting in rows, students will likely be in groups doing something different. Some do practical tasks, others write, and some do not even in the room but in another part of the building using specialist equipment or looking up something in the library. All of the students might be at different stages in their learning; consequently, the teaching is individualized to suit individual requirements and abilities.

This change from the traditional model is the result of several factors. First, it is recognized that adults, unlike small children, have a wealth of experience and can efficiently plan their learning. Second, not all individuals learn similarly, so if a teacher talks to students, some might benefit, but others might not. Third, everyone learns at their own pace and not, of necessity, at the rate set by the teacher. Hence, the individualizing of learning has defined advantages.

The concept of "teaching as success" implies that teaching always leads to learning, and the expression teaching-learning process often indicates this. From this viewpoint, teaching is an activity in which the teacher learns what the student is teaching. As Siegfried "Zig" Engelmann (1931-2019) said, "If the student has

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[33] *John Loughran Teaching about Teaching: Principles and Practice Teaching about Teaching: Purpose, Passion and Pedagogy in Teacher Education. Edited by John Loughran and Tom Russell. London, Washington, D.C The Falmer Press, 2003. P. 57–71.*

not learned, the teacher has not taught—that is not a slogan; it is an operating principle."[34] Last, teaching is an intentional activity, and that means a difference between instruction and teaching (Table 2.1).

Table 2.1

Teaching vs. instruction

Teaching	Instruction
The scope is broad.	Its scope is narrow and limited.
It is both formal and informal.	Instruction is always formal.
Teaching is a continuum for modification of behavior.	Instruction is a part of teaching.
Teaching means the development of the potential of an individual.	Instruction means to impart knowledge of specific subjects.
The range of methods used in teaching is extensive.	Instruction is generally confined to the classroom.
Teaching is imparted in schools, libraries, political groups, etc.	

Teaching is seen as normative behavior, making it possible to distinguish educative teaching from training and conditioning (Table 2.2 and Table 2.3). Of the approaches mentioned above, the view of teaching as an intentional activity is considered fruitful.

Table 2.2

Teaching vs. conditioning

Teaching	Conditioning
Teaching aims at the development of potential and intellect.	It aims at the modification of behavior and learning habits.
It has a broader scope.	The scope of conditioning is relatively narrow.
Reinforcement is not necessary for teaching.	Reinforcement plays a vital role here.
In teaching, repetition of the taught subject matter is not necessary.	Conditioning is done by the repetition of behavior to be acquired.
In teaching, there is a very comprehensive curriculum.	In conditioning, the curriculum is fixed.
In teaching, qualitative and quantitative techniques are used for evaluation.	Evaluation in conditioning is done based on the acquisition of a behavior or a habit.
Teaching is a broader process with various levels.	Conditioning is considered the lowest level of the entire process of teaching.

An intentional teacher focuses on how to engage students in active learning. Concentrating on individual strengths and challenges, an intentional teacher tracks how students meet the benchmarks of the established student development milestones.

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[34] *Heward, L., Kimball, J.W., Heckaman, K.A. et al. In His Own Words: Siegfried "Zig" Engelmann Talks about What's Wrong with Education and How to Fix It. Behav. Analysis Practice 14, 766–774 (2021). https://doi.org/10.1007/s40617-021-00636-x*

Many scholars of education define teaching as "the promotion of learning." In his work of teaching, the teacher must provide appropriate conditions for learning. Some others define teaching as helping other people to learn. Teaching is the art of imparting knowledge, and it knows what to teach the learners and ways of imparting the knowledge most effectively.

Table 2.3

Teaching vs. training

Teaching	Training
Seeks to instill a more profound knowledge over a more extended period.	Seeks to help people master a specific skill or skill set until they can execute it efficiently.
Teaching seeks to impart new knowledge, while training equips the already knowledgeable with tools and techniques to develop a specific skill set.	To mold habits or performance.
	Deals with a duty or function.
Deals with a subject or topic	

Teaching is also an influential art that builds up society by how it is done, the area in which it is conducted, and its cumulative effect on the community's life. Teaching is a process of inducing learning and guiding someone to behave in a given or particular manner beneficial to himself and society. Teaching is how a teacher shows the learners to acquire knowledge, skills, and attitudes. It is a system of interactions involving the teacher, the learner, and the learning materials. Here, the teacher can interact with the learner and the materials simultaneously, and the learner can too interact with both the teacher and the materials.

Cognitive science enlightened us about the nature of learning and the conditions for its growth. All we – the educators – should do from now on is to derive rules for teaching from the nature and conditions of learning (Table 2.4).

2.2 Characteristics of a profession

The terms "profession" and "professor" have their etymological roots in the Latin for profess. To be a professional or a professor was to profess to be an expert in some skill or knowledge field. The word profession meant 'a sense of religious dedication' during the 13th century. It refers to the set of activities performed based on some knowledge and skill to serve the public and earn money intern adhering to the rules established by society. Professions are occupations with remarkable power and prestige. The discrete components of professional ethics include honesty, transparency, integrity, loyalty, and confidentiality. A group of individuals adhering to ethical standards and possessing required special knowledge and skills in the area of their interest and encouraging others to continue seeking their service are termed as 'professionals.' In other words, the member of a profession is a professional. Codes of ethics govern them and profess a commitment to competence, morality, and goodness of the public upholding the

laws, ethics, and principles as a way of practice. Dedication toward duty is the core concept of a profession.

Table 2.4

Nature of learning and rules for teaching (based on Teaching and Learning by Harpaz Yoram)[35]

	Nature of learning	Rules for teaching
Undermining	People learn well when their confidence is undermined and the world disrupts their schemes (concepts and expectations). Undermined people are driven to learn to restore their lost cognitive equilibrium.	Teaching should undermine the students commonsense, challenge the beliefs they take for granted, and help restore their cognitive equilibrium through learning.
Multiple Intelligences	People learn well when the subject matter matches their intelligence profile.	Teaching should direct its contents to the dominant intelligence of the student (and strengthen his or her weaker intelligence after he or she has gained enough self-confidence).
Learning and Thinking Styles	People learn well when the methods of teaching and assessing match their thinking and learning styles.	Teaching and assessing should adjust to the student's thinking and learning styles.
Motivation	People learn well when they are driven by internal motivation.	The teaching method and its contents should stimulate students' curiosity and learn for the sake of learning.
Zone of proximal development	People learn well when the subject matter is at a stage they can reach with the help of another person when it fits their developmental state.	Teaching should spot the zone the student can attain with the help of a teacher and direct him/her there.
Attribution Theories	People learn well when they have productive (implicit) theories of learning, intelligence, and development.	Teaching should empower the productive theories of the learners in various ways.
Distributed Intelligence:	People learn well when their intelligence is distributed – supported by other people, computers, books,	Teaching should be done in an environment that encourages people to think with others, computers, and books.
Feedback	People learn well when they are supplied with ongoing, informative, and formative feedback.	Teaching should supply the students with productive feedback.

Professionalization is a social process by which any trade or occupation transforms into a true "profession of the highest integrity and competence." This process tends to result in ascertaining suitable qualifications, one or more professional associations to suggest best practices and direct the manner of

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[35] *Harpaz Yoram Teaching and Learning: Analysis of the Relationships, URL: https://yoramharpaz.com/teaching-and-learning-analysis-of-the-relationships/*

members of that profession, and some extent of differentiation of the qualified from unqualified amateurs (professional certification). It is also to be expected for crafting "occupational closure," closing the occupation to entry from outsiders, amateurs, and the unqualified. This process of professionalization generates "a hierarchical split between the knowledge authorities in the profession and a deferential group of people."

This demarcation is often termed "closure," as the profession is closed to entry from amateurs and the underqualified. The origin of the process is reported to have been with companies during Middle Ages when people fought for elite privileges to practice their trade as journeymen and to appoint unpaid trainees. It had also been called credentials, and they depend on strict qualifications or certifications to decide whether one is permitted to take on a task or talk as a specialist. It was also defined as "extreme reliance on testimonials, especially academic degrees, in decision-making about hiring or promotion policy." From the previous discussion, it can be concluded that the social process whereby people engage in an activity for pay or as a means of livelihood is termed professionalization after fulfilling the criteria decided by the institution/organization. It needs some prerequisites varying from field to field and occupation to occupation.

Several corollaries distinguish a profession from other occupations. The first distinguishing factor is the concept of restrictions regarding entry requirements and operations of the profession. The second factor is the professional focus on the performance of the members of that profession. Third, professions exist to advance themselves.

It is argued that professions impose restrictions on entry to have few people join the profession. This position implies that controlling the number of people entering the profession helps maintain professional standards as overcrowding is kept at bay. The profession usually regulates its members' conduct in several aspects.

Characteristics of a profession:

- knowledge acquired after a period of specialized intellectual study and training essential for the practice of an occupation.
- controlled entry into the occupation.
- a code of conduct to guide the behavior of the profession's members.
- a solid professional organization that guides the interest of its members as well as codifies the entire professional framework.

Occupation and profession are different concerning "moral values." Teachers are the employers of the wider community, those who serve the interests of people, society, culture, and religion.

Teaching is called a profession due to the following:

• Its social obligation.
• Social prestige.
• Community demand.
• Social service.

● Transformation of values and traditions.

What is Professionalism?

Professionalism involves decision-making and judgment-based practice. Professionalism comprises more than rules; it is a fluid concept highly dependent on context. Professionalism needs to be seen as a responsibility to make judgments and decisions in the context of practice. Contemporary professionalism needs to be underpinned by a professional identity.

Professional identity means becoming aware of what matters most in practice and what values and interests shape decision-making. Professional identity is closely linked to professionalism, which is taking responsibility for one's actions. So, thinking and acting as a professional are underpinned by professionalism and a sense of professional identity. Teacher professional identity refers to a teacher's optimistic attitude and a solid commitment to the profession, reflected in the teacher's desire to maintain their profession and the degree of liking. Teacher professional identity forms within the context of the teacher education program but is also influenced by prior experiences and beliefs.

> Professional identity stands at the core of the teaching profession. It provides a framework for teachers to construct their own ideas of 'how to be,' 'how to act,' and 'how to understand' their work and their place in society. Importantly, teacher identity is neither fixed nor imposed; instead, it is negotiated through experience and the sense that is made of that experience.[36]

Professionalism is a measure of an occupational group's social strength and authority. The teaching profession is the notion of regulated autonomy because it acts on the state's behalf in its citizens' best interest. Teacher professionalism is what teachers actually practice. These practices involve:
- transfer of knowledge,
- presentation of content,
- facilitating learning,
- developing skills in monitoring and enhancing learning,
- ability to exert educational judgment.

The first schools began many years ago—around 3000 B.C.E. In ancient Egypt, priests taught boys to read and write, and they tutored them in the humanities and math. Around the same time, Mesopotamia priests taught reading, writing, astrology, and medicine. Often, their pupils became scribes or librarians. Did these priests see themselves as teachers?

Earlier, priests and prophets taught noble and wealthy children the skills needed to excel in business and politics. Priests were treated well because of their great knowledge. The first private teacher was Confucius in the fifth century B.C.E. In Ancient Greece, knowledge was considered very sacred, and the same ideology passed through the time of Christianity. Education was not very popular among lower classes of people until after the Middle Ages. The Roman Catholic

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[36] *Judyth Sachs Teacher professional identity: competing discourses, competing outcomes Journal of Education Policy, 2001,16:2, P.149-161.*

Church took responsibility and created centers of learning, which eventually became the great universities of Europe, including Cambridge.

> The development of education in Ukraine dates back several centuries to Kyivan Rus. Schools were established at the end of the 10th century in Kyiv and grew in number during the 11th and 12th centuries. The fraternal schools (XVI-XVII centuries) paid great attention to the problem of developing the teacher's professional status. Schools worked based on the charter, which determined the duties of students, teachers, and the training regime. The relationship between the teacher and the parents has changed: according to the statute, they concluded a contract between themselves in the presence of two witnesses, which defined the school's obligations and the parents' rights, which were supposed to contribute to the success of the student's education. Pedagogical education in Ukraine was initiated by the Lviv Fraternal School, which trained teachers in primary and secondary education. However, fraternal schools were liquidated or turned into Catholic schools. In the fragmented Ukraine of the 18th and 19th centuries, teaching and teacher professionalization deteriorated.[37]

Specific teacher training originated in France in 1685 by St. John Baptist de la Salle. The training spread through Europe through the monitorial system, which is the education method where there are several students at a bench, a monitor (older student) who the teacher instructs and then instructs the younger students, and then the teacher.

In European countries, one of the first concerns of the 18th-century educational reformers involved establishing uniform procedures for selecting and nominating teachers. In fact, teaching was one of the first professions to adopt meritocratic selection methods based on the formalized recognition of individual merit, demonstrated by diplomas and specific tests. Teaching licenses or permits have been obligatory since the end of the 18th century. These documents have been granted by State authority or some other agency granted authority by the State. They were issued after an individual had passed an examination or competition open to anyone with a certain number of attributes necessary for admission (literary prowess, age, good moral character, etc.) This decision represents an important step in the process of professionalization. It creates the conditions necessary for elaborating a canon of technical competencies based on educational criteria, which served as a base for the recruitment of teachers and, as a result, as a blueprint for a teaching career.

The creation of teacher training institutions, a primordial step in the process of professionalization, is the fruit of action for both teachers and the State: the former saw it as a way of enhancing their status, the latter as a powerful instrument of control. On the one hand, the institutionalization of training procedures through the creation of regular schools has permitted the development of teaching as a profession and the social improvement of its members. On the other hand, it establishes stricter State control of the teaching profession. The project for

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[37] *On the history and problems of teacher professionalization in Ukraine, see: Vasylieva S. O. Rozvytok profesiinoho statusu vchytelia: teoriia ta istoriia. Kharkiv: Vyd. «Planeta-Prynt», 2015. (In Ukrainian)*

creating teacher training institutions is old but was not realized until the 19th century in most European countries.

In the 19th century, two axes of reflection developed: on the one hand, the axis of pedagogy, closer to the normal schools and the practices of teacher training, and on the other hand, the axis of the science of education, often in the space of the university, and a theoretical dimension. There is a disconnection between the science of education as an academic discipline and pedagogy as practical knowledge for teachers. This bias produced a cleavage between theory and practice (between theoreticians and practicians). This fact highlights the appropriateness of analyzing the professionalization of teachers based on the knowledge and powers in place in a given period.

The first cycle in the professionalization of teachers lasted until the 1920s/30s. This cycle is inscribed in the start of State-sponsored schooling at the end of the Ancien Régime and the consolidation of mass schooling at the beginning of the 20th century. Despite tensions and conflicts, it is a relatively coherent period in the life of teachers, a period where they constructed themselves as a professional body. However, teachers were confronted with several contradictory processes during the Second World War and after caused by the post-war dynamics of educational expansion. Elements of professional affirmation were mixed with the logic of devalorization and authoritarian control over the profession, which some authors have named de-professionalization.

Creating teacher training institutions has constituted a crucial step in professionalization. In the 20th century, the progressive universitarization of the training structures has represented an essential aspect of teachers' social and scientific affirmation.

> ***Further Reading**: António Nóvoa The Teaching Profession in Europe: Historical and Sociological Analysis. URL: https://core.ac.uk/download/pdf/12424649.pdf*

2.3 Professionalism of knowledge

Professional development should be related to the acquisition of new knowledge. Master teachers have four types of knowledge

Knowledge of content. The expert teacher has a body of knowledge related to the content or subject matter to be taught. The math teacher knows a lot about math; the social studies teacher knows a lot about social studies, etc. This body of knowledge guides the expert teacher in deciding what is taught and in what order. What about the elementary teacher or the special education teacher?

Pedagogical knowledge. Pedagogy is the art and science of teaching. Expert teachers know various skills, strategies, techniques, and methods to impart knowledge or enhance learning. Effective teachers have a toolbox filled with various pedagogical skills they can use with students in different situations.

Pedagogical content knowledge. Pedagogical content knowledge is an understanding of teaching specific content or skills. For example, you know the best strategies for teaching reading, science, math, or writing. Also, you understand how to convert your knowledge into information that students can

understand. You can break things into manageable parts, use kid language to clarify things, and design activities that help students understand.

Knowledge of learners and learning. You understand the learning process, know how students best learn, and recognize the link between what you do and student learning. Here you understand human development and learning theories, and that is, how humans learn.

Literature highlights many features that characterize expert teachers, which include extensive pedagogical content knowledge, better problem-solving strategies, adaptation for diverse learners, decision-making and perception of classroom events, greater sensitivity to context, and respect for students. Several studies stress the importance of teachers' knowledge, highlighting that in addition to assimilating academic knowledge, student teachers must also incorporate knowledge derived from experiential and practical experiences in the classroom. Research also shows that variations in 'opportunities to learn' in teacher preparation are related to differences in student achievement.

While teacher knowledge is undoubtedly a component of teacher professionalism, professional competence involves more than just knowledge. Skills, attitudes, and motivational variables also contribute to the mastery of teaching and learning.

Blömeke and Delaney[38] proposed a model that identifies cognitive abilities and affective-motivational characteristics. They are the two main components of teachers' professional competence, as shown in Fig. 2.1.

Cognitive abilities:
professional knowledge
general pedagogical knowledge
content knowledge
pedagogical content knowledge

motivation
self-regulation
professional beliefs about teaching and learning and the subject content
Affective-motivational characteristics
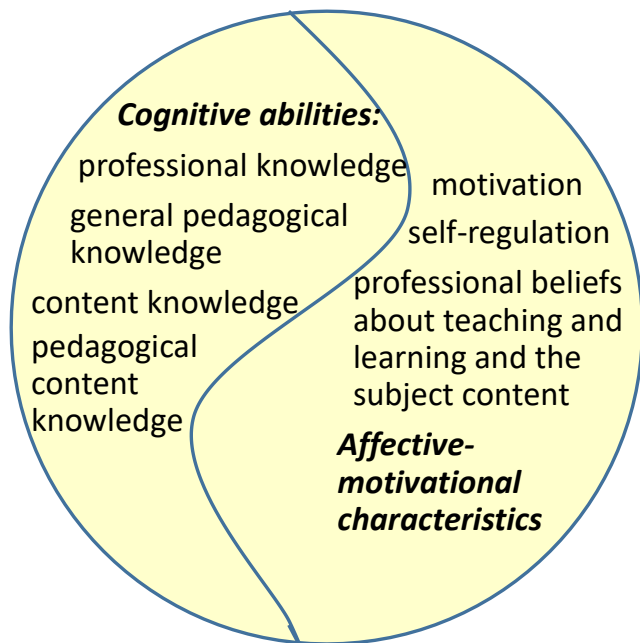
Figure 2.1 Cognitive abilities and affective-motivational characteristics as components of teachers' professional competence

Teachers' pedagogical 'knowledge base' includes all the required cognitive knowledge to create effective teaching and learning environments (Fig. 2.2).

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[38] *Blömeke, S. & Delaney, S. (2012). Assessment of teacher knowledge across countries: A review of the state of research. ZDM Mathematics Education, 44, 223-247.*

Research suggests this knowledge can be studied. However, identifying this knowledge base's content is a complex issue. Most studies use the distinction between declarative ('knowing that') and procedural knowledge ('knowing how') from cognitive psychology as a theoretical basis. This approach is relevant as it focuses on understanding how knowledge is related to behavior, or in other words, the quality of teaching performance.

General pedagogic knowledge (principles & strategies of classroom management & organization)

Pedagogical content knowledge (the knowledge which integrates the content of a specific subject & the pedagogical knowledge for teaching that particular subject)

Subject knowledge (incl.
a) the essential questions of the subject;
b) networks of concepts,
c) theoretical frameworks,
d) methods of inquiry ,
e) symbolic systems,
f) vocabularies & models)

Personal Construct
• Prior individual experience incl. culture, gender, ethnicity;
• Educational goals;
• View of mind & learning.

School knowledge (incl.
a) the process of transformation from "subject" knowledge;
b) historical, ideological, educational origins;
c) discourse, vocabulary models, etc.).

Pedagogical knowledge
•knowledge of learners in the setting goals of learning;
•selection of knowledge that is the subject of the learning;
•selection of learning & assessment activities;
•resources with boundaries – human, material, techn.;
•roles, relationships & discourse.

Figure 2.2 The model of teacher knowledge of L.S. Shulman [39]

Some models of general pedagogical knowledge combine pedagogical and psychological aspects (Table 2.5).

Psychological components account for learning occurring in a social context, and learning success depends on individual students' general cognitive and affective characteristics.

In the twenty-first century, teachers must see themselves as co-learners and collaborators within the learning environment. In their role as learners, teachers learn a great deal about – and often from – their students. They learn from each other, too. And, as a collaborative group, they learn together.

The researchers identify a number of 'knowledge era' skills for effective teaching. These include:
• Collaboration.
• Negotiation to arrive at shared expectations.
• Engagement management (managing learning, not classrooms).

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[39] *Shulman, L.S. (1987). Knowledge and teaching: Foundations of the new reform. Harvard Educational Review, 57(1), 1-22.*

- Creating and managing knowledge.
- Developing individual learning programs.
- Self-awareness and self-evaluation.
- Self-management and self-directed learning.

Table 2.5

Pedagogical knowledge as a combination of pedagogical and psychological aspects

Pedagogical components	Psychological components
Knowledge of classroom management: maximizing instructional time, handling classroom events, teaching steadily, and maintaining clear lesson direction.	Knowledge of learning processes: supporting and fostering individual learning progress by knowing various cognitive and motivational learning processes (e.g., learning strategies, the impact of prior knowledge, effects, and quality characteristics of praise, etc.).
Knowledge of teaching methods: having a command of various teaching methods and knowing when and how to apply each technique.	
Knowledge of classroom assessment: knowledge of different forms and purposes of formative and summative assessments, knowledge of how different frames of reference (e.g., social, individual, criterion-based) impact students' motivation.	Knowledge of individual student characteristics: knowing the sources of student cognitive, motivational, and emotional heterogeneity.
Structure: structuring learning objectives and the lesson process, lesson planning, and evaluation.	
Adaptivity: dealing with heterogeneous learning groups in the classroom.	

2.4 Developing teacher's knowledge

Teacher knowledge, as mentioned above, is heterogeneous and open to change. Accordingly, their development requires special preparation. Recent studies focus attention on practical experience, cooperative work, and learning. One of the main principles of teacher training is forming a professional identity based on self-development skills.

A teacher education program derived from a behavior model will prioritize what teachers need to know and can apply in the school situation. The apprenticeship model would emphasize the school experience with teachers being socialized to fit into the existing contexts. The development model would build teacher confidence in their learning and understanding of experiences. In the latter model, teacher educators must be seen as learners, monitoring their own experiences, supporting teacher research efforts, and valuing teacher knowledge and expertise.

Teacher professional development begins with training at the faculty when future teachers begin to create their professional identity, which happens through defining and recognizing the roles the future teachers will take on as teachers in the classroom.

As Robert V. Bullough states, the core principles in teacher education are:

1. Teacher identity—what beginning teachers believe about teaching and learning and self-as-teacher—is vital to teacher education; it is the basis for

meaning-making and decision-making. Teacher education must begin, then, by exploring the teaching self.

2. Because selves are formed in context, the exploration of teacher identity necessitates the study of schooling and the broader social context and how those contexts both enable and limit meaning, privilege and suppress knowledge.

3. Identifying ways contexts enable and limit meaning requires understanding social philosophy and the aims of education in a democracy.

4. Reflecting on a lifetime investment, self-conceptions are deeply resistant to change, as my determined flight from the problems of teacher education illustrates. Yet self-study can be risky and fraught with danger. Teacher education must be powerful enough to challenge beliefs that potentially might be miseducative in their effects. In contrast, the immediate context of teacher education must be supportive and respectful of the individual as an adult learner fully capable of making reasonable judgments about his learning and the direction of that learning.

5. Part of building a trusting and respectful learning environment is openly articulating the reasons behind program decisions.

6. All education is ultimately indirect. Teachers can create the conditions for learning, while learning is the responsibility of those who embrace or reject the opportunity.

7. Educational outcomes are inevitably unpredictable and aims flexible. While there may be a minimum acceptable student performance in teacher education, the essential learning outcomes will be personal, idiosyncratic, and probably unmeasurable. No one's best teaching style, personality, or model can serve as a standard for evaluation. Competency models inevitably oversimplify teaching and impoverish teacher education and teachers.

8. Each person makes teacher education meaningful in her way.

9. Program continuity is not just a matter of sensibly sequencing courses and content but of creating means that enable students to forge their sense of continuity through attending, systematically and over time, to their experience of teacher education and development as teachers.

10. Coming to feel part of a profession requires learning the language of teaching and applying it with others similarly invested in professional education and situations with real educational consequences.

11. To teach is to testify and care about, converse, and connect with others whose experiences differ from ours. To teach is to enable boundary crossing while seeking to build a sense of belonging to a broader and ethically grounded community.

Teaching is inextricably linked to learning; teaching is a two-way process. Teaching about teaching should extend teachers' and students' views of teaching and learning. This extension depends upon reflection on both the teaching and the learning that occurs; it follows that reconsidering one's actions, reframing from problematic situations, mulling over the flow of suggestions, and reasoning through the implications of alternative views and testing hypotheses are the cornerstones of reflection. Again, suppose reflection is to be better understood by

student-teachers. In that case, it needs to be explicitly modeled to encourage them to consider approaching their teaching in ways that might be based on a similar basis or foundation.

The teacher is a learner actively constructing ideas based on personal experience. This learning must occur in at least the following areas:

1. Ideas about the teaching and learning process.
2. Ideas in relevant knowledge discipline areas.
3. Understanding of self.
4. The social structures within the profession and in school communities.

It is a comprehensive agenda for teacher education. Still, each component needs to be addressed in learning about teaching.

> ***Further Reading****: Teaching about Teaching: Purpose, Passion and Pedagogy in Teacher Education. Edited by John Loughran and Tom Russell. London, Washington, D.C The Falmer Press, 2003.*

2.5 Professional role and behavior

We define a 'professional role' as a personal interpretation of a position based on expectations from the environment and on a systematically organized and transferable knowledge base. The 'professional role' concept should not be confused with the 'professional identity' concept, which has recently become more popular in literature. The researchers describe professional identity as relatively stable views, reflection patterns on professional behavior, and the accompanying self-image. So, the concept of 'professional identity' mainly focuses on personal opinions and self-images, whereas the idea of 'professional role' primarily focuses on position and expectations from the environment.

The role of the teacher is never uniquely defined, and many factors influence its definition. Cultural and social events and the environment characterize it. Both factors influence the differences that occur in the conceptions of the roles of teachers within different cultures and societies, including the geographic territory. Three roles for the teacher can be identified: the teacher as a subject matter expert, pedagogical expert, and didactical expert. They influence the development of the teacher's role and determine behavior in the classroom.

The factors that influence the role of the teacher are internal and external. Internal factors influence a teacher's perception of their role. External factors include the views and expectations of the role of the teacher, which arise from other stakeholders, such as pupils, parents, colleagues, school leaders, and the public. Both factors are also an essential part of a teacher's professional identity. The teachers create internal factors that influence the teacher's understanding of the teacher's role. They can be classified into two categories: the teacher's beliefs about which role is essential and the teacher's expectations for their role. Most interpretations of teachers' roles refer to their tasks, social position, status, or the status, image, and expectations of others. The people's core personal qualities that are important for the teacher and lists necessary traits for a successful teacher are

creativity, trust, care, courage, sensitivity, decisiveness, spontaneity, commitment, and flexibility.

> ### *Personal and professional conduct*
>
> A teacher is expected to demonstrate consistently high personal and professional conduct standards. The following statements define the behavior and attitudes that set the required conduct standards throughout a teacher's career.
>
> ♣ Teachers uphold public trust in the profession and maintain high standards of ethics and behavior, within and outside school, by:
>
> - treating pupils with dignity, building relationships rooted in mutual respect, and at all times observing proper boundaries appropriate to a teacher's professional position
>
> - having regard for the need to safeguard pupils' well-being in accordance with statutory provisions
>
> - showing tolerance of and respect for the rights of others
>
> - not undermining fundamental British values, including democracy, the rule of law, individual liberty and mutual respect, and tolerance of those with different faiths and beliefs
>
> - ensuring that personal beliefs are not expressed in ways that exploit pupils' vulnerability or might lead them to break the law.
>
> ♣ Teachers must have proper and professional regard for the ethos, policies, and practices of the school in which they teach and maintain high standards in their attendance and punctuality.
>
> ♣ Teachers must understand and always act within the statutory frameworks which set out their professional duties and responsibilities.[40]

We define 'professional behavior' as behavior based on systematically organized and transferable knowledge expressing the values and norms of the professional community. What can be detected as misbehavior? All teacher misbehavior can be placed into two categories based on legality. The misbehavior either does or does not break the existing law(s) of the land where it occurs, and it is a relatively straightforward categorization. Illegal teacher misbehavior usually relates to physical misconduct, abuse, harassment, theft, or financial lawbreaking.

'Didactogeny' is even defined as a faulty education that physically, psychologically, and educationally harms students. The most commonly reported misbehaviors that result in students becoming fearful or resentful of their teachers and disengaged from the subjects taught by them are:

• excessive negative criticism,

• embarrassment and humiliation,

• yelling in anger.

Teacher behavior is closely related to a code of ethics, which is reflected in clearly established norms, as in the example below

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[40] *The Teachers' Standards on the GOV.UK*

2.6 Professional ethics

Ethics are the fundamental ways of human behavior or basic social and personal life principles. It studies the values of all men and women, human or natural rights, and concern for health and safety in the natural environment.

Ethical principles guide how individuals live their lives according to defined criteria. Many thinkers discussed the virtues of moral life. The role of ethics or ethical behavior in professional life has been a great debate. The demand for ethics is an essential part of life, most notably in performing duties in a professional setting. In every field of life, ethical demand becomes crucial day by day. Doctors, lawyers, accountants, scientists, and several professions follow the rules and regulations, and they are all restricted to following ethics for the benefit of their stakeholders.

Professional ethics includes personal and community standards of conduct expected by professionals in an institution/organization. The term professionalism originally was functional for the undertaking of a religious order. By the end of the 17th century, this term was seen to be secular in its application and was applied to the three learned professions: Divinity, Law, and Medicine. Professionalism was also used for the military profession around this time. Any professional and those who work in recognized professions implement expert knowledge and skills. How this knowledge should be applied when providing the service to the public can be well thought out as a moral issue and is termed professional ethics. Experts can make decisions, use their skills, and reach informed conclusions in situations that the general public cannot because they are unfamiliar with the necessary field knowledge and not acquainted with skills. One of the most famous examples of professional ethics is the Hippocratic Oath, which medical practitioners still adhere to. The majority of institutions define ethical approaches in terms of discrete components. In general, they are:

- Honesty,
- Integrity,
- Transparency,
- Confidentiality,
- Communication skills,
- Interactive skills,
- Objectivity,
- Punctuality,
- Regularity,
- Respect for others,
- Obedience to law,
- Loyalty,
- Productivity,
- Sense of responsibility,
- Social skills.

There are five dispositions of effective teachers:

1. Empathy, seeing and tolerating the other individual's perspective.
2. Positive perspective of others, putting belief in the value, ability, and potential of others. Normally approach others feeling that they "can" and "will" as opposed to that they "cannot" or "will not."
3. Positive perspective of self, having faith in their worth, capacity, and potential, and having a built-up self-idea that is generally positive and gives a general feeling of self-adequacy.
4. Authenticity feeling a sense of opportunity and openness, empowers them to be interesting individuals in trustworthiness and pureness.
5. Meaningful purpose and vision identifying goals essentially individual-focused, wide, deep, freeing, and long-range. Sees the significance of being visionary and intelligent as a teacher. Focuses on the development of all students in mental, physical, and profound domains through a feeling of "mission" in teaching. Looks to recognize, clarify, and extend information and individual beliefs about what is really most important.

Considering stated approaches to professional ethics, we believe teachers' professional activity is based on global, professional, educational, and personal ethical principles.

Global ethics principles reflect general requirements for prosperous human life. They are based on universal moral norms, which imply social responsibility, interdependence, professional solidarity, the conscious concern of duty and honor, differentiation of good and evil, empathy and compassion, etc.

Professional teaching ethics principles reveal ethical norms and rules that reflect the required (normative) behavior within the professional teaching context. Such norms are fixed in the ethics teaching code and perform social functions aimed at the successful decision of professional tasks, taking into account the personal and public interest and ensuring the continuity of professional, progressive moral values. The principles of teaching professional ethics involve cultural norms of professional activity reflected in the professional and ethical competence and the culture of professionally significant motivation.

Personal ethics principles characterize the moral qualities and expectations of a teacher. They comprise beliefs and moral responsibility for actions, correctness and respect for the rights of another person, reliability, honesty, integrity, justice, self-control, etc. Personal ethics allows teachers to understand intrinsic moral characteristics, assess ethical behavior and actions skills, and develop their system of professional interaction regulations (teacher-student, teacher-teacher). Thus, professional teachers' ethics, accumulating the principles of universal (worldwide) ethics in a particular profession, is associated with humanistic ideas of modern higher education and training of future teachers. Future teachers are educated and have moral and cultural qualities such as a sense of duty and dignity, conscience and justice, responsibility, self-discipline, law-abiding consciousness and behavior, and others.

In the context of the above-stated, we have determined the structure of the future teacher professional ethics, presented with philosophical, professional, educational, cultural, behavioral, and reflective-evaluative components and

pedagogical conditions that ensure the formation of the professional ethics in the logic of the structure proposed. The ideological component characterizes man's moral destiny, the moral basis of personal and professional ethics. This component involves the implementation of pedagogical conditions aimed at comprehending and perceived understanding of universal moral laws, general life rules, and constructive moral formation of the worldview based on the harmonious and responsible relationship:

- introduction of teachers and students to universal values such as goodness, truth, beauty, ideal, meaning of life, happiness, duty, responsibility, freedom, conscience, justice, friendship, and love;
- development of the moral world of students based on awareness of their values and respect for cultural differences, personal value concepts, and beliefs of another person;
- activation of students' intrinsic motivation to self-knowledge and mastery of ethical knowledge and understanding the importance of personal responsibility, moral improvement, and personal growth.

The professional and educational component is aimed at the mastery of moral and ethical categories in the profession, as well as professional knowledge and moral values, norms, and rules of professional activity. It provides pedagogical conditions for ethical and regulatory professional activities, contributing to the formation of professional pride and moral activity of students:

- recognition of the social and moral significance of the future profession;
- a common understanding of professional training and ethical ways of its implementation objectives;
- readiness for ethical-cognitive relation to the future profession of the teacher;
- studying the development of moral norms and rules of behavior content of the teacher, reflected in the teacher's code of ethics.

The cultural and behavioral component characterizes professional and ethical focus on interaction in professional functions fulfillment. It demonstrates competence in using methods of moral behavior and manifesting moral qualities. It provides pedagogical conditions of system-activity approach to the organization of the ethical interaction, cultural, moral conduct, moral aspirations, and choice of activity modes:

- expression of interest to the students, establishment of professional interaction relations: participants' interests;
- learning objectives;
- learning methods and techniques;
- readiness for moral and professional activity and the desire to carry it well;
- creative approach to the use of methods, tools, and techniques of professional and ethical education and consolidation of moral experience;
- granting the right to choose alternative ways of learning, developing techniques that allow students to find the most suitable for them;
- competence in methods of management/self-management behavior. Reflective-evaluative component reflects the degree of awareness of students' moral position and identification of stable and unstable qualities necessary for

moral, professional work. It involves the pedagogical conditions that ensure the continuous monitoring of the factors that contribute to/hamper the professional and ethical development of students;
- study of individual characteristics, behavior, and actions that affect the construction of ethical relationships;
- formation of the conscious attitude of students to the need for the development and improvement of moral and personal qualities;
- actualization of individual moral experience and behavior correction from the perspective of ethical collaboration and construction of ethical relationships.

2.7 Teaching philosophy

A teaching philosophy is a statement that explains the perspective on teaching and how you will apply that perspective to your teaching environment. It is a way to organize your thoughts and approach to interacting with students and specific ways you want to facilitate learning.

Teaching philosophies are essential as a standard for teachers to evaluate their methods, and they can direct instructional decisions and change the educational approach. The reasons for writing a teaching philosophy may vary, and it might be the introduction to your teaching portfolio.

Or, it can serve as a means of professional growth as it requires you to give examples of how you enact your philosophy, thus requiring you to consider the degree to which your teaching is congruent with your beliefs.

The beginning of your teaching philosophy tells the reader your general ideas and beliefs about teaching, and your introduction forms the foundation for your specific strategies. In the introduction, craft your ideas and try to avoid cliches. Describe your teaching purpose, including what you hope students gain from your instruction, relational goals, and how you view your role in a student's life.

A teaching portfolio is a personal record of achievement and professional development that demonstrates level of attainment, scope of experience, range of skills and activity, and/or progression as a university teacher. They are commonly used at the end of the probationary period or as part of an application for promotion. A more specific type of structured portfolio may also form part of the assessment for a professional development program. Portfolios need to have a clear structure and, depending on the purpose, this will usually be determined by institutional, assessment or other requirements. There will be a collection of selected illustrative materials relating to practice and providing evidence of it.[41]

Moving from your general introduction, you can share which educational strategies you prefer to use to meet those standards. You can explain more about your approaches to areas such as:
- classroom management,
- the role of technology in education,
- incorporation of different modes of instruction,

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[41] *A Handbook for Teaching and Learning in Higher Education Enhancing Academic Practice. 3d edition. Ed. Heather Fry. New York, London: Routledge, 2008. P. 473.*

- homework,
- feedback from students.

You can also describe the assignments and activities you implement in your classroom. If you have room in your teaching philosophy statement, consider referencing specific research or theories that inform your educational strategies.

The teaching philosophy includes an overall self-reflection on:
• the strengths of your teaching;
• areas for further improvement;
• action plan for further professional development.

Remember to provide concrete examples from your teaching practice to illustrate the general claims you make in your teaching philosophy. The following general statements about teaching are intended as prompts to help you develop examples to explain your claims about teaching. For each statement, how would you describe what happens in your classroom? Is your description specific enough to bring the scene to life in a teaching philosophy?

Strong teaching philosophy statements share five elements:
- They offer evidence of practice (specific examples).
- They are student-centered.
- They demonstrate reflectiveness.
- They demonstrate that the writer values teaching.
- They are well-written, clear, and readable.

Questions about teaching experience and background.

These questions help an interviewer evaluate your qualifications for the position and whether your values match those of the institution:

What do you like most about teaching?
What do you dislike most about teaching?
What do you feel are the biggest challenges facing today's education system?
Describe your teaching style.
How would you organize this classroom?
How do you manage your teaching duties?
What is the greatest success you have had with teaching?
What do you think is the greatest challenge facing students today?
What is the greatest challenge facing teachers today?
What qualities make a great teacher?
Describe your worst teaching day. What did you learn from the experience?
How do you motivate your students to become active learners in your classroom?

A short example of the teaching philosophy is shown in Appendix to Chapter 2.

2.8 Teaching style

The teaching style is how we convey knowledge and information to students. As a result, the efficacy with which we display our teaching styles has two effects on students. It may facilitate or hinder their ability to acquire content and skills, influencing our students' learning styles. Teachers' personal qualities direct the selection of the way they deliver the substance of the matter. There is a symbiotic

relationship among personal qualities, teachers' instructional processes to convey discipline content, and the styles students display as learners.

There are three goals of teaching styles: to develop effective classroom management skills, to achieve lesson mastery, and to have positive expectations. Teaching styles vary considerably based on individual classroom settings, your subject, and your class's diverse group of students.

For example, an authority or lecture-based teaching style is well-suited to large classes and subjects that require heavy memorization, like history. A delegator or group teaching style might be more conducive to subjects that require lab activity, like chemistry, or subjects that involve significant feedback, like debate and creative writing. The teacher inspires and observes rather than recites facts in the latter style. The goal of any teaching style is to remain focused on teaching objectives and engaging students as best you can.

Match or mismatch between teaching style preferences and learners' learning style:

- When teachers know about students' learning styles and teaching style preferences, they can manage their classes better. They can adapt themselves to students' preferences to increase the quality of their teaching.
- The mismatch between the students' learning style preferences and the teachers' instructional approach may highly influence students' attitudes and motivation.
- It is essential for teachers to be aware of their students' learning style preferences and to prepare a learning environment that responds to those differences.
- A mismatch between teaching and learning styles can cause failure, frustration, and demotivation.

The discussion surrounding the issue of the effectiveness of finding a match between learning and teaching style has developed among the researchers. It is about the lack of evidence regarding the efficacy of such matching and, secondly, the possibility of achieving it. For example, how can a university lecturer consider learning styles and their diversity? Critics of the theory of matching styles argue that the best way to activate students is to introduce different teaching methods. However, awareness of one's learning and teaching style is recognized as necessary for designing professional activities.

Several approaches to identifying a teacher's style use different tools. The Staffordshire Evaluation of Teaching Styles (SETS) is a newly developed instrument by Mohanna, Chambers, and Wall.[42] It is a self-evaluation tool with items to be scored on a range of 1 to 5, from not agree at all to strongly agree, respectively.

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[42] *Mohanna K, Chambers R, Wall D. (2007) Developing your teaching style: increasing effectiveness in healthcare teaching. Postgrad Med J. Mar; 83(977): 145-147. doi: 10.1136/pgmj.2006.054106*

A procedure for style identification is described in Section 2.10. The six defined teaching styles are described in much greater detail in the article mentioned below, but short descriptions of each are as follows (Table 2.6).

Anthony Grasha coined five approaches to teaching styles in the middle of the nineteenth. Grasha believes that all educators possess each of these five teaching styles to vary degrees, though they gravitate to some more than others. He likens teaching styles to an artist's palette: the teacher's primary or dominant teaching style(s) are similar to the foreground of a painting, while the other qualities still exist but are farther into the background.[43]

Table 2.6

Characteristics of six SETS teaching styles

A student-centered, sensitive teacher	Straight facts, no-nonsense teacher
emphasizes emotions and gives students more responsibility for their learning; I am used by educators who are uncomfortable delivering lengthy presentations or when a subject does not necessarily call for formal lectures. Roleplay and drama can even be involved.	This teaching style describes educators who like to teach facts and figures, typically in a lecture format. These educators are less focused on multi-disciplinary teaching and learning and place more value on specific course material that needs to be taught. It is most appropriate for students at the beginning of the subject who need to absorb the topic's foundation. This teaching style also works well for subjects that involve heavy memorization.
Official curriculum teacher	**Big conference**
This teaching style focuses on external targets for teaching, faculty development, and "teaching the teacher" and offers dependency and security to instructors and students alike. Of course, knowledge of the curriculum is paramount, and this teaching style cannot work without it.	This teaching style is used by professors who enjoy standing in front of large audiences to share their knowledge of the tropics. These teachers can potentially be very engaging speakers who can hold students' interest, even if there is little interaction in class. This teaching style works well when applied to subjects like psychology, philosophy, or law, especially for large first-year courses.
One-off	**All-round: Flexible and adaptable**
The one-off teaching style is defined by professors who prefer to deliver small, self-contained bits of teaching one-on-one rather than lecturing on a topic for an hour in front of a big audience. There are no props or fancy presentations—just the teacher and student, and it can also cover any impromptu teaching time or guest workshops. The downside to this teaching method is that students often have a little-to-no connection with their professor, making learning feel highly impersonal.	Those who prefer this teaching style are comfortable using different skills and methods in the classroom. Educators consider the environment and individual student needs and adapt on the fly—knowing that students differ in needs and learning styles. The integrated approach is inclusive and allows professors to adjust as required, thus potentially reaching more students effectively.

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[43] *A. F. Grasha A Matter of Style: The Teacher as Expert, Formal Authority, Personal Model, Facilitator, and Delegator College Teaching, Vol. 42, No. 4 (Fall, 1994), pp. 142-149.*

According to Grasha, however, all styles and colors are needed to some degree to create a painting with dimensions and layers (Fig. 2.3).

Expert.

The expert teaching style defines professors who want to showcase a high level of knowledge and expertise in a subject and use the information to challenge students. The goal is to transmit information to students to prepare them for assignments, exams, and further studies. This tremendous knowledge transfer can be helpful for students looking to soak up information from credible resources in their field. But this method can be intimidating for students if it's overused. And while this style focuses on facts and figures, it might not successfully show the processes used to find answers to problems.
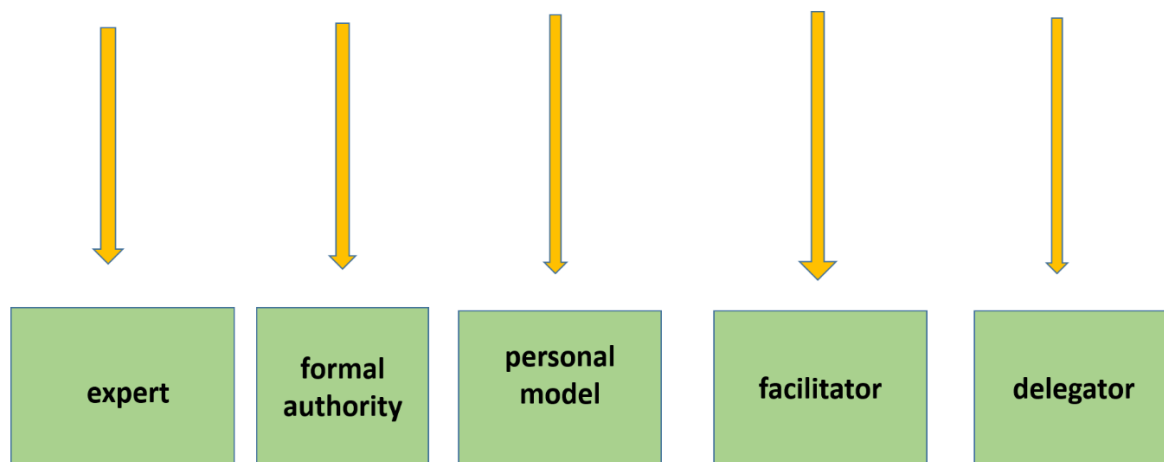
Figure 2.3 Five types of teaching style (by Anthony Grasha)

Formal authority.

Educators who use the formal authority teaching style establish status among students, clearly define their learning goals and expectations and follow a set list of rules of how things should be done. This teaching style is great for students who need structure since there are clear guidelines and expectations and an understanding of the acceptable way to do things.

However, this teaching style can be too rigid and standardized for many students who appreciate more active learning settings, interaction, and better engagement. This teaching method can work effectively in disciplines like law or music, where there are established rules that need to be followed and where an instructor can lead by example by playing an instrument or discussing legal procedures.

Personal model.

In the personal model, educators use any opportunity to teach by using real-life examples and establishing a prototype of how to think and behave based on their own beliefs and methods. Educators oversee, guide, and direct work but do not necessarily present themselves as authorities. Instead, they show students how to do things and encourage them to observe and follow directions to complete tasks. This educator, then, is essentially a role model.

This type of teaching style provides hands-on experience and direct observation. But some educators run the risk of pushing their way as the best way, which can cause some students to feel inadequate if they cannot live up to the standards. However, this method could work well in a higher education setting where students already grasp the material and abstract concepts, and all students work on the same level.

Facilitator.

The facilitator's teaching style focuses on teacher-student interaction on a personal level providing a warm, more emotional climate. Students are encouraged to ask questions, explore different options and suggest alternatives, and are guided along the way as they learn by trial and error. The goal is to help students think independently and be more responsible for their learning process.

The instructor is more consultative in this teaching style, providing support and encouragement. This style allows for much greater flexibility in the classroom and focuses on student needs and goals. But it can be time-consuming and ineffective if the subject matter requires a more direct approach. Some students might also be uncomfortable with a less structured approach. Facilitation can work well in smaller classroom settings or upper-level and graduate courses where creativity and exploration are encouraged. If students are at a point, they feel willing to take risks.

Delegator.

The ultimate goal for someone adopting this teaching style is for students to function autonomously, working independently on assignments and projects or as part of small teams with peers. The instructor is available when needed to be used as a resource. Educators who use the delegator teaching style do not host formal lectures.

A teaching style like this can help students develop the tools to be confident and independent learners. Still, students not ready for such autonomy could become anxious and not perform well. This method is great for upper-level studies where students already have an appropriate level of knowledge and do not need much hand-holding. They are ready to rise to the next level of learning and view the educator as a guide, not someone there for standard instruction.

The advantages and disadvantages of all the above five styles are shown in Table 2.7 and their short descriptions.

Teaching styles are not set in stone, and course delivery should not be placed in specific boxes. Every educator falls somewhere on a spectrum, from the authoritative expert to the student-centered facilitator and delegator. More important than defining where you fall on the spectrum—though this is useful to determine—is analyzing and observing your curriculum, students, and subject matter and finding the best teaching style to match. Teaching styles that match students' learning styles and put student needs and learning at the forefront can lead to more positive academic outcomes. Students tend to be more engaged and thus better grasp the material. Educators, who are aware of their teaching style, re-evaluate it, try new things, and get feedback from students can take teaching to a new level.

Table 2.7

Description of teaching styles following Anthony Grasha

Style	Description	Advantage	Disadvantage
Expert	Possesses knowledge and expertise that students need. Strives to maintain status as an expert among students by displaying detailed knowledge and by challenging students to enhance their competence. Concerned with transmitting information and ensuring that students are well prepared.	The information, knowledge, and skills such individuals possess.	If overused, the display of knowledge can be intimidating to inexperienced students. May not always show the underlying thought processes that produced answers.
Formal authority	Possesses status among students because of knowledge and role as a faculty member. Concerned with providing positive and negative feedback, establishing learning goals and expectations for students, Concerned with the "correct, acceptable, and standard ways to do things."	The focus on clear expectations and acceptable ways of doing things.	A strong investment in this style can lead to rigid, standardized ways of managing students and their concerns.
Personal model	Believes in "teaching by personal example" and establishes a prototype for how to think and behave. Oversees, guides, and directs by showing how to do things and encouraging students to observe and then to emulate the instructor's approach.	The 'hands-on' nature of the approach. An emphasis on direct observation and following a role model.	Some teachers may believe their approach is the "best way," which makes some students feel inadequate if they cannot meet such expectations and standards.
Facilita-tor	Emphasizes the personal nature of teacher-student interactions. Guides students by asking questions, exploring options, suggesting alternatives, and encouraging them to develop criteria for informed choices. The overall goal is to develop students' capacity for independent action and responsibility. Works with students in a consultative mode and provides much support and encouragement.	The personal flexibility, the focus on students' needs and goals, and the willingness to explore options and. alternative courses of action to achieve them.	Style is often time-consuming and can be ineffective when a more direct approach is needed. It can make students uncomfortable if it is not used positively and affirmatively.
Delega-tor	Concerned with developing students' capacity to function autonomously. Students work independently on projects or as part of autonomous teams. The teacher is available at the request of students as a resource person.	It contributes to students perceiving themselves as independent learners.	May misread students' readiness for independent work. Some students may become anxious when given autonomy.

2.9 Learning styles

An individual approach to those being taught is one of the essential principles of pedagogy. Pedagogical influence on a person is based on studying and considering his psychological traits, interests, abilities, attitude to learning, and motives for educational and cognitive activity.

In the scientific literature devoted to the study of the impact of student characteristics on the effectiveness of educational activities, such concepts as "learning preferences," "approaches to learning," "thinking style," "cognitive style," and "learning style" are increasingly used. The most significant importance is given to studying the peculiarities of individual cognitive styles and learning styles of the individual. These concepts are integrative, reflect individual characteristics, and are of great importance for predicting the effective cognitive activity of a person.

Let us dwell on concepts that consider individual differences in the educational activity of individuals from the point of view of their learning styles.

First, the meaning of the term "learning style" should be clarified. This term appeared in Western psychological and pedagogical literature in the 70s of the last century. It characterized the approach to the learning process typical for a given individual (schoolchild, student, adult). Defining learning styles is complex; its theory is created on the border of psychological, physiological, and pedagogical sciences. Different approaches and models characterize people's learning styles, each with advantages and disadvantages. There is no generally accepted universal theory until now. However, among the existing developments, common features can be identified, which make it possible to determine the most critical differences in the educational preferences of students to establish connections between the degree of their manifestation and the effectiveness of students' study of some subject areas.

In 2004, a group of scientists from the University of Newcastle, led by F. Coffield, conducted a study and identified 71 theories and concepts of theories of learning styles developed since the beginning of the 20th century. In each of them, from 3 to 20 different learning styles are defined, corresponding to a particular set of the most effective learning methods. Based on these theoretical and practical research results, the most important models were named, the effectiveness of which was proven in practice. Among them: the model of cognitive styles according to R. Ryding and his analysis of cognitive styles; indicators I. Myers and K. Briggs (from now on Myers-Briggs); profiler (a program for collecting information) of learning style according to K. Jackson; definition of learning style according to D. Kolb; index of cognitive styles by K. Elinson and J. Hayes, etc.[44]

It is necessary to pay attention to two main, still unsolved problems.

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[44] *F. Coffield, D. Moseley, E. Hall, and K. Ecclestone. Learning styles and pedagogy in post-16 learning. A systematic and critical review. London, Learning and Skills Research Centre, 2004, 182 p.*

First, the definition of the "learning style" differed. Authors of different methods often describe the same phenomenon using different terms each time. The concepts of "cognitive style" and "learning style" are often confused. For example, traditional cognitive styles, such as field dependence/field independence, impulsiveness/reflexivity, etc., are often listened to among learning styles.

Secondly, learning styles are usually detected using questionnaires. According to some authors, they are not always sufficiently reliable and valid. Educational preferences, verbally declared by the test subjects as desirable during the independent assessment, may differ significantly from individual preferences at the level of real academic behavior.

These two problems forced scientists to revise the view on the nature of learning style, namely, to abandon its interpretation as a bipolar measurement and move to its analysis as a multidimensional mental phenomenon in which different levels of stylistic behavior can be distinguished.

So, L. Curry proposed a model, trying to combine different approaches in the study of styles by analogy with the structure of a light bulb.[45]

L. Curry's model, the so-called "onion model," suggests that nine possible learning styles are organized into three layers (Fig. 2.4). The inner layer is formed from the characteristics of individuality (cognitive individuality). Average - shows a person's ability to process information. The outer layer characterizes the learning preferences of people. The model explains the peculiarities of the malleability of styles. Its author believes that styles in the most distant layer (learning preferences) are easier to change, and the innermost layer (cognitive individuality) is the most stable.
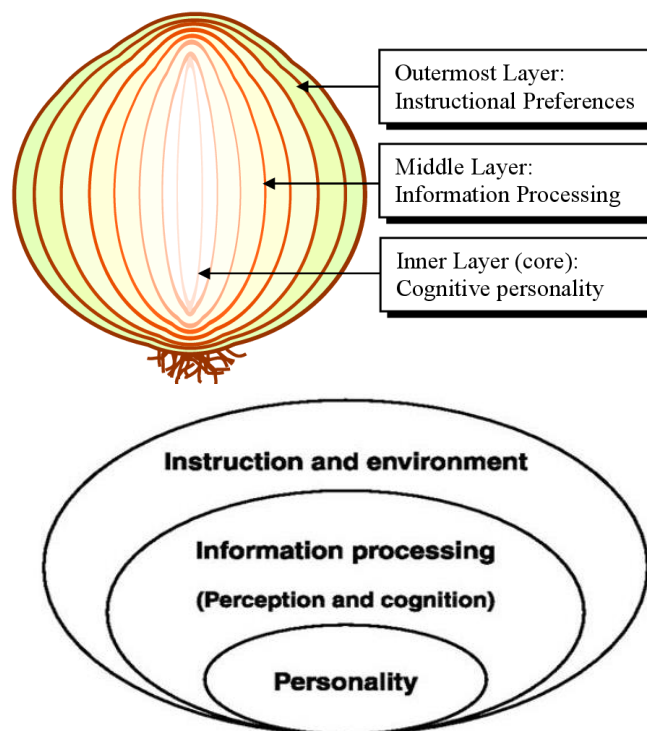
Figure 2.4 Curry's onion model of learning style theories, taken from[46]

Coffield et al., in the research cited above, criticized the theoretical foundation of Curry's onion model because it uses psychoanalytic assumptions rather than quantitative evidence to determine learning style stability. Based on

[45] *L. Curry. Patterns of learning style across selected medical specialties, Educational Psychology, 1991, vol.11 (3–4), 247–278.*

[46] *C. Wolf. Construction of an Adaptive E-learning Environment to Address Learning Styles and an Investigation of the Effect of Media Choice. PhD Thesis, RMIT University, 2007.*

several learning style overviews and quantitative evidence, they classified learning style models according to 'families of learning styles.' The model suggests that there are five families of learning styles as follows.

• **Constitutionally based learning styles and preferences**. These styles are largely constitutionally based, including the four sensory modalities: visual, auditory, kinaesthetic, and tactile. Learning styles belonging to this family are assumed to be fixed and very difficult to change.

• **Cognitive structure.** Learning styles reflect structural characteristics of the cognitive system that are embedded in personality construction. The styles belonging to this family are assumed to be generalized habits of thought (i.e., an enduring structural basis for such behavior).

• **Stable personality types.** Learning styles are viewed as embedded characteristics within the personality traits which are assumed to shape all aspects of an individual's interaction with the environment. These styles and preferences are primarily stable but can change over time.

• **'Flexibly stable' learning preferences.** Learning styles are viewed as flexibly stable learning preferences. Although the preferences can change slightly from one situation to another, there is some long-term stability in learning styles.

• **Learning approaches and strategies.** Moving on from learning styles to a holistic and active view of approaches to learning, study strategies, orientations, and conceptions of learning. These approaches and strategies must be adapted to match the learning context so that they are frequently changed depending on the situation.

This classification may provide general insights into the concept of learning style. However, some dimensions of learning style appear across different learning style models, and these models may be classified according to different layers, groups, or categories.

The above examples illustrate some approaches to style models and show a close relationship between different theories of learning styles. Scientists often use the phrase "cognitive type" as a psychological term that characterizes a person's typical way of using the mind. Cognitive type is often considered an element that collectively describes learning styles. Cognitive types are also defined as typical means of solving tasks, thinking, perceiving, and remembering.

Viewing the learning style as the result of integrating various forms of individual experience allows us to separate the concepts of cognitive style and learning style.

Cognitive styles are a highly organized mechanism of regulation of intellectual activity, the influence of which is manifested in various situations (including educational ones).

Instead, learning styles are learning strategies that characterize an individual's actions in response to the demands of a specific learning situation. By their nature, they directly depend on educational technology (characteristics of the educational situation, the uniqueness of the individual's academic motivation, teaching methods, types of educational resources, the teacher's position, the educational institution's status, etc.). In turn, individual methods of educational

activity are produced under the influence of human cognitive styles (styles of encoding and processing information, posing and solving problems, cognitive attitude to the world, etc.).

From the point of view of pedagogy, the most acceptable definition of learning style is typical cognitive, emotional, and psychological behavior, which is a relatively stable indicator of how students feel and interact with the learning environment. This definition considers that learning styles are an adaptive strategic response to the situation, depending on various factors (for example, the level of interest). They manifest themselves as more stable types associated with individual characteristics. The wording also does not exclude that the learning style can be cognitive, affective, or a combination of both types.

Currently, the question of changing people's learning styles over a long period is a function of age; gender; socioeconomic status; the academic discipline being studied; experience of practical work; extracurricular expertise, etc.

Most researchers agree that it is impossible to determine which styles are better at all. For example, the advantage of an introverted or extroverted style depends on the situation. An introvert may benefit from working alone, while an extrovert may benefit from working in a group. A reflective style is more adaptive than blind impulsiveness (active style).[47] There is empirical evidence that in the conditions of real educational activities, students show a multi-style approach.

The factual material confirms that the peculiarities of studying certain academic disciplines in various fields of knowledge change the intellectual types of people. It shows that the types are at least partially socialized. It has also been established that the intellectual types of people change as a function of their personal characteristics. According to the modern view, types of thinking are essentially states rather than traits. However, the characteristics of people create the conditions for the emergence of these conditions.

There are contradictions in the conclusions obtained by various scientists. Thus, some studies suggest that students' targeted learning of certain styles can improve learning outcomes. Others show no relationship between student achievement and their learning preferences. Conflicting data are given in the literature regarding the problem of the malleability of styles. Different readings indicate the complexity of the problem and require further research in this direction.

Thus, some general conclusions can be drawn.

1. Existing concepts of learning styles are vastly interconnected and consider different aspects of the problem. There is no universal theory.

2. Models in which learning styles are considered integral formations in terms of the combination and interaction of various learning advantages (differences in methods of encoding and processing information, techniques for solving learning problems, etc.) have much greater explanatory potential.

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[47] *L.F. Zhang and R.J. Sternberg. A Threefold Model of Intellectual Styles, Educ. Psychol. Rev, 2005, vol.17(1), 1–53.*

3. A specific student in a real educational activity demonstrates not separate learning and cognitive styles but an individual learning style at a certain level of its formation. At the limit of its development, it acts as a hierarchically organized, multifaceted form of intellectual behavior that flexibly changes.

4. Styles are not free from value judgments.

5. Learning styles are unstable over time, as they can change under the influence of the learning process itself, the use of new teaching methods, student motivation, and other factors.

6. The development of a reflective style in a person is more often than others associated with better academic and cognitive performance.

7. The critical condition for high-quality educational activity is the readiness of a person to work with a problem at two levels simultaneously. When being taught, the person does not concentrate only on solving the task as the primary goal; he is interested in the learning process itself.

Currently, many questions remain open for pedagogical research. There is no single scientific approach to determining the conditions for overcoming a person's stylistic limitations to improve the quality of education. The problem of optimization of stylistic characteristics is insufficiently studied theoretically and practically. The most acute problem can be combining students' learning styles with learning methods to increase their educational achievements. In this regard, it is unsurprising that the question is increasingly discussed in the literature: what is a condition for successful learning – the coincidence or, on the contrary, the discrepancy of the student's learning styles and forms of learning?

2.9.1 Learning styles by P. Felder and B. Soloman

The model of R. Felder and B. Soloman (hereinafter Felder-Soloman) is among the most widespread and studied worldwide. According to this model, the learning styles of an individual can be determined based on answers to four questions:

1. How does the student perceive information? Predominantly sensory (physical sensations, sounds) or intuitively (in thoughts, the ability to penetrate the essence)? Students are distinguished: inclined to be concrete, practical, and oriented on facts and experimental procedures; intuitive - who better operate with abstractions (theories, mathematical models) and are more likely to act quickly and innovatively when solving problems. This scale is identical to the Myers-Briggs Intuitive Style Indicator.

2. What sensory information does the student perceive most effectively: visual (images, diagrams, technological process maps, demonstrations) or verbal (records and spoken explanations)?

3. How does the student process information: actively (through participation in physical action or discussion) or reflectively (through introspection)? This scale is identical to the active-reflective scale of D. Kolb's model and is related to the extraverted-introverted scale of other theories.

4. How does the student understand and remember the initial material: sequentially (in a logical sequence of steps) or globally (from general to partial)?

Sequential learners tend to think linearly and can work after understanding part of the material. Global learners cannot apply new material until they fully understand it and see how it relates to what they have previously learned. But, as soon as they grasp the essence from a holistic perspective, they can solve tasks much faster than consistent students.

The components of the Felder-Soloman model and learning styles with their descriptions and short names are schematically presented in Table 2.8.

Table 2.8

Component models and learning styles, according to R. Felder and B. Soloman

Dimension	Style name (in short)	Description
Perception of information	Sensing (sen)	Awareness of information, facts
	Intuitive (int)	Intuition, forming an abstract concept
Sensors for perception	Visual (vis)	Preference for drawings and diagrams
	Verbal (vrb)	Preference to the written or oral explanation
Understanding information	Active (act)	Activity, experimentation
	Reflective (ref)	Reflections, observations
Learning patterns	Sequential (seq)	Step-by-step understanding, convergent thinking, and analysis
	Global (glo)	Understanding by jumps, system thinking, and synthesis

Questionnaires of the methodology contain forty-four questions for selecting elements that make it possible to evaluate preferences in four scales: sen/int, vis/vrb, act/ref, and seq/glo.

For each scale, a special form calculates the difference in points characterizing the educational preferences of students. For example, if in the act/ref dimension, there are 4 "act" answers and 7 "ref" answers, then the final score difference is 3 "ref."

Index of Learning Style

The degree of manifestation of educational preference is evaluated as follows:

- if the score difference is from 1 to 3, the styles of this scale are pretty well balanced in two directions (in the above example, active and reflective learning styles will be balanced);
- if the difference varies from 5 to 7, the student is characterized by a moderate preference for one style over another. Learning will be easier in an environment that corresponds to this style;
- if the score difference corresponds to 9 or 11, the student strongly prefers one aspect of the scale. He may experience learning difficulties in an environment that does not match this advantage.

Characteristics of learning styles and recommended behaviors for students with specific learning preferences are provided below.

Active and reflective styles. Active students tend to retain and understand learning material better if they actively discuss or apply the information received or explain the material to others. Reflective - prefer calm thinking at first. "Let us try it and see how it works" and "Let us think about it first" are phrases that illustrate the typical reaction of active and reflective students, respectively.

Active learners prefer working in groups to reflective learners, who prefer working alone. For both personality types, sitting through a lecture without doing any physical activity other than taking notes is difficult and most difficult for active students.

All people are sometimes active and sometimes reflective. The preference of one of the categories can be strong, medium, or light. It is desirable, of course, that there should be a balance. If a student always acts before thinking about his action, he may act prematurely and then make a mistake. But he may never do anything if he spends too much time thinking.

Recommended behavior for active students. If the teaching method provides little (or no) time for discussion and problem-solving during the activity, students should try to compensate for this. They need to: study in a group, the members of which take turns explaining different topics to each other; work with other students; imagine what might be asked on the next test, and find out their answers. Active students will always remember information better if they find a way to do something with it.

Recommended behavior for reflective students. In classes with little (or almost no) time for understanding new information, students should try to compensate for this lack in the work process. While reading and memorizing the material, they need to stop and review what they have already read periodically. Consider possible issues and ways of applying the received data. Writing a short summary of the reading in your own words is useful. It may take longer, but it will allow students to remember the material more effectively.

Sensing and intuitive styles. Sensing people tend to like facts. Those with a dominant intuitive perception often prefer to open up opportunities and relationships.

Students with sensing perception often solve problems using known methods; they do not like surprises and difficulties. Intuitive learners prefer innovation and dislike repetition. The former students are more often than the latter indignant when materials appear in tests that were not clearly discussed in class. Students with sensing perception, as a rule, remember facts well, are patient in details, and perform practical (laboratory) work well. Intuitive students grasp new concepts better and are often more comfortable working with abstractions and mathematical formulations.

Sensing learners are more practical and cautious than intuitive learners. As a rule, the latter work faster and are more resourceful than the former.

Sensing learners do not like courses that do not have an obvious connection to the real world. Intuitives do not like plug-and-play courses that contain a lot of memorization and routine calculations.

Each person sometimes has sensory perception and sometimes - intuitive perception. The preference of one of the categories can be strong, medium, or weak. Students must perform equally well in both areas to effectively learn and solve problems. If they overestimate intuition, they may miss important information or make careless mistakes in calculations or practical work. If students overestimate sensing perception, they may rely too much on memorization and known methods and will not focus on understanding and innovative thinking.

Recommended behavior for sensing students. Such students remember and understand information better if they see its connection with the real world. They may struggle in classes where much of the material is abstract and theoretical. For them, it is necessary to give concrete examples of implementing concepts and theories and show how the concepts are applied in practice. If the teacher does not provide such information, the sensory student should try to find it independently in the course literature or other references.

Recommended behavior for intuitive students. Most of the lectures are aimed at students with intuitive perceptions. If a student with this type of perception finds himself in classes where it is mainly necessary to memorize and mechanically solve formulas, he may have problems and boredom. The teacher needs to provide interpretations or theories that connect the facts being studied. Otherwise, the student must establish the connection between the actual data independently. Intuitive students tend to make careless mistakes on tests because they are impatient with details and do not like repetition (for example, when checking completed solutions). They must read all the questions before answering and checking the results.

Visual and verbal styles. Students with visual perception remember images better: pictures, diagrams, charts, graphs, movies, demonstrations, etc. Students with verbal perception get more information from words - written and oral explanations. Both types learn better when the learning material is visually and verbally presented.

Most classes in educational institutions use very little visual information: students mainly listen to lectures and read materials written on the board and in textbooks and handouts. Facts show that most people are visual learners, which means that students are not getting as much as possible if classes were more about the visual presentation of learning data. Good students can process information presented both visually and verbally.

Recommended behavior for students with visual perception. Suppose the student has a visual type of perception. In that case, it is necessary to find graphs, sketches, diagrams, photographs, diagrams, or any other visual representation of the educational material presented orally. Referrals to reference books and e-resources with educational materials of this course will be useful. For them, it is better to prepare a map or diagram that lists key points inside rectangles or other figures, demonstrating connections between concepts (in the form of lines or arrows). It is useful to use colored highlights (accents, labels) in the notes.

Recommended behavior for students with verbal perception. Students of this type need to briefly describe the structure of the educational material in their own words. Working in a group can be particularly effective for them, as they gain an understanding of the material by hearing their peers explain it and learn even more when they explain the material themselves.

Sequential and global styles. As a rule, students who are better at processing material sequentially achieve understanding when the material is taught step by step when each new step logically follows the previous one. Globally minded learners are more likely to learn in large leaps, absorbing material almost haphazardly without seeing the connections and then suddenly getting it.

Students with sequential perception tend to follow a logical step-by-step path to finding a solution. Students with global perception can solve problems quickly and combine the parts once they understand the whole picture. But they may have difficulty explaining how they did it.

Many people may mistakenly conclude that they have a global perception because everyone has the experience of not understanding something and then having a sudden flash of understanding. What makes perception global or sequential occurs before understanding. Students with sequential comprehension may not fully understand the material and do something with it (for example, solve homework or take a test) because the parts they understand are logically connected. Students with a strong global perception who cannot think sequentially can experience severe difficulties until they understand the big picture. Even after seeing it, they can vaguely imagine the details of the object. Students with a sequential perception know a lot about specific aspects of a subject, but they may have problems connecting them to each other and to parts of other subjects.

Recommended behavior for students with a sequential type of perception. Most educational courses at universities are taught sequentially. However, if the student has a sequential learning style and the teacher jumps from topic to topic and skips steps, it may be difficult for the student to follow and remember the subject. It is necessary to fill in the missing steps with the help of the teacher's answers or independently by referring to the reference books. Students need to arrange the lecture material in a logical order. To develop global thinking, one needs to try to connect each new topic with previously studied ones. The more the student does this, the deeper the understanding of the topic will be.

Recommended behavior for students with a global type of perception. A student with a global perception can organize his work to get the overall picture faster. For example, before studying the first part of the text, he needs to skim through the entire chapter to get a general idea. It may take longer initially but will save time later when returning to individual parts of the text. Rather than reviewing each subject briefly each day, such students may benefit more from studying subjects in large blocks. The teacher needs to help students see the connections of the new material with other topics and disciplines.

2.9.2 Learning styles for students of different study fields

To develop an effective teaching method, a teacher must consider many factors. He should understand that students of different training areas have specific differences in the profiles of educational preferences. The characteristics of groups of students of various specialties obtained from the meta-analysis results[48] are given in Table 2.9. In addition to student data, the table describes teachers' styles. Some results of this meta-analysis concerning learning preferences in different study fields will be discussed later in this Section.

Table 2.9

Generalized quantitative characteristics of the processed sample of respondents

Study fields	Participated in surveys:						
	University	Country	Respondents together	Student	Teacher	Probationer	Ph.D. student
Technic science	14	10	4538	4409	129	-	-
Natural science	12	7	1772	1587	13	164	8
Economics	11	6	2111	2005	89	17	-
Liberal arts	6	5	743	608	-	135	-
Medicine	2	2	560	560	-	-	-
Total	33	16	9724	9169	231	316	8

In Fig. 2.5, averaged profiles of groups of students by learning styles are presented in the form of eight-petal-filled diagrams.

For example, we compare data for students of technical specialties with traditional ideas about educational types in technical education. From Fig. 2.5, one can see, for example, that 67% of engineering majors consider themselves sensory learners, while traditional engineering training tends to be heavily oriented toward an intuitive style. The educational and professional training programs emphasize the critical role of theory and modeling compared to experimentation for most training modules.

85% of students identify themselves as visual learners, while most technical training is verbal, with teachers explaining physical phenomena using notes and mathematical explanations. It can be seen that a large proportion of students (64%) choose an active learning style. At the same time, most technical courses, apart from laboratory work, rely almost exclusively on lectures and readings as the primary means of information transfer.

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[48] *Derkach T.M. Theoretical and Methodical Foundations of Training Future Chemical Specialists Through Information Technologies. Dnipro, Art-Press, 2013.*

56% of the studied students chose a sequential learning style. Traditional technical education is mainly sequential. Thus, unlike others, this aspect does not contradict theoretical expectations and experimental results.

Global students make up a substantial and essential minority of samples for all majors. People of this type are multidisciplinary thinkers; they have a broad perception.
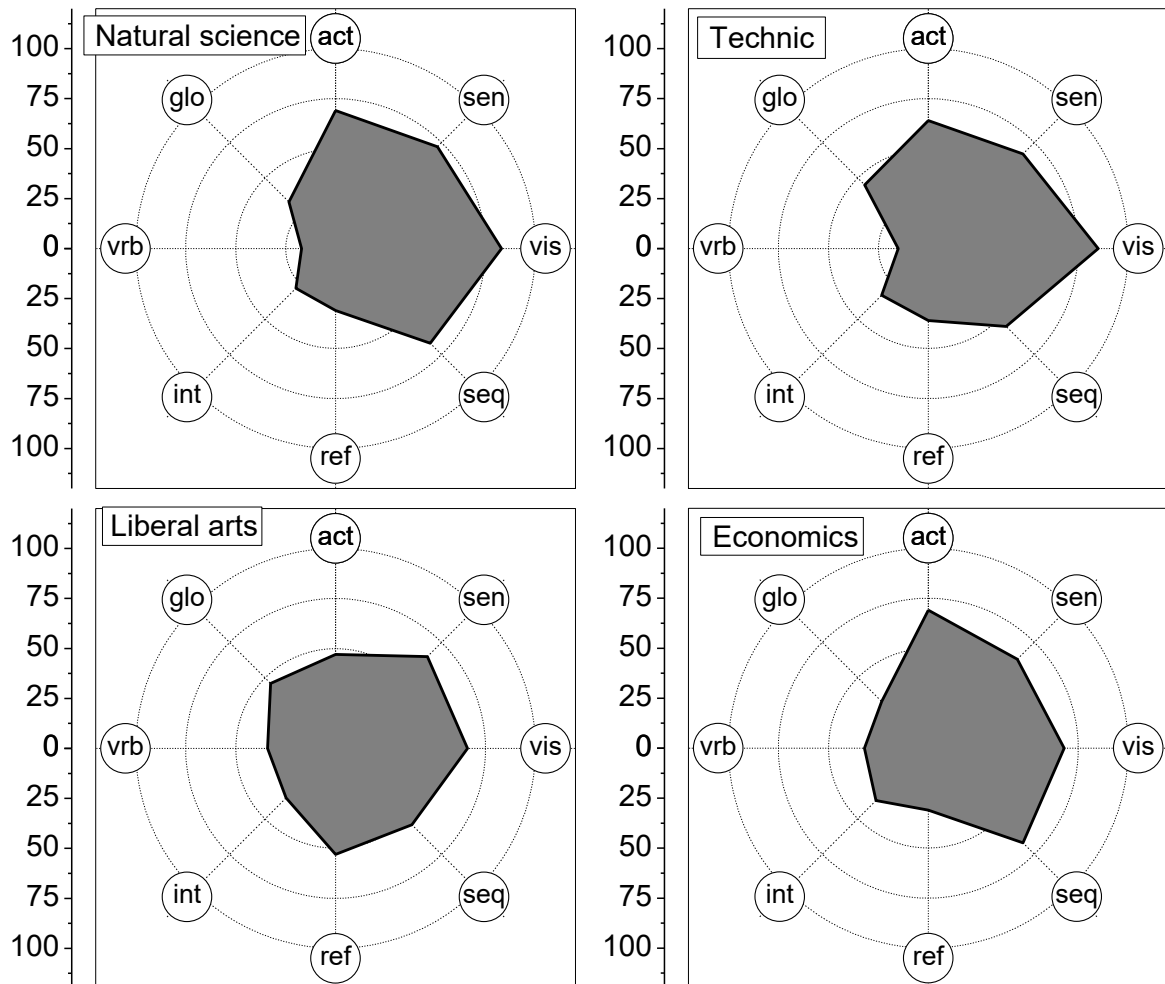
Figure 2.5 Comparison of learning styles of students of different fields of study (average values are shown in %)

Unfortunately, traditional technical education does little to develop a systems perspective in students. In most cases, when students take time to grasp the issues thoroughly, they do not fit into the curriculum and are at risk regarding academic achievement.

Figure 2.6a compares the average indicators of learning styles for students majoring in technic and natural sciences, while Fig. 2.6b compares liberal arts and economics majors. The most significant difference between technical and natural sciences students is the higher percentage of sequential students (and correspondingly lower percentage of global students) in natural sciences faculties (Fig. 2.6a). In other parameters, the differences are much more minor.

A comparison of the preferences of humanitarians and economists indicates a significantly higher percentage of humanitarian reflective students. At the same time, there are practically no differences in the other two pairs of parameters.

Suppose you compare the preferences between students belonging, on the one hand, to the technical-natural block and, on the other hand, to the economic-humanitarian block. In that case, the differences between them become much more remarkable.
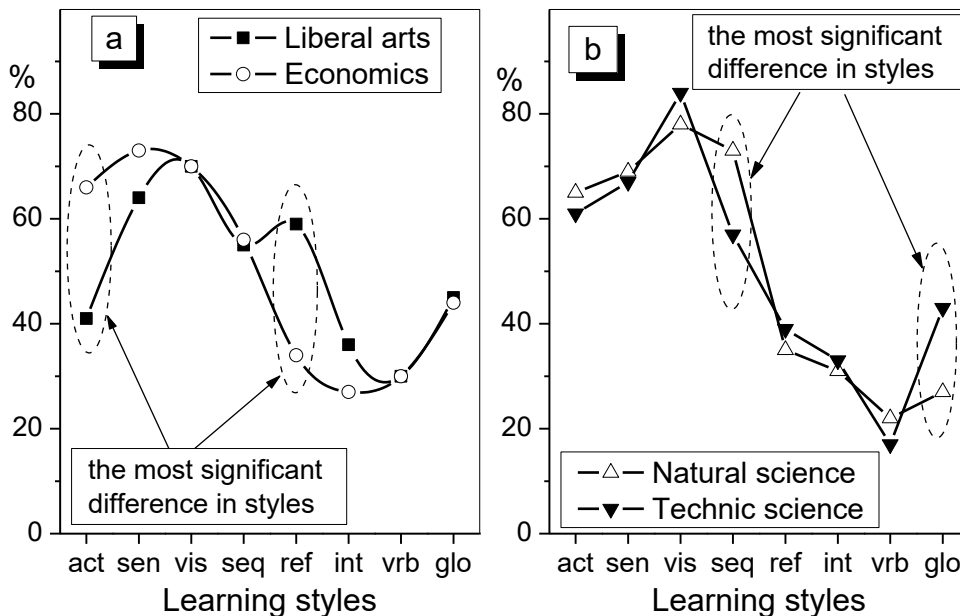
Figure 2.6 Average data-based profiles of learning styles of students majoring in natural and technic fields of study (a) and humanitarian and economic fields (b)

2.10 Teaching-learning style conflicts and ways to overcome them

Teaching styles of teachers and students. Establishing the optimal combination of teaching and learning methods, namely taking into account the peculiarities of the learning styles of students and teachers to obtain the maximum efficiency of the educational process, remains one of the important problems. Figure 2.7 illustrates the extent to which the profiles of learning styles of samples of teachers and students of different fields of training overlap.
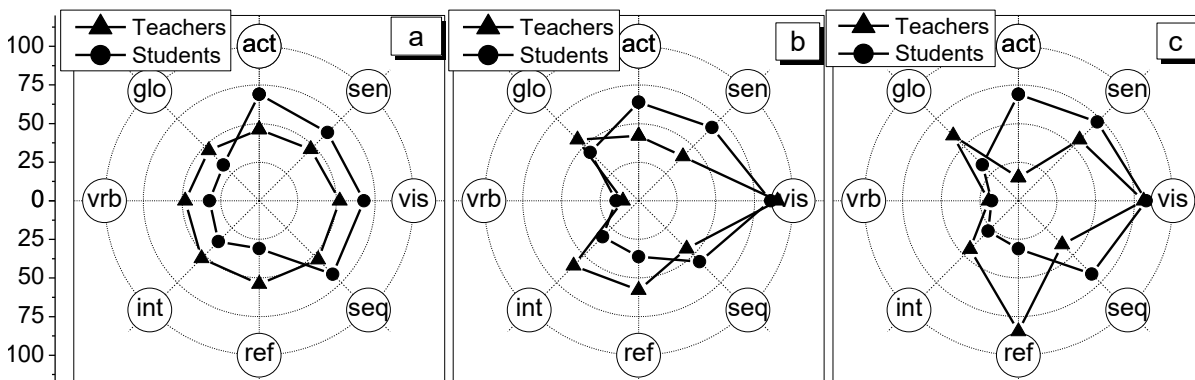
Figure 2.7 Profiles of learning styles of students and teachers of the fields: a) economic; b) technical; c) natural

In all the images, among the teachers, we see a significantly larger number of people of the reflective type and a more pronounced predominance of global and intuitive learning styles. It should be noted that among teachers, the degree of expression of educational advantages is often tiny. It means most teachers belong to people with balanced learning styles so that they can adapt to different conditions easily.

Pedagogical research has shown that the learning process is carried out more effectively when teaching styles match learning styles than when they do not. However, the student's identification of learning styles should not lead to a complete adaptation of the teacher's behavior to him. To function effectively as a specialist in any profession, a student must develop traits of each type:
- ability to observe and pay close attention to details;
- developed perception and possibility of abstract thinking;
- abilities to understand the information presented both visually and orally;
- systematic analytical skills and multidisciplinary synthesis skills.

If the teaching style or instruction is biased toward one aspect of learning styles, some students may find it too uncomfortable to learn. In the mode of "conflict of styles," such negative phenomena as the extreme polarization of intelligent behavior, a decrease in productivity and mobility, and a sharp narrowing of the range of methods of educational activity will be observed. The student's learning behavior, losing its individuality, will gradually become role-based or situational. On the contrary, if learning maximally expands the repertoire of ways of activity (regardless of whether it is traditional or innovative), it enriches the stylistic sphere of the individual's intelligence. At the same time, within the framework of forming an individual cognitive style, the flexibility of intelligent behavior in various educational situations increases. In this way, the individual originality of the composition of the mind will expand in combination with increased intellectual activity productivity.

Aligning the learning styles of those being taught with teachers' teaching methods is a prerequisite for increased academic achievement. The problem of the most rational combination of styles and methods is acute enough due to a severe contradiction.

The need to rebuild the learning process (used teaching methods, forms of presentation of educational material, characteristics of the teacher's behavior, etc.) from the point of view of bringing it into line with individual differences in the methods of educational activity of those who are taught, is a correct idea. Some examples confirm this.

Suppose the educational process takes into account the individual pace of learning. Each student can spend as much time studying the educational material as he needs. In that case, about 95% of students show a high and above-average level of educational material mastery in tests. Whereas with traditional education, which ignores individual differences in the speed of assimilation of educational information, the distribution of children's abilities is subject to the action of the law of normal distribution (that is, up to 50% of children have low and average levels of educational and cognitive abilities).

However, a problematic picture emerges regarding learning styles. The analysis of the described studies shows that there is, as a rule, a connection between a particular cognitive style of an individual and academic success. So, the facts show that high school students with field-independent, reflective, theoretical (in terms of P. Hani and A. Mumford), deep (in terms of N. Entwistle) styles, etc., learn better. However, as soon as the teaching method is strictly adjusted to the educational preferences of the student (including students in professional education), the connection between style and academic performance practically disappears. The question of what actually constitutes a condition for successful learning - coincidence or, on the contrary, the divergence of learning styles and forms - remains unclear.

Prospective ways of overcoming the conflict of styles. Let us formulate possible options for preventing the occurrence of a "conflict of styles":

- Adapting teaching aids (teaching methods, form of presentation of educational material, behavior of the teacher) to the educational preferences of those being taught. At the same time, as a rule, homogeneous groups are created, and appropriate educational methods and materials are used;

- Creation of an educational environment in which individuals with different learning and cognitive styles can choose a line of learning that matches their characteristics, mastering other, subjectively new ways of studying reality as their intellectual development progresses. At the same time, a variable educational program is implemented.

The first of two named options is incompatible with the scientific point of view on the nature of learning styles, which are not a stable mental property of the individual. For example, the study of E.L. Grigorenko and R. Sternberg showed that the degree of development of certain thinking styles of American schoolchildren depends on several factors: socioeconomic status of parents; type of school; teacher's style, etc. Evidence that stylistic properties have the resource of mobility is their changes under the influence of specially organized training. Thus, a purposeful shift in students' styles towards a transition to a deeper approach to learning was shown to be possible under the influence of developing skills for working with scientific information.

Suppose we proceed from the generally accepted statement about the stability of an individual learning style. In that case, by "adjusting" all forms of the educational process to the existing learning style of the student, we will fix and consolidate a particular style of assimilation of information. As a result, the individual's mental outlook will be narrowed and possibly deformed. By stimulating unproductive forms of stylistic behavior in the learning process, it is possible to slow down the individual's intellectual development.

Secondly, suppose the educational process will be built based on the generally accepted statement about the equivalence of different poles of the same style concerning the success of the educational activity. In that case, serious mistakes may be made in its organization, and, as a result, the basic mechanisms of effective intellectual activity may be destroyed. Thus, the predominant use of either verbal or figurative material makes it impossible to build an adequate

mental representation of the problem. The mental basis of understanding is the interaction of verbal-linguistic and visual forms of experience. A prerequisite for ineffective learning appears if a single method dominates information processing. For example, such single methods are impulsiveness or reflexivity, analytical, synthetic, deductive or inductive thinking, etc. It sharply narrows the range of ways of studying reality. If you set people up only for a "deep" approach to learning the educational material, you can violate the mechanism of selectivity in evaluating its relevant and irrelevant aspects, etc.

It would be correct to ask about the need to consider students' styles in the learning process. In the learning process, conditions should be created for the formation of the individual cognitive style of each student. At the same time, individuals with different learning styles (and different cognitive styles) should be able to choose a line of learning according to their stylistic preferences within a single educational space. Taking individual styles into account in the learning process is transformed into the task of forming an individual cognitive style, which, in turn, is one of the aspects of the individual's intellectual education in modern education.

One of the criteria for the educational process's effectiveness is the uniqueness of the mind of those being taught. The formation of this uniqueness is related to the evolution of the individual cognitive style of each person. It results from the complication of all forms of mental experience under the influence of an enriched educational environment.

Returning to the definition of terms, we again emphasize that an individual cognitive style is a mental formation. It is, firstly, multidimensional in its manifestations; secondly, hierarchical in its structure (including different levels of stylistic behavior); thirdly, integral, a product of the integration of various forms of mental experience; and fourth, flexible in its adaptive capabilities.

An individual cognitive style is formed in the process of a person's intellectual development, determining the peculiarities of his behavior in various situations: life, education, professional, etc. The higher the level of intellectual maturity of the individual, the brighter the individual cognitive style is manifested.

The formation of an individual cognitive style involves:

1. Identifying the personal stylistic preferences and awareness of the "weak" and "strong" aspects of this type of stylistic behavior while mastering the material by the student and the teacher.

2. Development of basic mechanisms of stylistic behavior at the level of styles:

- coding of information – development of the ability to use different modalities (verbal-linguistic, visual, kinesthetic, sensory-emotional) in the mode of application of different methods of coding information when constructing mental representations;
- processing of information (cognitive styles) – development of the ability to involuntary intellectual control in the form of the two most productive types of stylistic behavior (reflective and fast/accurate – within the framework of the cognitive style impulsivity/reflectivity, flexible and integrated into the aspect

of flexible/rigid styles, etc.), as well as the mobility of stylistic behavior (possibility of transition from one pole of a given style to another depending on one's own needs and requirements of the educational situation);

- posing and solving problems (thinking styles) – developing the ability to use all possible methods to solve the given task, choosing them depending on the nature of the problem situation. The willingness to vary the methods of posing and solving problems is critical in conditions when students have to work in the mode of independent intellectual search;

- cognitive attitude to the world - development of the ability to realize the advantages of one's style, to take into account the existence of people with other characteristics, and to build a dialogue in the conditions of the existence of radically different approaches to the construction of cognitive "pictures of the world."

3. Enrichment of stylistic characteristics of intellectual behavior, including:

- expanding the repertoire of stylistic behavior associated with mastering different styles at different levels of stylistic behavior, as well as different styles within each level (developing skills in using different methods of encoding and processing information, posing and solving problems, organizing a cognitive "picture of the world");

- creation of conditions for the interaction of different cognitive styles when studying a certain topic, mastering a concept, solving a specific problem, etc.

Thus, it can be concluded that forming an individual cognitive style in professional training means gradually leveling the difference in individual styles. The thesis is paradoxical only at first glance since its true content is that a mechanism for integrating different types of stylistic behavior should be developed in the learning process. Therefore, the pedagogical approach, according to which individualizing and adapting education means to the existing cognitive style of one student with appropriate "adjustment" to this style of content and teaching methods, is not completely correct. It is more accurate to talk about the formation of each student's individual cognitive style based on actualizing and enriching the entire system of stylistic behavior mechanisms.

The formation of an individual cognitive style (and, accordingly, an increase in the effectiveness of educational activities) involves the creation of an educational environment, some elements of which correspond to the style of students. In contrast, others do not and are intended for developing missing mechanisms of stylistic behavior. In current conditions, the possibility of such individualization using ICT is promising. Solving this task involves the creation of such didactic materials that allow everyone who is taught to choose their unique line of learning at work and create prerequisites for the gradual formation of individual cognitive styles. At the same time, the mental experience of each student is enriched. It determines the productivity of intellectual behavior and the growth of the originality of the composition of the mind.

From the point of view of the teacher's activity, it is often said that a balanced teaching style, which partly corresponds to the students' preferences, is optimal. The level of discomfort should not be too great for the students, but the

teaching style may go against the students' strengths, encouraging them to grow in less developed areas.

Preliminary diagnosis of students' learning styles in a group can provide additional support for effective instructional design. For example, knowing that most students are visual individuals motivates the teacher to find visual ways of presenting material that might usually be presented entirely abstractly and verbally.

There is often a discrepancy between what lecturers think about their classroom actions and what happens there. Such conclusions were made based on determining the teaching styles of teachers, analysis of their interview data, and direct observations of their work style in the classroom. For an adequate analysis of their pedagogical actions, teachers are recommended to establish their predominant learning styles and identify their teaching styles.

We will formulate some recommendations that will help teachers prevent ineffective work with students:

The course material must be well structured. Students note that the good structure allowed them to work with the material flexibly.

It is necessary to present the information to make its connection with the real world obvious. It means that it is essential to illustrate each discussed topic with relevant examples, draw on your experience for models, and integrate the details into the overall picture of the question.

Students consider active and group methods of work to be the best. Lectures should be replaced as much as possible by working with a small group in the classroom, practical laboratory, or project activities. It is necessary to activate the activity of students during a traditional lecture.

Students believe that the way the content is delivered, even if it is different from what they are comfortable with, is less important than good organization and structure of the material. For the successful delivery of the content, it is necessary to: identify tasks and goals, correlate them with real expediency; organize educational resources well in printed or electronic format; give enthusiasm to the teacher; provide timely feedback (or response) to student concerns about the program or educational issues.

According to the survey results, it was established that students of higher education institutions believe they receive essential support from each other. Everything that the educational institution organizes to facilitate cooperation between students (from the conditions of a dedicated space, such as a joint study center, to well-managed collective work), they evaluate very positively. Students consider online resources, such as lectures, important because they allow them to review work at their own pace and at their leisure.

Thus, students will feel supported by teachers and the educational institution if:
• there is open communication, an opportunity to inform and transfer information about students' needs, and the institution or the lecturer provides a timely response;
• provided resources that can be accessed at students' own pace in their free time;

- organized cooperation of students with peers is considered a correct, acceptable, logical continuation of education.

2.11 Self-assessment questions

1. Why teaching is a profession?
2. What are the main components of pedagogical professionalism?
3. What is the difference between teacher knowledge from other professions?
4. What types of knowledge are inherent in teacher professionalism?
5. Enumerate the teacher's philosophy's functions in developing professionalism.
6. What professional development strategies is the model of the teacher as a learner implemented?
7. Define the concept of a teacher's professional role.
8. What are the characteristics of a teacher's misbehavior?
9. What could the consequences be for the learners?
10. What is the teaching style? Are teaching styles contextual or fixed? Provide an example.
11. What is the correspondence between learning style and teaching style?

2.12 Practice exercises

2.12.1 Steps for Staffordshire Evaluation of teaching styles

Task: Determine your teaching style using Self-Evaluation SETS Tool.[49]

1. Rate how much you agree with each statement below on a five-point scale.

Table 2.10

Self-Evaluation Tool

		Not agree at all ⟷ Strongly agree				
Q1	I vary my approach depending on my audience.	1	2	3	4	5
Q2	I am less comfortable giving straight presentations than teaching through games and exercises.	1	2	3	4	5
Q3	I prefer to teach through games to relay learning.	1	2	3	4	5
Q4	I like having external targets to determine the course of learning.	1	2	3	4	5
Q5	I prefer teaching sessions that are self-contained with no follow-up.	1	2	3	4	5
Q6	Props often detract from a talk.	1	2	3	4	5
Q7	I am comfortable addressing large audiences.	1	2	3	4	5
Q8	Preparation for my teaching focuses on me and my role.	1	2	3	4	5
Q9	I am usually standing up when I teach.	1	2	3	4	5
Q10	The best teaching sessions convey straight facts in a dear way.	1	2	3	4	5
Q11	I avoid being distracted from running sessions the way I plan to run them.	1	2	3	4	5
Q12	I am happy teaching general skills.	1	2	3	4	5
Q13	I put no value on being formally employed as a teacher.	1	2	3	4	5
Q14	I dislike one-to-one teaching.	1	2	3	4	5
Q15	I am consistent in the delivery of a topic, whatever the audience.	1	2	3	4	5
Q16	I like to give students the opportunity to explore how to learn.	1	2	3	4	5
Q17	I have developed my own style as a teacher.	1	2	3	4	5
Q18	I prefer one-to-one teaching.	1	2	3	4	5
Q19	Eliciting emotions through role-play or drama is a valuable aspect of teaching.	1	2	3	4	5
Q20	I am comfortable using humor in my teaching.	1	2	3	4	5
Q21	I rarely sit down when with students.	1	2	3	4	5
Q22	It is important to me that my teaching is accredited by an official body.	1	2	3	4	5
Q23	I am uncomfortable when I have multi-professional groups of learners to teach.	1	2	3	4	5
Q24	I am at my best when organizing my teaching to fit an external curriculum or organizational structure.	1	2	3	4	5

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[49] *https://ocpe.mcw.edu/sites/default/files/KN%20Worksheet_Staffordshire%20Evaluation%20of%20Teaching%20Styles.pdf*

2. Write the score in the indicated spaces on the scoring sheet.

3. Calculate each column's total score corresponding to a particular style.

Table 2.11

The Scoring Grid

Question	Style One	Style Two	Style Three	Style Four	Style Five	Style Six
Q1	Q1 =					
Q2		Q2=				
Q3		Q3=				
Q4			Q4=			
Q5						Q5=
Q6						Q6=
Q7					Q7=	
Q8			Q8=			
Q9					Q9=	
Q10				Q10=		
Q11				Q11=		
Q12	Q12=					
Q13						Q13=
Q14					Q14=	
Q15				Q15=		
Q16		Q16=				
Q17	Q17=					
Q18						Q18=
Q19		Q19=				
Q20	Q20=					
Q21					Q21=	
Q22			Q22=			
Q23				Q23=		
Q24			Q24=			
TOTALS						

4. Next, fill in your scores from the chart totals into the six boxes against each teaching style below.

5. Add the columns on the previous page to obtain your score for each of the six teaching styles (out of a maximum of 20 points).

Style One: The all-around flexible and adaptable teacher. This teacher can use many different skills, teach peers and juniors, and is very aware of the whole environment in teaching and the learners.

Style Two: The student-centered. Sensitive teacher. This teacher is very student-centered and teaches in small groups, with emotions to the fore, using role play and drama, and is uncomfortable doing straight presentations.

Style Three: The official curriculum teacher. This teacher is very well prepared as a teacher, accredited, aware of and teaches to the formal curriculum, and follows external targets for teaching.

Style Four: The straight facts, no-nonsense teacher. This teacher likes to teach clear facts, with straight-talking, concentrating on specific skills, and much prefers not to be involved with multi-disciplinary teaching and learning.

Style Five: The big conference teacher. This teacher likes nothing better than to stand up in front of a big audience. This teacher does not like sitting in groups or one-to-one teaching.

Style Six: The one-off teacher. This teacher likes to deliver small self-contained bits of teaching on a one-to-one basis with no props to help and no follow-up.

6. Take the marks from the six boxes and put a cross along each of the six axes (Fig. 2.8).

7. Crosses will represent your score in the six teaching styles.

8. You may wish to join the crosses to produce a shape of your combination of styles.
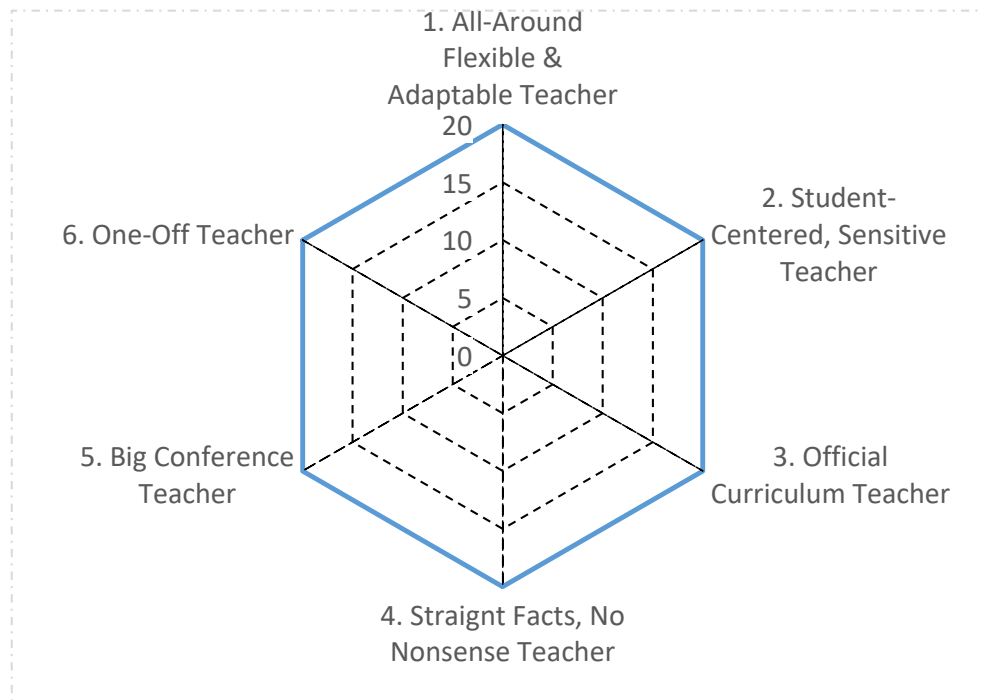
Figure 2.8 One's combination of teaching styles by Staffordshire Evaluation of Teaching Styles Instrument

2.12.2 Teaching styles (the Grasha-Riechmann model)

Directions: The following is a Grasha teaching style survey which includes 40 items (Table 2.12). Respond to each of the items below in terms of how you teach. Use a 7-point Likert-type scale ranging from strongly disagree to strongly agree. If you teach some courses differently than others, respond in terms only of one specific course. Fill out another survey for the course(s) you teach in a different style. Try to answer as honestly and as objectively as you can.

Table 2.12

Grasha teaching style survey

No	Question	Response
1.	Facts, concepts, and principles are the most important things thatstudents should acquire.	
2.	I set high standards for students in this class.	
3.	What I say and do models appropriate ways for students to think aboutissues in the content.	
4.	My teaching goals and methods address a variety of student learning styles.	
5.	Students typically work on course projects alone with little supervisionfrom me.	
6.	Sharing my knowledge and expertise with students is very important to me.	

No	Question	Response
7.	I give students negative feedback when their performance isunsatisfactory.	
8.	Activities in this class encourage students to develop their ideas about content issues.	
9.	I spend time consulting with students on improving their work on individual and/or group projects.	
10.	Activities in this class encourage students to develop their ideas about content issues.	
11.	What I have to say about a topic is important for students to acquire abroader perspective on the issues in that area.	
12.	Students would describe my standards and expectations as strict and rigid.	
13.	I typically show students how and what to do to master coursecontent.	
14.	Small group discussions are employed to help students develop their ability to think critically.	
15.	Students design one of the more self-directed learning experiences.	
16.	I want students to leave this course well-prepared for further work in this area.	
17.	I am responsible for defining what students must learn and how they should learn.	
18.	Examples from my personal experiences often are used to illustrate points about the material.	
19.	I guide students' work on course projects by asking questions, exploring options, and suggesting alternative ways to do things.	
20.	Developing the ability of students to think and work independently is an important goal.	
21.	Lecturing is a significant part of how I teach each class session.	
22.	I provide very clear guidelines for how I want tasks completed in this course.	
23.	I often show students how they can use various principles and concepts.	
24.	Course activities encourage students to take the initiative and responsibility for their learning.	
25.	Students take responsibility for teaching part of the class sessions.	
26.	My expertise is typically used to resolve disagreements about content issues.	
27.	This course has very specific goals and objectives that I want to accomplish.	
28.	Students receive frequent verbal and/or written comments on their performance.	
29.	I solicit student advice about how and what to teach in this course.	
30.	Students set their own pace for completing independent and/or group projects.	
31.	Students might describe me as a "storehouse of knowledge" who dispenses the fact, principles, and concepts they need.	
32.	The syllabus clearly defines my expectations for what I want students to do in this class.	
33.	Eventually, many students began to think like me about the course content.	

No	Question	Response
34.	Students can make choices among activities to completecourse requirements.	
35.	My approach to teaching is similar to a manager of a workgroup who delegates tasks and responsibilities to subordinates.	
36.	This course has more material than I have time available to cover.	
37.	My standards and expectations help students develop the discipline they need to learn.	
38.	Students might describe me as a "coach" who works closely withsomeone to correct problems in how they think and behave.	
39.	I give students much personal support and encouragement to do well in this course.	
40.	I assume the role of a resource person available to students whenever they need help.	

Every eight items identify one of the five basic teaching styles. Regarding this instrument, Grasha (1996) reported acceptable reliability (alpha =.72 for the entire test) and validity.

The items associated with each particular teaching style are shown below.

Teaching Style	Items
Expert	1, 6, 11, 16, 21, 26, 31, 36
Formal Authority	2, 7, 12, 17, 22, 27, 32, 37
Personal Model	3, 8, 13, 18, 23, 28, 33, 38
Facilitator	4, 9, 14, 19, 24, 29, 34, 39
Delegator	5, 10, 15, 20, 25, 30, 35, 40

2.12.3 Index of Learning Styles (Felder-Silverman's questionnaire)

Determining one's learning preferences according to the Index of Learning Styles

According to the Index of Learning Styles methodology, determine your learning preferences. Felder and Silverman initially designed it at North Carolina State University, USA. Answer the 44 questions in the survey below and build an eight-petal diagram - a profile of your learning preferences.

Guideline

To complete the questionnaire, please circle "a" or "b" to indicate your answer to every question. You may only choose one answer for each question and must answer every question. If both "a" and "b" seem to apply to you, please select the one that involves more frequently.

Questionnaire

1. I understand something better after I
    (a) try it out.
    (b) think it through.
2. I would rather be considered
    (a) realistic.

(b) innovative.
3. When I think about what I did yesterday, I will most likely get
    (a) a picture.
    (b) words.
4. I tend to
    (a) understand details of a subject but may be fuzzy about its overall structure.
    (b) understand the overall structure but may be fuzzy about details.
5. When I am learning something new, it helps me to
    (a) talk about it.
    (b) think about it.
6. If I were a teacher, I would rather teach a course
    (a) that deals with facts and real-life situations.
    (b) that deals with ideas and theories.
7. I prefer to get new information in
    (a) pictures, diagrams, graphs, or maps.
    (b) written directions or verbal information.
8. Once I understand
    (a) all the parts, I understand the whole thing.
    (b) the whole thing, I see how the parts fit.
9. In a study group working on difficult material, I am more likely to
    (a) jump in and contribute ideas.
    (b) sit back and listen.
10. I find it easier
    (a) to learn facts.
    (b) to learn concepts.
11. In a book with lots of pictures and charts, I am likely to
    (a) look over the pictures and charts carefully.
    (b) focus on the written text.
12. When I solve maths problems
    (a) I usually work my way to the solutions one step at a time.
    (b) I often just see the solutions but then have to struggle to figure out the steps to get to them.
13. In classes I have taken
    (a) I have usually got to know many of the students.
    (b) I have rarely got to know many of the students.
14. In reading non-fiction, I prefer
    (a) something that teaches me new facts or tells me how to do something.
    (b) something that gives me new ideas to think about.
15. I like teachers
    (a) who put a lot of diagrams on the board.
    (b) who spend a lot of time explaining.
16. When I am analyzing a story or a novel
    (a) I think of the incidents and combine them to figure out the themes.

(b) I just know what the themes are when I finish reading, and then I have to go back and find the incidents that demonstrate them.

17. When I start a homework problem, I am more likely to
    (a) start working on the solution immediately.
    (b) try to understand the problem first fully.

18. I prefer the idea of
    (a) certainty.
    (b) theory.

19. I remember best
    (a) what I see.
    (b) what I hear.

20. It is more important to me that an instructor
    (a) lay out the material in clear sequential steps.
    (b) give me an overall picture and relate the material to other subjects.

21. I prefer to study
    (a) in a group.
    (b) alone.

22. I am more likely to be considered
    (a) careful about the details of my work.
    (b) creative about how to do my work.

23. When I get directions to a new place, I prefer
    (a) a map.
    (b) written instructions.

24. I learn
    (a) at a fairly regular pace. If I study hard, I'll "get it."
    (b) in fits and starts. I will be totally confused, and then suddenly, it all "clicks."

25. I would rather first
    (a) try things out.
    (b) think about how I'm going to do it.

26. When I am reading for enjoyment, I like writers to
    (a) clearly say what they mean.
    (b) say things in creative, interesting ways.

27. When I see a diagram or sketch in class, I am most likely to remember
    (a) the picture.
    (b) what the instructor said about it.

28. When considering a body of information, I am more likely to
    (a) focus on details and miss the big picture.
    (b) try to understand the big picture before getting into the details.

29. I more easily remember
    (a) something I have done.
    (b) something I have thought a lot about.

30. When I have to perform a task, I prefer to
    (a) master one way of doing it.
    (b) come up with new ways of doing it.

31. When someone is showing me data, I prefer
   (a) charts or graphs.
   (b) text summarizing the results.
32. When writing a paper, I am more likely to
   (a) work on (think about or write) the beginning of the paper and progress forward.
   (b) work on (think about or write) different parts of the paper and then order them.
33. When I have to work on a group project, I first want to
   (a) have a "group brainstorming" where everyone contributes ideas.
   (b) brainstorm individually and then come together as a group to compare ideas.
34. I consider it higher praise to call someone
   (a) sensible.
   (b) imaginative.
35. When I meet people at a party, I am more likely to remember
   (a) what they looked like.
   (b) what they said about themselves.
36. When I am learning a new subject, I prefer to
   (a) stay focused on that subject, learning as much about it as I can.
   (b) try to make connections between that subject and related subjects.
37. I am more likely to be considered
   (a) outgoing.
   (b) reserved.
38. I prefer courses that emphasize
   (a) concrete material (facts, data).
   (b) abstract material (concepts, theories).
39. For entertainment, I would rather
   (a) watch television.
   (b) read a book.
40. Some teachers start their lectures with an outline of what they will cover. Such outlines are
   (a) somewhat helpful to me.
   (b) very helpful to me.
41. The idea of doing homework in groups, with one grade for the entire group,
   (a) appeals to me.
   (b) does not appeal to me.
42. When I am doing long calculations,
   (a) I tend to repeat all my steps and check my work carefully.
   (b) I find checking my work tiresome and have to force myself to do it.
43. I tend to picture places I have been
   (a) easily and fairly accurately.
   (b) with difficulty and without much detail.
44. When solving problems in a group, I would be more likely to
   (a) think of the steps in the solution process.

(b) think of possible consequences or applications of the solution in a wide range of areas.

Now turn to the scoring sheet so you can see where your preferences are.

1) Place a "1" in the appropriate spaces in Table 2.13. For example, if you answered "a" to Question 3, put a "1" in Column "a" by Question 3.
2) Add up the columns and write the totals in the indicated spaces.
3) For each of the four scales, subtract the smaller total from the larger one. Write the difference (1 to 11) and the letter (a or b) with the larger total. Example: If your total in the act-ref dimension was 3 for "a" and 8 for "b": 8 – 3 = 5, b is a letter of larger, so you would enter 5b (bottom of Table 2.13).

Table 2.13

Learning Styles Questionnaire Scoring Sheet

Activist/Reflector			Sensing/Intuitive			Visual/Verbal			Sequential/Global		
Q	*a*	*b*	*Q*	*a*	*b*	*Q*	*a*	*b*	*Q*	*a*	*b*
1			*2*			*3*			*4*		
5			*6*			*7*			*8*		
9			*10*			*11*			*12*		
13			*14*			*15*			*16*		
17			*18*			*19*			*20*		
21			*22*			*23*			*24*		
25			*26*			*27*			*28*		
29			*30*			*31*			*32*		
33			*34*			*35*			*36*		
37			*38*			*39*			*40*		
41			*42*			*43*			*44*		
Total (add up each column)											
Activist/Reflector			**Sensing/Intuitive**			**Visual/Verbal**			**Sequential/Global**		
Q	a	b	Q	a	b	Q	a	b	Q	a	b
Larger – Smaller + Letter of Larger											

On the style index chart below, mark your score on each of the four scales. To interpret the results, use the following:

1) If your score on the scale is 1-3, you are fairly well balanced on the two directions of this scale.

2) If your score is 5 or 7 on the scale, you have a moderate preference for one of the aspects of the given scale, and learning will be easier in an environment that corresponds to that aspect.

3) If your rating on the scale corresponds to 9 or 11, you strongly prefer one of the aspects of styles on this scale. You may find it challenging to study in an environment that does not suit your preferences.

ACT											REF
	11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b

SEN											INT
	11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b

VIS											VRB
	11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b

SEQ											GLO
	11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b
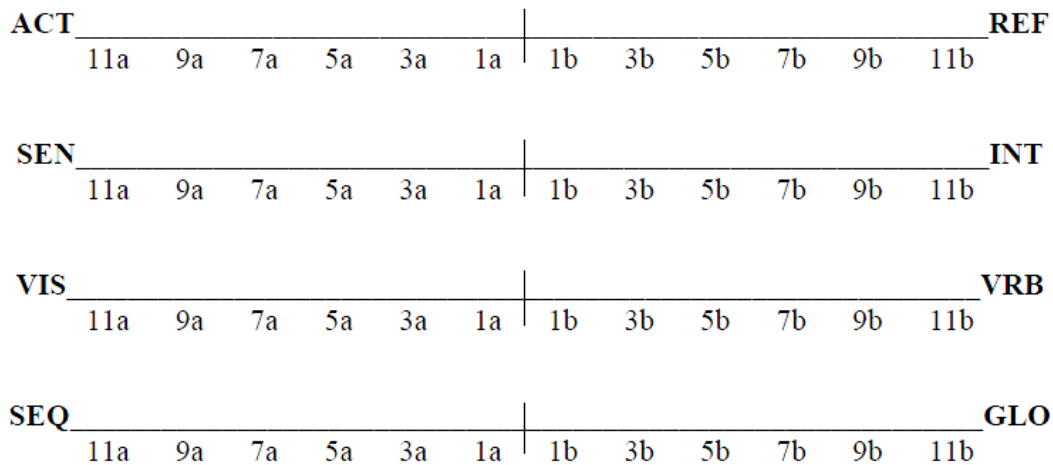
Figure 2.9 A scheme to illustrate aspects of style indexes

For clarity, construct an eight-petal diagram representing the profile of your learning preferences in all four aspects of styles at once. Use the Figure below as a sample.
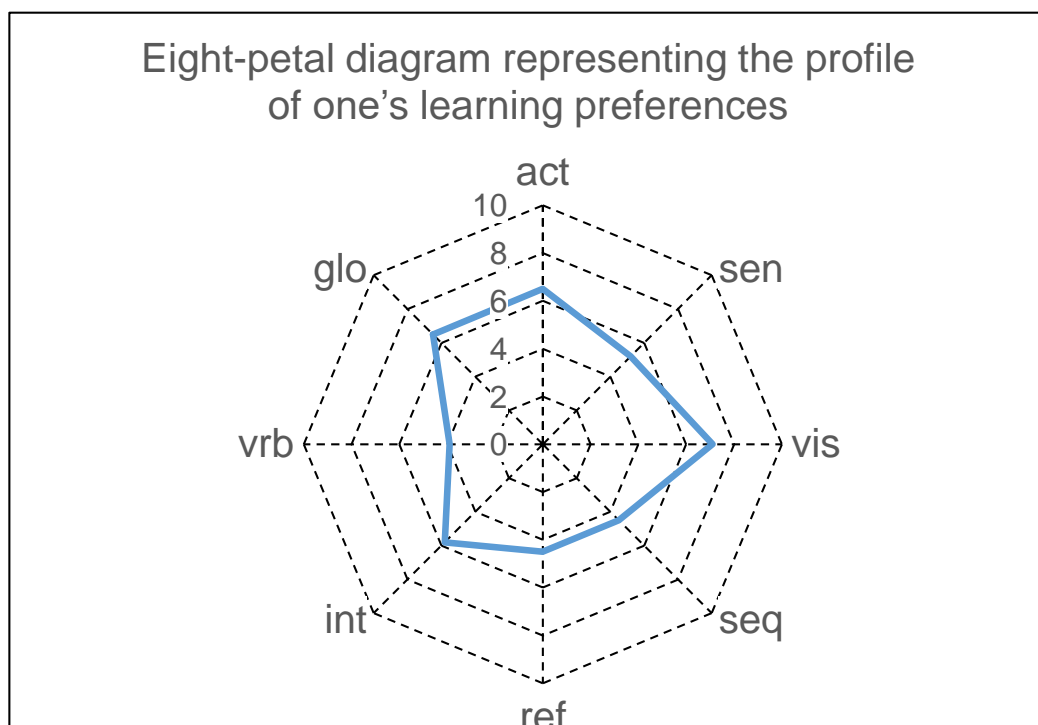
Figure 2.10 Eight-petal diagram representing the profile of one's learning preferences

For a defined profile of your learning preferences, describe recommended student behavior to prevent discomfort and promote learning efficiency. Use the recommendations given in Section 2.9.1.

2.12.4 Learning profiles of student groups by ILS

Build a generalized profile of the learning preferences of academic group students by completing the following tasks:

1. Combine the data obtained from the survey of each group member according to the ILS method into a single table.

2. Build an averaged group profile in the form of an eight-petal diagram in two versions: a) according to the obtained average points of educational advantages; b) by the number in % of persons with certain educational advantages.

3. Describe the generalized characteristics of the group's profile.

4. Using the system below, choose those forms, methods, and e-resources that are better perceived by most students in the group.

Taxonomy of selection of e-resources and learning methods for each type of student

For the development of teaching methods, the taxonomy of the selection of appropriate e-resources and teaching methods is compiled for each type of student. Taxonomy is based on four dimensions of learning styles ILS. Based on the accepted notation, the expression can be written as follows:

Combination ILS = {ILS1, ILS2, ILS3, ILS4},

where ILS1 represents data processing and corresponds to the dimension active/reflective, ILS2 describes the perception of information in the sensing/intuitive dimension, ILS3 shows preferences in perception channels (visual/verbal), and ILS4 corresponds to learning patterns (sequential/global).

Entirely there are 16 combinations of styles, for example, (sen, visa, act, seq), (sen, vis, act, glo), (sen, vis, ref, seq), etc. The choice of optimal learning methods, depending on students' learning styles, is based on the following components: a pedagogical approach to the organization of learning, the most suitable learning methods, and characteristics of the corresponding e-resources.

For each type of student, one or more learning methods can be implemented using one or more e-resources most relevant to their preferred learning styles. For example, a student with a clear sensing style prefers teaching material and methods to solve problems. When selecting teaching methods for him, one must pay particular attention to practical work, such as study based on solving problems, practical exercises, etc. The following e-resources assist in implementing learning methods based on solving problems: animation, simulation, work among others in forums, etc. The integration elements for ILS1 (act/ref), ILS2 (sen/int), ILS3 (vis/vrb), and ILS4 (seq/glo) are illustrated in Tables 2.14-2.17, respectively. The selection of e-resources is carried out by[50].

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[50] *A.L. Franzoni-Velázquez, F. Cervantes-Pérez, and S. Assar. A Quantitative Analysis of Student Learning Styles and Teacher Teachings Strategies in a Mexican Higher Education Institution, Journal of Applied Research and Technology, vol. 10, no.3, pp.289-308, 2012. A.L. Franzoni, and S. Assar, Student Learning Styles Adaptation Method Based on Teaching Strategies and Electronic Media, Journal of International Forum of Educational Technology and Society, vol. 12, no. 4, pp. 15-29, 2009.*

Table 2.14

Taxonomy of methods and e-resources for active/reflective dimension (ILS1)

	Active	**Reflective**
Characteristics of student style	Prefer experimentation and active and collective work with learning data with the possibility of the practical application of results	Prefer thinking and observation, as well as prefer to work alone. Good perceived work with text
A pedagogical approach to the organization of learning	Students need to take active action: discuss or apply data, and explain the material to others. It is difficult for them to listen to lectures without performing activities other than annotation. It is better to organize training in groups	During training, it is necessary to arrange periodic stops to understand the material, write short stories, and think about possible applications of the study. Without such activity, students experience discomfort
Learning methods that are best suited	Problem-searching Practical Modeling Creating game situations Study based on solving problems Expert discussion group (discussion panel) Brainstorm Method of projects	Presentations Case method Method of questions and answers Individual work with text Writing a short resume paraphrased in your own words may be helpful. It can take longer, but it will allow students to remember the material more efficiently.
E-resources qualified for use	Static visualization Program package E-mail Search engines, teaching database E-textbooks Teaching programs Tests ready for use	Static and dynamic visualizations Quantum chemical simulation Lab complex with measuring sensors Wiki, Forum, Chat, E-mail Search engines, teaching database E-textbooks, hypertext Teaching programs Tests ready for use Test shells

Table 2.15

Taxonomy of methods and e-resources for sensing/intuitive dimension (ILS2)

	Sensing	**Intuitive**
Characteristics of student style	Prefer courses directly related to the real world, studying facts and experimenting. Pay attention to the details, work well practically, and often solve problems by known methods; they are cautious and do not like surprises and difficulties.	They are innovators and hate tedious work and repetition. Working with abstract problems, formulation of concepts, and mathematical dependencies is pleasant. They do not enjoy courses that contain a lot of material for memorizing and routine calculations, are bored studying details, and are more inventive.
A pedagogical approach to the organization of learning	Teaching material with specific examples of implementing theories and their practical application. Solving tasks with a particular order, implementation of procedures-actions. Work in the laboratory	Teaching material with a guide to the theory and conceptual examination. It is necessary to provide theories that connect the facts being studied. Recommended lectures, exercises, and innovative methods.
Learning methods that are best suited	Verbal, visual, practical Simulation, problem-searching	Modeling Role games, games, and simulations The case method, project method Discussion panel

	Sensing	Intuitive
	Experiment, execution of exercises; question and answer method; a study based on solving problems	
E-resources qualified for use	Static visualization Program package Virtual labs for laboratory work E-textbooks Teaching programs It is advisable to provide students with resources that allow them to independently find the facts: E-mail, search engines, teaching database Tests ready for use	Static visualization, 3D models Quantum chemical simulation E-textbooks, Encyclopedia All types of communications are best suited for learning: forum, video-, audio-conference, chat, e-mail Search engines, teaching database Ready tests are of little use for learning

Table 2.16

Taxonomy of methods and e-resources for visual/verbal dimension (ILS3)

	Visual	Verbal
Characteristics of student style	Well-perceived and better-memorized images: drawings, diagrams, charts, graphs, etc.	Well-perceived language and text elements, more information is obtained from words - written and oral explanations
A pedagogical approach to the organization of learning	Both types study better when the teaching material is presented both visually and verbally	
	Students better remember what they see	They quicker perceive spoken or audio information. It is better to remember what they read or hear
Learning methods that are best suited	Visual, practical Problem-searching Modeling Experiment Games and simulations Independent work with training programs and simulators	Verbal, visual Problem-searching Lecture, Exercises Method of questions and answers Discussion panel Brainstorm Individual work with text Working in a group can be particularly useful: students achieve an understanding of the material, hear the explanations of their groupmates, and learn even more when they explain the material
E-resources qualified for use	Static and dynamic visualizations Quantum chemical simulation of spectra Modeling of experiments Virtual labs are best suited for learning Teaching programs Teaching database Tests ready for use	Static visualization Quantum chemical simulation of spectra Lab complex with measuring sensors E-textbooks Chat, E-mail Teaching programs Search engines,

Table 2.17
Taxonomy of methods and e-resources for sequential/global dimension (ILS 4)

	Sequential	Global
Characteristics of student style	Convergent thinking prevails. Achieve an understanding using the step-by-step study of the material when each new step logically follows from the previous	System thinking prevails. Seeing everything in general, studying with high jumps, mastering the material almost by accident, not seeing the connections, and suddenly "understanding them" can innovatively combine things.
A pedagogical approach to the organization of learning	Students learn better through small, orderly, and logically related sequential steps to solve problems. It is necessary to teach the material in a logical order and to try to link each new topic with those studied earlier for a broad and holistic understanding.	Students can study through high jumps, suddenly and almost in any order. Such students may find it more useful to consider subjects in large blocks. Lecturers need to help students to see the links between the material with other topics and disciplines
Learning methods that are best suited	Verbal-dialogical Visible - manuals Reproductive exercises Method of questions and answers Modeling Problem-searching work with reference books	Case method Method of projects Role games Brainstorm Independent work Creative activities on systematization
E-resources qualified for use	Static and dynamic visualizations are of little use for learning Quantum chemical simulation of spectra E-mail, search engines, teaching database E-textbooks, teaching programs Tests ready for use	Static visualization, 3D models Quantum chemical simulation of molecule structure The following e-resources are best suited for learning: virtual labs for laboratory work; video-, audio-conferences E-mail, search engines, teaching database E-textbooks, hypertext, teaching programs Tests ready for use

Analysis of the results collected in Tables 2.14-2.17 allows lecturers to design the teaching methodology best suited to the course material. Different approaches can be used for such a goal. The first approach is to group students into subgroups with similar learning styles and use different teaching methods and materials for each of the subgroups. Typically, the lecturer cannot implement such an approach because of time constraints, inaccessibility of technical support, etc.

Another similar method is identifying a "group average type" and selecting appropriate learning materials.

The third alternative approach, perhaps, the most realistic, consists of using different learning materials that consider different students' needs for particular units of study.

Integrating aspects of styles and selecting e-resources and teaching methods allow one to change the teaching methodology, focusing on the characteristics of students. The optimal methodology seeks to balance teaching and learning styles rather than to achieve absolute consistency between each lecturer's actions and

students' learning preferences. The discomfort when students work according to a method that does not fit their learning styles should not be significant. Still, it is necessary to form the knowledge and qualifications of a future specialist. Entirely consistent with students' learning preferences, teaching methods do not create conditions for their progress. Our approach allows one to apply an indicative quantitative characteristic that helps determine the above balance. The main stages of the developed approach are as follows (Fig. 2.11).
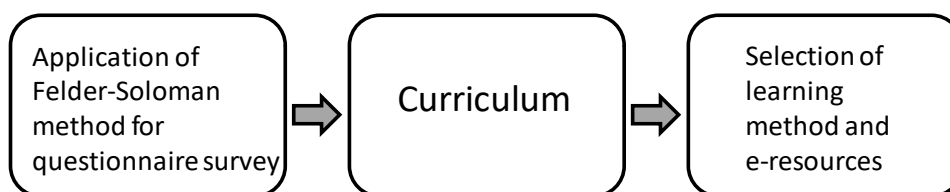

Figure 2.11 Integration stages of learning styles with teaching methods and learning e-resources in the course of development of instructional technology

The developed approach includes the following:
- Methodical work on the content of a discipline, the development of a training and work program;
- The establishment of goals and objectives of the study;
- Investigation of the composition of a student group using the Felder-Soloman questionnaire. When a lecturer works in a traditional group, it is impossible to make the whole material convenient for all types of students. Therefore, it is necessary to take into account the dominant category of students that will be the basis for selecting methods and means of learning;
- Selection of teaching methods and essential electronic resources according to taxonomy illustrated in Tables 2.14-2.17.

Not all teaching methods with corresponding e-resources should be used for each type of student. You can select the most convenient and affordable.

Example of application of the developed technology for inorganic chemistry learning

In the first stage, 63 students in the first year of the Faculty of Chemistry at DNU completed a questionnaire based on the method of Felder-Soloman. The results are shown in Table 2.18.

Table 2.18

The results of an ILS survey of the first-year students of the Faculty of Chemistry at DNU

Subgroup	The relative number of students, %							
	act	ref	sen	int	vis	vrb	seq	glo
1	77.8	22.2	88.9	11.1	55.6	44.4	77.8	22.2
2	88.9	11.1	66.7	33.3	66.7	33.3	22.2	77.8
3	63.6	36.4	90.9	9.1	90.9	9.1	54.5	45.5
4	77.8	22.2	66.7	33.3	66.7	33.3	77.8	22.2
Total:	77.0	23.0	78.3	21.7	70.0	30.0	58.1	41.9

A sizeable average difference was found to connect with the channels of perception, where 70% of students pointed out the prevailing visual style, and only 30% preferred the verbal style. The greatest difference is observed in the processing and perception of data: most students work actively (77% versus 23% of reflective students) and are more sensing and practical than intuitive (78.3% and 21.9%, respectively). Finally, in comprehension, students mainly prefer a sequential style. As a result, the dominant combination of the styles for each dimension in the studied group is {act, sen, vis, seq}.

The lecture course is supplemented by four hours of practice in a laboratory, where the group is divided into subgroups. During the organization of laboratory classes by subgroups, lecturers will need to consider the specific characteristics of each subgroup because, e.g., subgroup 1 has more verbal students. In contrast, subgroup 2 differs from others by higher relative numbers of global and intuitive students (Table 2.18).

Based on the consideration of the general characteristics of this course, students are recommended to carry out the most significant number of tasks in the form of possible problems to be solved. Practicing and repeating the material while solving problems will allow students to understand the theory entirely.

In the third stage, optimal teaching methods and e-resources are selected based on the taxonomy of Tables 2.14-2.17 and according to the results of the student's educational preferences survey (Table 2.18). The results of optimization are shown in Table 2.19. A lecturer can select a type of e-resources that better matches the content of the material and the category of students. Table 2.19 allows one to compare learning methods better perceived by students of these types and select the most expedient one.

For example, most students in a group with the profile {act, sen, vis, seq} are better trained in the problem-searching method in its different versions and quickly comprehend modeling. The computer simulation method, which is rarely currently used, shows promise in developing teaching methods for basic chemical disciplines.

Table 2.19

Taxonomy of integration of learning methods and e-resources for {act, sen, vis, seq}

	Active	**Sensing**	**Visual**	**Sequential**
Characteristics of student style	Prefer experimentation and active and collective work with learning data with the possibility of the practical application of results	Prefer courses directly related to the real world, studying facts and experimenting. Pay attention to the details, work well practically, and often solve problems by known methods; they are cautious and do not	Well-perceived and better-memorized images: drawings, diagrams, charts, graphs, etc.	Convergent thinking prevails. Achieve an understanding using the step-by-step study of the material when each new step logically follows from the previous

	Active	Sensing	Visual	Sequential
		like surprises and difficulties.		
A pedagogical approach to the organization of learning	Students need to take active action: discuss or apply data, and explain the material to others. It is difficult for them to listen to lectures without performing activities other than annotation. It is better to organize training in groups	Teaching material with specific examples of implementing theories and their practical application. Solving tasks with a particular order, implementation of procedures-actions. Work in the laboratory	Study better when the teaching material is presented both visually and verbally. Students better remember what they see	Students learn better through small, orderly, and logically related sequential steps to solve problems. It is necessary to teach the material in a logical order and to try to link each new topic with those studied earlier for a broad and holistic understanding.
Methods qualified for use	Practical Problem-search (brainstorming, project method) Modeling Creating game situations Study based on solving problems Expert Group Discussion	Verbal, visual Practical Problem-searching Modeling Experiment Method of questions and answers Study based on solving problems Exercise	Visible Practical Problem-Finding Modeling Experiment Games and simulations Independent work with training programs and simulators	Verbal, visual Problem-searching (work with reference books) Modeling Method of questions and answers Reproductive exercises
E-resources qualified for use	Static visualization, Program package, E-textbooks, Teaching programs, E-mail, search engines, Teaching database, Tests ready for use	Static visualization Program package, Virtual labs for laboratory work, E-textbooks, Teaching programs, E-mail, search engines, Teaching database, Tests ready for use	Static and dynamic visualizations, Virtual labs for laboratory work, Quantum chemical simulation of spectra, Teaching programs, Teaching database, Tests ready for use	Quantum chemical simulation of spectra, E-textbooks, Teaching programs, E-mail, search engines, Teaching database, Tests ready for use

2.12.5 Possible conflicts between teaching and learning styles

Imagine yourself in the place of a teacher who plans to work in a group with the profile of learning preferences defined in Paragraph 2.12.4.

Graphically combine the pictures of your profile and the average group profile. Compare the data obtained for the average scores of the student's learning preferences in the group.

Determine if there are significant (>3 units) differences in the profile of the imaginary teacher (your profile) and the profile of the group.

Describe possible "conflicts of learning and teaching styles" and ways to overcome them. Use the recommendations given in Section 2.10.

Appendix to Chapter 2

Teaching Philosophy

Education helps to discover and develop the potential of students. My classroom welcomes open-mindedness, embraces differences, and adheres to norms and laws. The primary teaching method for my class is to encourage students. In my personal experience, encouragement does bring out the best in people. I respect the needs of each student, and there is no double standard. Again, teaching is not about showing off how much you know. If students feel compelled to guess what is on the teacher's mind without examining their critical thinking, the teacher will fail.

Interest is a good teacher and a good friend. My primary goal is to get students excited about design studies, and I am a role model for passing on my enthusiasm for design research to my students. After class, students could see their interests very clearly. They believe in their ability to learn. The second goal is to teach students how to inspire passion. By the end of the course, students would think systematically. They can identify the root causes of specific design problems, think globally, and act locally.

There are three levels of teaching: guidance, demonstration, and training, depending on the level of education, disciplinary background, and social context of the students. Secondly, a technical course such as "Interior Lighting Design" may require training, while a conceptual course such as "Foreign Excellent Design Appreciation" needs to be primarily instructional. I would also like to develop a new course, "Digital Exhibition Design," which combines industrial design, interior design, and virtual reality technology.

A typical course involves lectures, discussion, and writing. After my lessons, I expect each student to ask one to five questions. In the end, the students are required to write a closing statement. Impromptu writing helps students think and also helps them with their term papers. Special sessions include role-playing case studies where students can take on the role of designers, entrepreneurs, developers, or residents and participate in design projects.

I focus on process assessment and class participation to assess students, and I emphasize post-class quizzes and class discussions more than final summaries. In addition, students' assignments and class participation give me regular feedback on the effectiveness of my teaching, enabling me to better reflect on and improve my teaching method.

CHAPTER 3. THEORIES OF PEDAGOGY AND LEARNING THEORIES

3.1 Philosophical foundation and significance of pedagogical theories

Pedagogical theories: these are theories that postulate how things should be thought, how teaching should be done, and/or how one can be brought to learn. Pedagogical theories are based both on the study of human psychology and philosophical ideas. Epistemology is a branch of philosophy that delves into the problems of acquiring knowledge. Two main traditions originate in the philosophy of Ancient Greece: nativism, presented in the philosophy of Plato, which is associated with the development of cognitive theories, and empiricism (Aristotle), which is related to behavioral approaches.

Some theories were based on the study of animal behavior, such as the theory of I. Pavlov and B.F. Skinner. Others from observation of child development, such as the theories of J. Piaget and L. Vygotsky. Newer ideas, such as experiential learning theory, synthesize various approaches. The latter theory considers the process of holistic adaptation as the key to the process of learning. The representatives of this branch appeal to Jung's concept of psychological types.

The educational philosophical approaches are currently used in classrooms the world over. They are Perennialism, Essentialism, Progressivism, and Reconstructionism, as illustrated in Table 3.1.

It is important to note that in addition to Western philosophical thought, an Eastern philosophical tradition influences the formation of pedagogical theories. Confucius expressed leading thoughts on education in his work "Analects."

> "What does this subdivision of Confucian educational philosophy ultimately show? Confucius put a strong emphasis on moral education, including proper conduct in daily life and honoring one's parents. Social harmony is paramount—people have relationship duties to others and are expected to show loyalty toward society, social class, and family. Others' needs supersede individual needs, and there is an obligation to treat others humanely. Since people are eminently teachable, they should always seek knowledge and study to become a better person and can learn self-control, virtue, and consistently ethical behavior through personal and communal efforts."[51]

The interpretation of Western philosophical approaches to pedagogy is based on Confucianism. For example, the ideas of Herbart, whose theory will be discussed below, turned out to be close. Herbart's ideas on the convergence of professional education with personal development resonate with the thoughts of Confucius. Vocational education and industrial requirements continued to be subordinate to character education.

> *Further Reading*: *Chen J. Confucius as a teacher: Philosophy of Confucius with special reference to its educational implications. Beijing, China: Foreign Languages Press. 1990.*

[51] *Corcoran Ch. Chinese learning styles: Blending Confucian and Western theories. Journal of Instructional Pedagogies. 2014. Vol.13. URL: https://eric.ed.gov/?id=EJ1060088*

The ideas of student-centered learning are supported because they are consistent with the Confucian focus on individual changes in the learning process.

Table 3.1

Key current educational philosophical approaches

Perennialism	Essentialism	Progressivism	Reconstructionism
A teacher-centered philosophy.	It shares several similarities with perennialism.	A student-centered philosophy.	It shares several similarities with progressivism.
Knowledge is enduring.	Knowledge is not fixed.	Enduring knowledge accumulated through the ages.	Favor multicultural education to construct a larger sense of identity and purpose.
The curriculum is aimed at learning time-tested information.	The curriculum should be socially oriented and focus on procedural subjects instead of content-centered ones.	The curriculum is subject-centered and not in favor of interdisciplinary studies.	The curriculum should include global social, economic, and political problems such as poverty, warfare, famine, and terrorism, develop the skills to solve these problems and be convicted of creating a new world order.
Education is highly structured and logical.	Education should be a part of life, not just a preparation for life	The students are expected to meet high academic standards and are assessed through various competency tests.	Focuses on student experience and taking social action on real problems.

When the individuals depict interest and enthusiasm in selecting the teaching profession, it is apparent and comprehensively understood that they need to be well-equipped in terms of the theories of pedagogy. The educators formulate their teaching methods in dealing with students and imparting adequate information regarding academic concepts and lesson plans. As one gains experience in teaching jobs, an instructor's style will emerge. In other words, they began to develop interest and motivation towards implementing job duties and generating desired outcomes. To achieve the desired goals and objectives, the instructors need to acquire an efficient understanding in terms of theories of pedagogy. The teaching style elements will remain with the instructors throughout their teaching careers. Therefore, the meaning and significance of the theories of pedagogy will be understood well when it will contribute efficiently to teaching styles.

Through acquiring education at all levels, the students are not only acquiring knowledge in terms of academic concepts, but they can also develop the skills and abilities necessary to promote better livelihood opportunities. The various types of skills, which the students create are, communication skills, presentation skills, analytical skills, problem-solving skills, decision-making skills, critical thinking skills, time management skills, personal skills, professional skills, and work

ethics. In primarily higher educational institutions, the academic programs are designed so that students can augment their understanding of work ethics. Work ethics must be practiced when individuals are engaged in employment settings, and the skills must be put into practice in individuals' personal and professional lives. Hence, they need to augment their knowledge and generate awareness regarding the meaning and significance of these skills. Therefore, it is well understood that the meaning and importance of the theories of pedagogy will be understood adequately when the pedagogical methods are developed so that they will significantly contribute to developing various types of skills among students.

3.2 The significance of learning theories

Pedagogical theories stem from learning theories. Learning theories serve as conceptual frameworks for teaching and learning. Learning theories devote to the following:

- conditions and processes through which learning occurs;
- ideas about the ways students learn and retain the information;
- models to develop instruction sessions that lead to better understanding;
- processes that people engage in as they make sense of information and how they integrate that information into their mental models so that it becomes new knowledge;
- factors that motivate people to learn, and what circumstances enable or hinder learning.

Understanding learning theories helps teachers explain the instructional choices or the "why" behind what and how to teach, and it helps to improve the teaching philosophy.

Here are a few ways of bringing the learning theories into the classroom or curriculum:

Theories of learning can provide clarity and direction by offering a set of principles or guidelines to build your teaching approach around.

The more theories of learning you are familiar with, the more strategies you will have to connect with diverse students from different backgrounds, learn at different paces, and face different academic challenges or obstacles.

Learning theories facilitate clear communication between teachers and students (including nonverbal communication like body language, as seen in the Behaviorism section) and parents, families, and school administrators.

As learning outcomes improve, students will also build confidence and self-esteem. There are the main theories of learning (Fig. 3.1).

3.3 Herbatianism

Johann Friederich Herbart (1776-1841) is regarded as the father of pedagogy as his works conceptualized pedagogy (Fig. 3.2).

According to Herbart, the teacher does not simply give the principle to the child; instead, his teaching aims to lead the child step by step to recognize the principle as his own and reflect on his direct experience. For Herbart, the teacher promotes reflection by promoting what he calls the child's "interest."
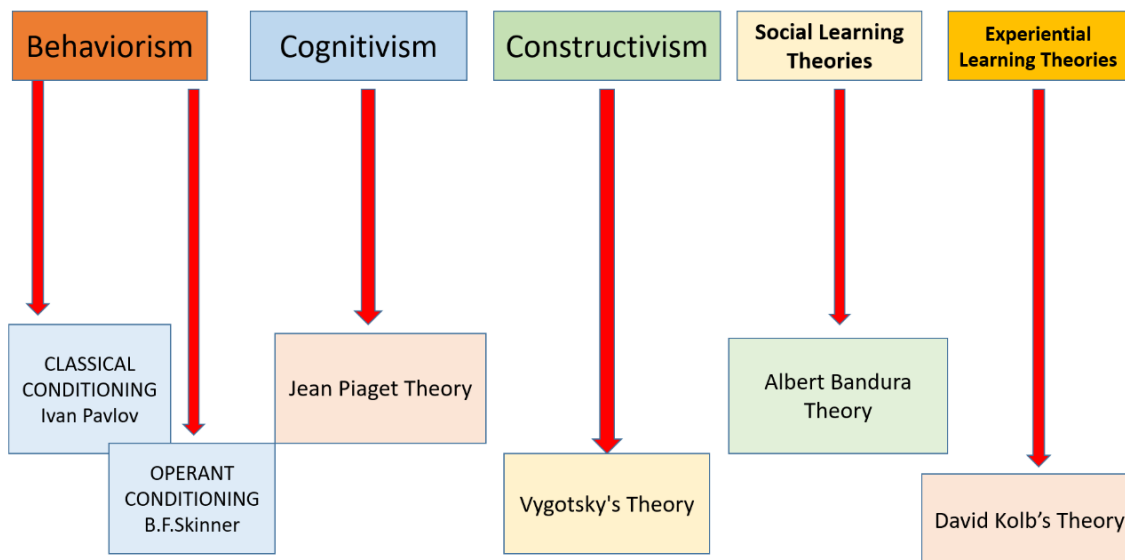
Figure 3.1 Main theories of learning

Equally important, however, is the pupil's constant, active participation in his surroundings to develop an empathic understanding of her fellow human beings.

In all these cases, a teacher must modify experience and human interaction to maximize knowledge yield. The teacher must not be narrowly committed to his scientific expertise but demonstrate an interest in the world and human beings.

Figure 3.2 Johann Friederich Herbart (1776-1841)

In his theory, he identified five components of pedagogy, as listed below:

Preparation involves getting ready for the instructional process.

Presentation refers to the actual teaching and learning process. In honing presentation skills, various factors need to be taken into consideration. These are: providing accurate information, speaking clearly and fluently, maintaining eye contact with the audience, using everyday language, answering questions put forward by the audience, having pleasant facial expressions, teaching the traits of morality and ethics, possessing technical skills, and maintaining the time frame.

Associating the process of bringing ideas or events together, e.g., in memory or imagination, it can also refer to a mental connection or relation between thoughts, feelings, ideas, and/or sensations.

Generalization refers to reasoning from detailed facts to general principles and also can be explained as the formulation of general concepts from specific instances.

Applications refer to putting into practice what was learned. Teachers should incorporate the above components in teaching and learning for effective pedagogy.

Herbart also highlighted the relationship between an individual's development and societal impact. His works led to Herbatianism, a movement associated with his views.

3.4 The new London group

The new London group (1996) refers to an international consortium of academics researching literacy pedagogies. The ten authors of this group met in 1994 to discuss the state of literacy pedagogy, the tension between immersion and explicit teaching models, and the challenge of cultural and linguistic diversity. They published the manifesto "A Pedagogy of Multiliteracies: Designing Social Futures." Multiliteracy is a term that refers to the connections between the changing social environment facing students and teachers and demanding a new approach to teaching.

Their research identified four significant pedagogy components (Table 3.2):

- Situated practice,
- Overt instruction,
- Critical framing,
- Transformed practice.

Table 3.2

Four major components of pedagogy

Situated Practice:	Immersion in experience and the utilization of available discourses, including those from the students' lifeworlds and simulations of the relationships to be found in workplaces and public spaces.
Overt Instruction:	Systematic, analytic, and conscious understanding. In the case of multiliteracies, this requires the introduction of explicit metalanguages, which describe and interpret the Design elements of different modes of meaning.
Critical Framing:	Interpreting the social and cultural context of particular Designs of meaning. This involves the students' standing back from what they are studying and viewing it critically in relation to its context.
Transformed Practice:	Transfer in meaning-making practice, which puts the transformed meaning to work in other contexts or cultural sites.

Didactic teaching methods convey results, products, or facts of inquiry to learners without engaging them in the processes through which they were achieved or even the impact they will have on their lives. The researchers observe that situation practice calls for modeling in classrooms of the contexts in which 'real-life' learning is achieved.

Situation practice takes learners through the processes that yield the desired knowledge. Basically, it involves activities, such as projects, and practical and social contexts of learning (learner interactions).

Overt instruction involves constructing knowledge from what learners already know and identifying learners' specific needs for further attention.

Critical framing. It is an aspect of pedagogy where learners stand back from what they have learned and view it critically about its context. Learners are guided through analyzing and questioning the ideologies and their relevance critically. In critical framing, emphasis is placed on critique.

Transformed practice is an authentic learning experience where students are both products and transmitters of learning, including student-teacher role reversals. Transformed practices enable learners to practice the learned knowledge and work in a new situation. It helps them develop an ability to act based on their understanding and apply the knowledge acquired to solve problems. With transformed practice, learners are provided opportunities to help apply the learned knowledge beyond the classroom setting. Generally, the four pedagogical aspects are neither hierarchical nor sequential but can be interdependent.

> *Further Reading: Cazden Courtney; Cope Bill; Fairclough Norman; Gee Jim A pedagogy of multiliteracies: Designing social futures. Harvard Educational Review; Spring 1996; 66, 1.*

D.R. Collier and J. Rowsell[52] analyze the theory after 20 years, how it developed, and whether it influenced pedagogical thought. They state that many models of multiliteracies teaching certainly exist. Two major themes emerged from their well-cited article:

1) the centrality of multimedia and popular culture;
2) the importance of online relationships to young people.

3.5 Behaviorist learning theories

Behaviorist pedagogy (behaviorism) looks at the observable actions of students and assesses whether they are learning as effectively as possible.

The central belief of a behaviorist is that students learn through reinforcement - constant feedback that tells them whether what they are doing is right or wrong. It comes in test scores, homework marks, and more.

Behaviorism was found in the second half of the XIXth century. From this perspective, three assumptions are essential:

- The focus is on observable behavior rather than on internal cognitive processes.
- The environment is the modifier of behavior and learning, not individual characteristics.
- Principles of contiguity and reinforcement are central to the learning process.

The theories focus on learning as an aspect of conditioning, emphasizing behavior modification.

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[52] *D. R. Collier, J. Rowsell A Room with a View: Revisiting the Multiliteracies Manifesto, Twenty Years On. In: Fremdsprachen Lehren und Lernen. 2014. Vol. 43. Issue 2. P. 12–28.*

Ivan Pavlov (1849-1936) proposed **classical conditioning**. It explains behavior as a reflex action/response to an antecedent stimulus. In simple terms, two stimuli are connected together to produce a new learned response in a person or animal. Later it was proposed that the process of classical conditioning was able to explain all the aspects of human psychology. Everything from speech to emotional responses was the patterns of stimulus and response.

In his experiment, Pavlov kept a dog hungry for a few days. Then he tied him to the experimental table, which was fitted with certain mechanical as far as it was possible to do so (Fig. 3.3). The observer himself remained hidden from the dog but was able to view the experiment using a set of mirrors. The arrangement was made to give food to the dog through an automatic mechanism.

Figure 3.3 Pavlov's conditioning experiment

He also arranged for a bell to ring whenever food was presented to the dog. When the food was put before the dog, and the bell was rung, automatic secretion of saliva occurred from the dog's mouth. The activity of presenting the food accompanied by the bell ringing was repeated several times, and the amount of saliva secreted was measured.

After several trials, the dog was given no food, but the bell was rung. In this case, the saliva secreted was also recorded and measured. It was found that even in the absence of food (the natural stimulus), the ringing of the bell (an artificial stimulus) caused the dog to secrete saliva (the natural response).

Implications of classical conditioning:
1. In daily life, fear, love, and hatred towards an object, phenomenon, or event are created through conditioning.
2. Most learning is associated with conditioning, i.e., stimulus-response association and substitution.
3. The phenomenon of stimulus generalization and discrimination goes on throughout our lives.
4. Abnormality in one's behavior may greatly be the result of conditioning.
5. Our behavior in the shape of interests, attitudes, habits, sense of application or criticism, mood, and temperaments is fashioned through conditioning.
6. Conditioning helps in learning what is desirable and also unlearning what is undesirable.

Operant conditioning is where a consequence of behavior follows antecedent stimulus through reinforcement or punishment. Burrhus Fredric

Skinner (1904-1990), an American psychologist and Behaviorist, proposed operant conditioning (Fig. 3.4).

This approach considers the causes of an action and its consequences; he referred to it as operant conditioning. Operant conditioning deals with intentional acts that affect the surrounding environment.
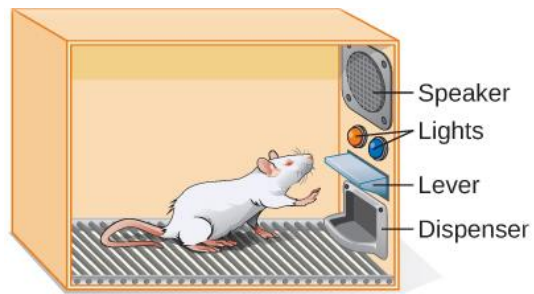

Figure 3.4 B.F. Skinner (1904-1990) and illustration of his experiments with operand conditions

In his works, Skinner concluded that reinforced behavior tends to be repeated/strengthened and vice versa, i.e., behavior not supported tends to diminish/die out.

He identified the responses that can follow behavior. Skinner placed a hungry rat in the box. In this experiment, the rat's pressure on the bar in a certain way could produce a click and a food pellet's emergence. The click sound signaled to the rat that if it responded by going to the food cup, it would be rewarded. After the lever-pressing response had been rewarded, the rat repeated it and was again rewarded, which further increased the probability of repeating the lever-pressing response, so it continued. In this way, ultimately, the rat learned to press the lever as desired by the experimenter.

With the help of such experiments, Skinner put forward his theory of operant conditioning for learning simple responses like pressing the lever and the most challenging and complex series of reactions.

> "Operant conditioning shapes behavior as a sculptor shapes a lump of clay <…> an operant is not something that appears fully grown in the behavior of the organism. It is a result of a continuous shaping process."[53]

Responses that can follow behavior:
- Neutral operant: these are responses from the environment that neither increase nor decrease the probability of a behavior being repeated. ·
- Reinforces: these are responses from the environment that increase the probability of repeated behavior. Reinforcers can be either positive or negative (Fig. 3.5).
- Positive reinforcement strengthens a behavior by giving rewarding consequences to an individual. The learner will be more likely to repeat this behavior in the future, reinforcing the behavior of scoring more than seventy percent in-class assignments.
- Negative reinforcement refers to removing an unpleasant behavior to strengthen a given behavior.

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[53] *Skinner B.F. Science and human behavior. New York. The Free Press, 1965. P. 91.*

- Punisher: these are environmental responses that decrease the likelihood of a behavior being repeated and weaken (eliminate) a given behavior. Generally, a punisher acts the opposite of reinforcement.

In conventional learning, operant conditioning applies primarily to class and student management issues rather than learning content, and it is very relevant to shaping skill performance. A simple way to shape behavior is to provide feedback on learner performance (compliments, approval, encouragement, and affirmation).

Positive reinforcement introduced to increase a behavior

Negative reinforcement introduced to decrease a behavior

Figure 3.5 Illustrations of positive and negative reinforcement under operant conditioning

The implications of the theory of operant conditioning:

- The learning or training process and environment must be designed to create the minimum frustration and the maximum satisfaction in a learner to provide him with the proper reinforcement for the desired training or learning.
- The theory of operant conditioning does not attribute motivation to internal processes within the organism, and it takes for granted the consequences of that behavior.
- Operant conditioning emphasizes the importance of schedule in the behavior reinforcement process. In trying to impart or teach a particular behavior, therefore, great care should be taken for the proper planning of the schedule of reinforcement.
- The theory advocated avoiding punishment for unlearning undesirable behavior and shaping desirable behavior. Punishment proves ineffective in the long run. Operant conditioning experiments suggested an appropriate alternative to punishment, in the form of rewarding appropriate behavior and ignoring inappropriate behavior, for its gradual extinction.

For behaviorists, instruction aims to elicit the desired response from the learner presented with a target stimulus. To accomplish this, the learner must know how and under which conditions to respond appropriately. Therefore, instruction is structured around presenting the target stimulus and providing opportunities for learners to practice responding properly. Instruction frequently uses cues (to prompt the delivery of the response initially) and reinforcement (to strengthen correct answers in the presence of the target stimulus) to facilitate linking stimulus-response pairs.

It is how the application of this theory in practice looks like this:

- The teacher leads the class through a topic.
- Students listen silently.
- The teacher then sets a task based on the information.
- Students complete the task and await feedback.

- The teacher gives feedback, then puts on the next task.
- With each round of feedback, the student is conditioned to learn the material.

The critics of behaviorism argue that just because a student is engaged and working does not mean they are learning because the learning process is much more internalized.

3.6 Cognitivism

Cognitive psychology is the theoretical perspective that focuses on how people perceive, remember, think, speak, and solve problems. These theories differ from behaviorist ones by acknowledging the existence of internal mental states, such as belief, desire, and motivation. These theories focus on the complexities of human memory as influencing learning. Thus, instructional strategies should foster learner retention. The ideas also emphasize the importance of prior knowledge as significantly impacting teaching and learning. Therefore, instruction should be done sequentially, incorporating teaching from known to unknown, simple to complex, and/or concrete to abstract.

Cognitive learning is an active style of learning that focuses on helping you learn how to maximize your brain's potential. It makes connecting new information with existing ideas easier, deepening your memory and retention capacity.

Jean Piaget (1896–1980) was a Swiss psychologist (Fig. 3.6). He researched children's development and developed Jean Piaget's theory of cognitive development. In theory, he describes a child's development as a sequence of learning beyond simple rote learning. He regarded the child as a philosopher who perceives the world only as he has experienced it. Therefore, most of Piaget's cognitive and intellectual development inspiration came from children's observations.

Figure 3.6 Piaget's three-step process in the formation of a schema
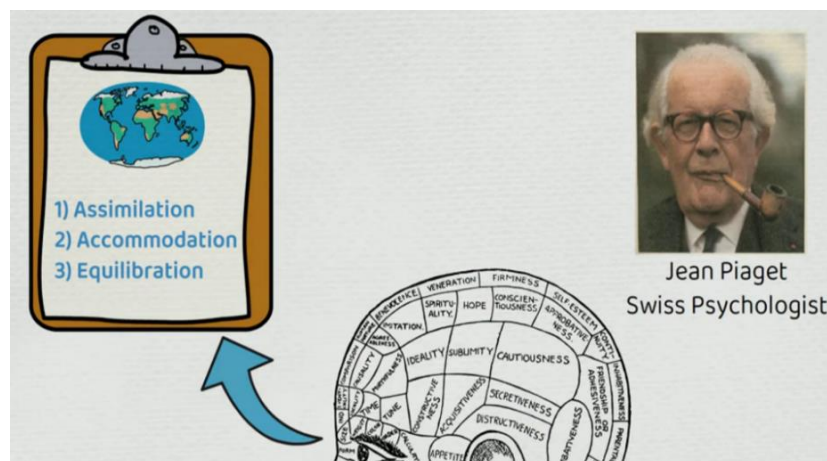
The theory of cognitive development focuses on mental processes such as perceiving, remembering, believing, and reasoning. Piaget disagreed with the behaviorist theorist who focused strictly on observable behavior and concentrated more on what goes on inside the learners' heads instead of how they reacted.

Reasoning is the essence of intelligence, and reasoning is what Piaget studied to discover – how we come to know. Piaget believed that cognitive development is cumulative; understanding a new experience grows from a previous learning experience.

Piaget sought to break knowledge into a single, basic unit to make a consistent psychological theory. From there, he could develop a theory of

cognitive learning that could apply just as much to a baby's first step to deep philosophical concepts they might develop later in life.

Piaget called this basic unit **schema** – a cohesive, repeatable action sequence possessing component actions interconnected tightly and governed by a core meaning.

Piaget outlines a three-step process for forming a schema (Fig. 3.6). These steps are as follows.

1. Assimilation is the cognitive process of associating new information with what is already known.

2. Accommodation – refers to modifying the existing schemas caused by the new information. According to Piaget, a learner constructs knowledge when he or she encounters input from the environment -- the learner's schemes or mental structures incorporate the new experiences (assimilation). If and when newly assimilated information conflicts with previously formed mental structures, the result is called disequilibrium (or 'cognitive conflict'). This state (disequilibrium) motivates the learner to seek equilibrium. Regaining equilibrium or cognitive harmony results in what Piaget called accommodation, which develops new mental structures. Furthermore, assimilation and accommodation represent the learner's adaptation to the environmental input.

3. Equilibration is an active and dynamic process of moving between cognitive disequilibrium and equilibrium states. It is as we assimilate new experiences and accommodate schemes. In the cycle of adaptation and equilibration, a new experience is first assimilated into an existing scheme. If it does not fit properly, cognitive disequilibrium results. Accommodating (adjusting) the scheme brings the child to cognitive equilibrium until a new assimilation rechallenges the scheme.

> "Assimilation theoretically does not result in a change of schemata, but it does affect the growth of schemata and is thus a part of development. One might compare a schema to a balloon and assimilation to putting more air in the balloon. The balloon gets larger (assimilation growth) but does not change its shape. Assimilation is a part of the process by which the individual cognitively adapts to and organizes the environment."[54]

> *Learning* can only occur when we find ourselves in a state of _disequilibrium_ - a state of "imbalance" and "not knowing."
> *Learning* is the process of resolving that *disequilibrium* and achieving _equilibrium_ - a state of "balance" and "knowing."[55]

Theories in General to Pedagogy Jean Piaget's theory directly impact classroom instruction and pedagogical strategies. As explained below: ·

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[54] *Aloqaili, A. S. The relationship between reading comprehension and critical thinking: A theoretical study. Journal of King Saud University-Languages and Translation, 2012. 24(1), 35-41.*

[55] *Ginsburg, H. P., & Opper, S. (1988). Piaget's theory of intellectual development (3rd ed.). Prentice-Hall, Inc.*

- Age consideration; this call for teachers to provide appropriate learning activities depending on the learner's developmental level.
- Individual differences; due to nature and nurture, children exhibit differences; teachers should therefore attend to learners individually from time to time, avoid making comparisons and allow learners to progress at an appropriate pace for them.
- Appropriate materials should also be provided for learners with special needs.
- Assimilation is the process of fitting new information into the existing way of thinking (mental schemes) in the learners' minds. Teaching should be built from prior knowledge to achieve this goal.
- Learning by doing, productive learning occurs when learners are engaged in activity-based instruction.
- Active receptors of stimulus; learners are active receptors of stimulus. As such, knowledge acquisition and construction should be fully involved. Teachers should employ teaching methods that are applied to learners.

Cognitive theories emphasize making knowledge meaningful and helping learners organize and relate new information to existing knowledge in memory. Instruction must be based on a student's existing mental structures, or schema, to be effective, and it should organize information so learners can meaningfully connect new information with existing knowledge. Analogies and metaphors are examples of this type of cognitive strategy. For example, instructional design textbooks frequently draw an analogy between the familiar architect's profession and the unfamiliar instructional design profession to help the novice learner conceptualize, organize and retain the major duties and functions of an instructional designer. Other cognitive strategies may include framing, outlining, mnemonics, concept mapping, advance organizers, etc.

The various benefits of cognitive learning theories have been stated as follows:

Enhances learning. Learning takes place throughout the lives of individuals. They need to learn various concepts and aspects necessary to enrich their lives. Enhancing learning is regarded as one of the fundamental aspects. The individuals have multiple goals and objectives to achieve. They can enrich their lives when they enhance their learning in ways needed to achieve goals and objectives. Cognitive learning theories render an essential contribution to improving learning. The individuals can build upon previous ideas and apply new concepts to existing knowledge. In particular, learning of adults, when they come to the classroom, they are sometimes familiar with the topics. They make use of previous knowledge to acquire an efficient understanding of the concepts and factors. Therefore, when individuals use prior knowledge to enhance learning, they can benefit to a significant extent.

Boosts confidence. The individuals need to learn to overcome apprehensiveness and vulnerability and boost their confidence. The up-gradation of confidence levels enables individuals to concentrate on their tasks and activities and generate the desired outcomes. Hence, individuals need to research to boost

their confidence. When the learners can understand the concepts in a well-organized manner, they feel confident and can provide solutions to various types of problems. One of the important ways of boosting confidence in the case of learning is to instill the traits of diligence and resourcefulness. Individuals who inculcate and practice these traits can augment their learning and generate the desired outcomes. Therefore, it is well-understood that boosting confidence is a crucial benefit of cognitive learning theories.

Enhances comprehension. Cognitive learning theories effectively upgrade the learners' comprehension by acquiring new information. When comprehension is enhanced, one of the essential benefits is, the learners will be able to develop a deeper understanding of new materials. Over time, it is of utmost significance to bring about changes, and when the changes are comprehended well, the individuals will be able to understand the concepts better. In the present existence, modern, scientific, technical, and innovative methods are utilized in the teaching and learning processes. Hence, by enhancing comprehension, individuals can put these methods into practice effectively and overcome all types of problems and challenges. Therefore, enhancing comprehension is a benefit that is acknowledged in cognitive learning theories.

Improves problem-solving skills. Problems and challenges do take place in the lives of individuals, personally as well as professionally. Hence, individuals need to be well-equipped in terms of ways of bringing about improvements in problem-solving skills. Through cognitive learning theories, individuals can acquire the meaning and significance of problem-solving skills and ways to improve them. The main benefit of cognitive learning is providing knowledge and understanding among individuals by using effective and meaningful methods and approaches to solve problems. When individuals are experiencing setbacks in learning, they need to work diligently and augment their knowledge and understanding. Therefore, improving problem-solving skills is a benefit regarded as worthwhile in cognitive learning theories.

Helps in learning things at a rapid pace. When the concepts are difficult to understand, it is apparent that individuals will take time to understand things. But through cognitive learning theories, individuals can learn things rapidly. Through the experience of learning, the individuals will be able to recycle and use learning methods that they have utilized in the past. It will contribute efficiently to helping them to learn new things at a rapid pace. The students in higher educational institutions know the learning methods that would be beneficial and meaningful to them in achieving academic goals. Students feel contented and pleasurable when they can understand the concepts at a rapid pace. Furthermore, they need to know how to use their learning in their personal and professional lives. Therefore, the benefit of helping to learn things rapidly is comprehensively acknowledged.

Teaches to form concept formation. Cognitive learning can teach individuals various concepts, i.e., easily perceiving and interpreting information that would enhance creativity and lead to innovations. When the members of educational institutions can use modern and innovative methods in the teaching-

learning processes, in implementing other tasks and activities, and in upgrading the overall education system, they can perform well in their job duties. Still, they can also think logically and rationally. Generating information in terms of concept formation will be an important contribution to using cognitive learning theories effectively. Therefore, it is well understood teaches to form concept formation is a vital benefit of cognitive learning theories.

Some students advance quickly, and some need more time on certain subjects. When educators consider their students' existing knowledge, they can better support each student's learning process. As a learning theory, cognitivism has many applications in the classroom. In each application, the main principle is incorporating student experiences, perspectives, and knowledge.

For example, a teacher might:
1. Ask students about their experience with the lesson.
2. Emphasize the connection between past ideas and new ones.
3. Incorporate group discussions into the curriculum.
4. Invite a variety of opinions about a given subject.

This approach can not only help students in learning, but it can also help them feel respected and listened to. That can make class exciting and encourage a passion for learning that continues throughout students' lives.

> *Further Reading*: *Perry, T., Lea, R., Jørgensen, C. R., Cordingley, P., Shapiro, K., & Youdell, D. Cognitive Science in the Classroom. London: Education Endowment Foundation. 2021. URL: https://educationendowmentfoundation.org.uk/evidence-summaries/evidencereviews/cognitive -science-approaches-in-the-classroom/*

3.7 Constructivism

Constructivism is a theory that equates learning with creating meaning from experience. Both constructivism and cognitivism conceive of learning as a mental activity. Constructivism is considered a branch of cognitivism. Nevertheless, constructivism distinguishes it from traditional cognitive theories. Most cognitive psychologists think of the mind as a reference tool to the real world; constructivists believe that the mind filters input from the world to produce its unique reality. Constructivists do not share with cognitivists and behaviorists the belief that knowledge is mind-independent and can be "mapped" onto a learner. Constructivists do not deny the existence of the real world but contend that what we know of the world stems from our interpretations of our experiences. Learners do not transfer knowledge from the external world into their memories, and they build personal interpretations of the world based on individual experiences and interactions.

From its perspective, these assumptions are essential:
- Behavior is situationally determined.
- The internal representation of knowledge is constantly open to change; there is no objective reality that learners strive to know.

- Knowledge emerges in contexts within which it is relevant. Therefore, the actual experience must be examined to understand the learning that has taken place within an individual.
- The situations actually co-produce knowledge (along with cognition) through activity. Every action is "an interpretation of the current situation based on an entire history of previous interactions."
- The focus of instruction shifts from teaching to learning, from the passive transfer of facts and routines to the active application of ideas to problems.

A major contributor to the field of constructivism is Lev Vygotsky (1896 – 1934). According to Vygotsky's social constructivism theory, cognitive abilities are gained through social guidance and construction.

He defined the "zone of proximal learning" (Fig. 3.7), according to which students solve problems beyond their actual developmental level (but within their level of potential development) under adult guidance or in collaboration with more capable peers.
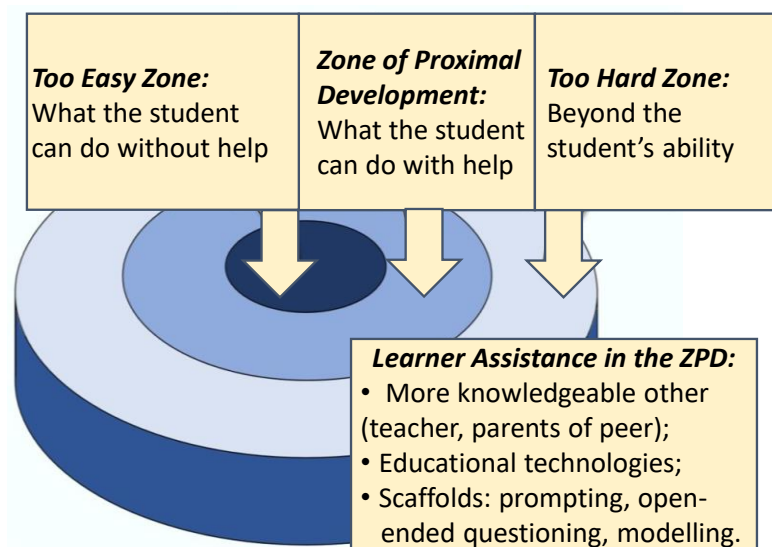
Too Easy Zone: What the student can do without help

Zone of Proximal Development: What the student can do with help

Too Hard Zone: Beyond the student's ability

Learner Assistance in the ZPD:
- More knowledgeable other (teacher, parents of peer);
- Educational technologies;
- Scaffolds: prompting, open-ended questioning, modelling.

Figure 3.7 Vygotsky's zone of proximal

"This difference between twelve and eight, or between nine and eight, is what we call the zone of proximal development. It is the distance between the actual developmental level as determined by independent problem-solving and the level of potential development as determined through problem-solving under adult guidance or in collaboration with more capable peers <…> The zone of proximal development furnishes psychologists and educators with a tool through which the internal course of development can be understood. By using this method, we can take account of not only the cycles and maturation processes that have already been completed but also those processes that are currently in a state of formation that are just beginning to mature and develop. Thus, the zone of proximal development permits us to delineate the child's immediate future and his dynamic developmental state, allowing not only for what already has been achieved developmentally but also for what is in the course of maturing."[56]

Vygotsky described human mental abilities in the following way.
- "lower mental functions" (vision, hearing, taste), which are controlled by external objects and events,

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[56] *Vygotsky L.S. Mind in Society: The development of higher psychological processes.1978. Cole, M. and others, eds. Cambridge, Mass.: MIT Press. P. 86 – 87.*

- "higher mental functions" (logical and abstract thinking and language) that operate internally and are used to control lower mental functions,
  The main of Vygotsky's ideas are:
- adults in society foster children's cognitive development by engaging them in challenging and meaningful activities. Adults convey to children the way their culture interprets and responds to the world,
- the interactions with others significantly increase not only the quantity of information and the number of skills a child develops but also affect the development of higher-order mental functions such as formal reasoning,
- higher mental abilities could only develop through interaction with more advanced others,
- children are born with elementary mental abilities such as memory and perception; higher mental functions develop through social interactions.

The true direction of the development of thinking is not from the individual to the social. Indeed, it is from the social to the individual. Vygotsky introduced the concept of **internalization** to emphasize human development's sociocultural nature (Fig. 3.8).

According to Vygotsky, the mental function does not simply move from the 'social' plane into the individual's head. It transforms through the individual's growing familiarity with other people's roles in the distributed action (e.g., according to Vygotsky, internal private speech by the child is an abbreviation of external speech directed to others).

It also transforms through a change in mediation (e.g., initially stretching out the hand-mediated command to another to give a remote object, then stretching out the hand-mediated command to the child to pay attention to a remote object or event).
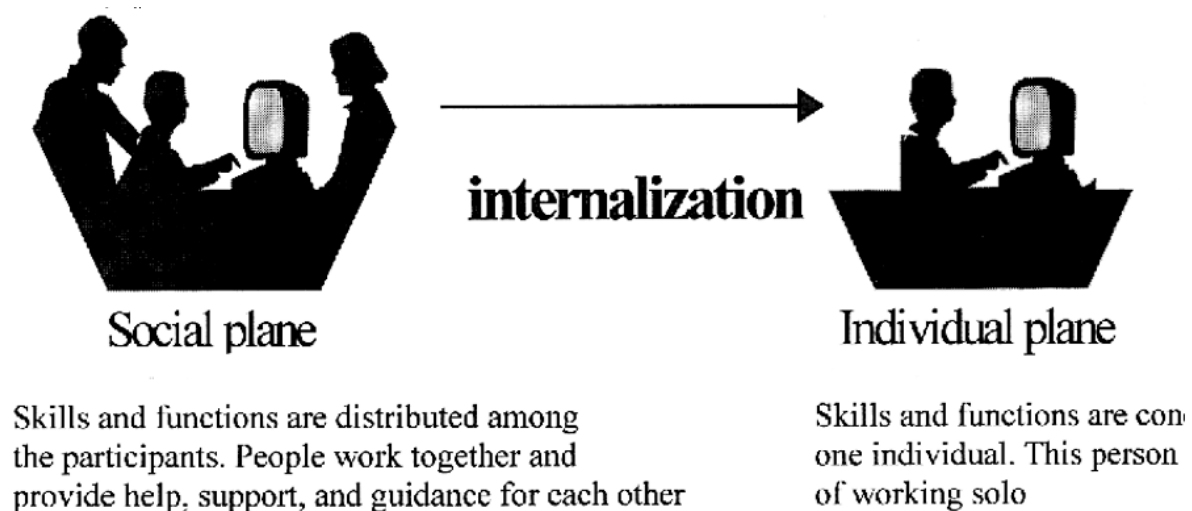

Figure 3.8 Vygotsky's concept of internalization

"<...> the process of internalization consists of a series of transformations: An operation that initially represents an external activity is reconstructed and begins to occur internally. Of particular importance to the development of higher mental processes is the transformation of sign-using activity, the history and characteristics of which are illustrated by the development of practical intelligence <...> An interpersonal process is transformed into an intrapersonal one. Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological), and then inside the child (intrapsychological) <...> All the higher functions originate as actual relations between human individuals <...> The internalization of socially rooted and historically developed activities is the distinctive feature of human psychology <...> As yet, the barest outline of this process is known."[57]

Vygotsky agreed with Piaget that the development of cognitive abilities takes place in stages, and he also agreed broadly with the description of the stages; however, he viewed cognitive development as a social process where children learn from experienced adults. Key differences between Vygotsky's and Piaget's theories are illustrated in Table 3.3.

Table 3.3

Vygotsky vs. Piaget

	Piaget	Vygotsky
Sociocultural context	Little emphasis	Strong emphasis
Constructivism	Cognitive constructivist	Social constructivist
Stages	Strong emphasis on stages of development	No general stages of development proposed
Key processes in development & learning	Equilibration; schema; adaptation; assimilation; accommodation	Zone of proximal development; scaffolding; language/dialogue; tools of the culture
Role of language	Minimal – Language provides labels for children's experiences (egocentric speech)	Major – Language plays a powerful role in shaping thought
Teaching implications	Support children to explore their world and discover knowledge	Establish opportunities for children to learn with the teacher and more skilled peers

While Piaget was interested in describing what was universal in children's cognitive development, Vygotsky was interested in differences and how those differences arose from the social, cultural, and historical context in which children grow. Like Piaget, Vygotsky believes young children are curious and actively involved in learning, discovering, and developing new understandings/schemas. However, Vygotsky emphasized social contributions to the development process, whereas Piaget emphasized self-initiated discovery.

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[57] *Vygotsky L.S. Mind in Society: The development of higher psychological processes.1978. Cole M. and others, eds. Cambridge, Mass.: MIT Press. P. 57.*

There is much emphasis on social interaction and culture. Still, many other aspects of development are neglected, such as the importance of emotional factors, e.g., the joys of success and the disappointments and frustration of failure, these act as motivation for learning.

Due to the nature of constructivism,

- the instructor must adopt a more hands-on approach instead of the traditional lecture style,
- the environment of the classroom should be supportive of each learner's thinking and encourage a constant challenge,
- the learning occurs in small groups,
- knowledge is shared between both the students and the instructor.

Currently, however, constructivism is considered the dominant educational theory; it has been embraced by nearly every educational reform initiative within the last two decades. Most teaching methods developed in recent years are based on various constructivist theories, such as *social constructivism, situated learning, and connectivism*. For example, they are problem-based learning, authentic instruction, and computer-supported collaborative learning.

3.8 Social learning theory

Social learning theory explains behaviors through the continuous reciprocal interaction between cognitive, behavioral, and environmental influences. In this theory, two aspects must be emphasized: mediating processes between stimuli and responses and learning behavior from the environment through observational learning. The individuals that are observed are called models. The children observe and learn from the behaviors of the individuals around them. The term identification has been used by social learning theory.

There are three core concepts of social learning theory.

- The idea is that people can learn through observation.
- The notion is that internal mental states are essential to this process.
- This theory recognizes that just because something has been learned does not mean it will result in a behavior change.

Albert Bandura (1925–2021) put forth the brilliant concept of reciprocal determinism (Fig. 3.9). He describes how a person's behavior is influenced by and influences his/her personal factors and the environment.

In his writings, Bandura challenges early behavioristic thinking that took a simplistic view of the human mind and experience. According to this view, it was thought that humans function like input-output systems, whereby external stimuli exert their effects, resulting in a specific unvarying response (like a machine that lights up whenever a particular button is pressed).

Figure 3.9 Albert Bandura
(1925–2021)

Bandura's theory states that a person's behavior is influenced by the environment and vice versa. In simpler terms, it means that the environment tends to change the individual's behavior, and in return, the individual's behavior is also responsible for environmental changes. So, it means that not only does the environment influence the person's thinking, but the person's subsequent behavior also influences the environment. Thus, three main factors are dealt with in this theory, known as triadic reciprocal causation (Fig. 3.10).

Determinism is the theory that portrays that a person's actions, behavior, or decisions are just an outcome of the events that have happened in the past. It means that our actions are just reactions to what has already happened.

Figure 3.10 Bandura model of reciprocal determinism

The way we behave today is just a reaction to past events. He agreed with the theory of determinism that our behavior and actions are the causation of past events. Still, he was also of the opinion that the environment is also caused or affected by our behavior. Children observe the people around them behaving in various ways. It is illustrated during the famous Bobo Doll experiment (a controlled study investigating whether social behaviors can be acquired by observation and imitation.)

Bobo Doll experiment

The social learning of Albert Bandura emphasizes the importance of learning and modeling the behaviors, attitudes, and emotional reactions of others. Social learning theory explains behaviors through the continuous reciprocal interaction between cognitive, behavioral, and environmental influences. In this theory, two aspects must be emphasized: mediating processes between stimuli and responses and learning behavior from the environment through observational learning. The individuals that are observed are called models. The children observe and learn from the behaviors of the individuals around them. The term identification has been used by social learning theory.

Bandura explains the following steps usually involved in learning.

1. Attending and perceiving: observation of a role model catches a child's attention.

2. Remembering the behavior: the child remembers the actions and styles.

3. Converting the memory into action: the child imitates the role model. A behavior observed and remembered by the learner is analyzed in terms of its acceptability. It is transformed into action only afterward; thus, the learner imitates the observed, relevant and accepted aspect of the model's behavior.

4. Reinforcement of the imitated behavior: the child tries to change himself into the role of a model. The model's behavior imitated by the learner is reinforced for proper adoption and further continuance.

Reinforcement can be external or internal and can be positive or negative. If a child wants approval from parents or peers, this approval is an external reinforcement, but feeling happy about being approved of is an internal reinforcement. A child will behave in a way that it believes will earn approval because it desires approval.

Positive (or negative) reinforcement will have little impact if the external reinforcement does not match an individual's needs. Reinforcement can be positive or negative, but the important factor is that it will usually change a person's behavior.

The child will also consider what happens to other people when deciding whether or not to copy someone's actions. A person learns by observing the consequences of another person's (i.e., models) behavior, e.g., a younger sister observing an older sister being rewarded for a particular behavior is more likely to repeat such behavior herself. It is known as vicarious reinforcement.

> "In dealing with their environment, models usually exhibit coping strategies both by their actions and by voicing their self-guiding thoughts. Observers can thus acquire, from informative modeling, strategies for managing challenging or threatening situations. This contribution is especially important when personal inefficacy reflects skill deficits rather than misappraisals of the skills one already possesses. In addition, modeling displays convey information about the nature of environmental tasks and the difficulties they present. Modeled transactions may reveal the tasks to be more or less difficult and potential threats more or less manageable than observers originally believed. Adoption of serviceable strategies and altered perceptions of task difficulty will change observers' judgments of their personal efficacy."[58]

It relates to an attachment to specific models that possess qualities seen as rewarding. Children will have several models with whom they identify. These may be people in their immediate world, such as parents or older siblings, or they could be fantasy characters or people in the media. The motivation to identify with a particular model is that they have a quality that the individual would like to possess.

The concept of **self-efficacy** is central to Albert Bandura's social cognitive theory. Self-efficacy is a person's belief in their ability to complete a task or

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[58] *Bandura, A. (1992). Social Cognitive Theory of Social Referencing. Social Referencing and the Social Construction of Reality in Infancy, 175–208. P. 194.*

achieve a goal. It encompasses a person's confidence in themselves to control their behavior, influence their environment, and stay motivated to pursue their goal. People can have self-efficacy in different situations and domains, such as school, work, relationships, and other important areas.

> "Cognitive self-arousal obviously depends on the level of cognitive development. Cognitive functioning involves knowledge and cognitive skills for operating on it. The issue of theoretical interest is whether the cognitive prerequisites for vicarious arousal are best analyzed as global cognitive stages or as specialized cognitive competencies. Social cognitive theory explains the mechanisms of vicarious arousal in terms of specialized ideational, attentional, self-referential, and self-regulatory subskills. As already noted, the degree of social correlation of personal outcomes also figures prominently in the social cognitive theory of vicarious arousal."[59]

According to Bandura, self-efficacy is part of the self-system comprised of a person's attitudes, abilities, and cognitive skills. This system plays a significant role in perceiving and responding to different situations. Self-efficacy is an essential part of this self-system. Bandura also identified vicarious experiences obtained through peer modeling as another essential means of establishing and strengthening self-efficacy. Seeing others putting in effort and succeeding, as a result, can increase your belief in your ability to succeed.

Bandura identified four major sources of self-efficacy. The four ways that self-efficacy is achieved are mastery experiences, social modeling, social persuasion, and psychological responses:

- Mastery Experiences.
- Social Modeling.
- Social Persuasion.
- Psychological Responses.

> *Further Reading: Bandura, A. (1992). Social Cognitive Theory of Social Referencing. Social Referencing and the Social Construction of Reality in Infancy, pp. 194 – 202.*

The following steps are involved in the observational learning and modeling process:

- **Attention:** To learn, you need to be paying attention. Anything that distracts your attention is going to hurt observational learning. If the model is attractive or there is a novel aspect of the situation, you are far more likely to dedicate your full attention to learning.
- **Retention:** The ability to store information is also an important part of the learning process. Several factors can affect retention, but the ability to pull up information later and act on it is vital to observational learning.
- **Reproduction:** Once you have noticed the model and retained the information, it is time to perform your observed behavior. Further practice of the learned behavior leads to improvement and skill advancement.

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[59] *Bandura, A. (1992). Social Cognitive Theory of Social Referencing. Social Referencing and the Social Construction of Reality in Infancy, 175–208. P. 184.*

- **Motivation:** For observational learning to be successful, you have to be motivated to imitate the behavior that has been modeled. Reinforcement and punishment play an important role in motivation.

While experiencing these motivators can be highly effective, so can observing others experiencing some reinforcement or punishment. For example, if you see another student rewarded with extra credit for attending class on time, you might show up a few minutes early each day. Thanks to Bandura's work, psychologists now recognize that humans are the agents of their self-development, who can adapt and self-regulate to achieve their desired future.

3.9 Experiential learning theory

Experiential learning is a constructivist learning theory defined as 'learning by doing.' The learner actively participates in the educational process, and learning is achieved through a continuous cycle of inquiry, reflection, analysis, and synthesis. Experiential learning shifts the learning design from a teacher-centered to a semi-structured approach. In the first case, the teaching is mainly transmissive, and the students may remain unmotivated and disengaged. A semi-structured approach requires students to cooperate and learn from one another through direct experiences tied to real-world problems.

Y.A. Kolb and A.D. Kolb are the authoritative developers of this theory. The thorough work "The Experiential Educator Principles and Practices of Experiential Learning" (2017) comprehensively considers the origins, principles, perspectives, and differences between experimental learning and traditional approaches in education—emphasizing the learning process instead of the behavioral outcomes.

> "Learning is the process whereby knowledge is created through the transformation of experience. This definition emphasizes several critical aspects of the learning as viewed from the experiential perspective. First is the emphasis on the process of adaptation and learning as opposed to content or outcomes. Second is that knowledge is a transformation process, being continuously created and recreated, not an independent entity to be acquired or transmitted. Third, learning transforms experience in both objective and subjective forms. Finally, to understand learning, we must understand the nature of knowledge, and vice versa."[60]

The theory of experiential learning rests on a different philosophical base. Experiential learning is actually a philosophy of education based on what Dewey (1938) called a 'theory of experience.' He argued that while traditional education had little need for theory since the practice was determined by tradition, the new experiential approach to the education needed a sound theory of experience to guide its conduct. Since their emergence in the early 1970s, the principles and practices of experiential learning have been used to create curricula and conduct educational courses and programs. Many nontraditional educational innovations that have flowered during this period, such as college programs for adult learners

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[60] *Kolb D.A. Experiential learning: experience as the source of learning and development Englewood Cliffs, NJ Prentice Hall 1984. P. 38.*

and prior learning assessments, have used experiential learning as their educational platform. Experiential, learner-centered education has gained widespread acceptance in the twenty-first century.

The concept of experiential education draws together the work of several notable 20th-century scholars who were valued for their theories of human learning and development. The Association for Experiential Education has summarized the key findings of their work into a set of key experiential learning principles:

- Experiential learning occurs when carefully chosen experiences are supported by reflection, critical analysis, and synthesis.
- Experiences are structured to require the student to take the initiative, make decisions and be accountable for results.
- Throughout the experiential learning process, the student is actively posing questions, investigating, experimenting, curious, solving problems, assuming responsibility, being creative, and constructing meaning.
- Students are engaged intellectually, emotionally, socially, soulfully, and/or physically. This involvement produces a perception that the learning task is authentic.
- The learning results are personal and form the basis for future experience and learning o Relationships are developed and nurtured: student to self, student to others, and student to the world at large.
- The instructor and student may experience success, failure, adventure, risk-taking, and uncertainty because the experience's outcomes cannot be predicted.
- Opportunities are nurtured for students and instructors to explore and examine their values.
- The teacher's primary roles include setting suitable experiences, posing problems, setting boundaries, supporting students, ensuring physical and emotional safety, and facilitating learning.
- The teacher recognizes and encourages spontaneous learning opportunities.
- Teachers strive to be aware of their biases, judgments, and preconceptions and how these influence students.
- The learning experience design allows learning from natural consequences, mistakes, and successes.

Experiential education has gained recent momentum in the higher education sector. Driving this shift is the recognition by universities that the purpose of 21st-century education has evolved to include the generation of student competence in self-directed learning, citizenship, eco-sustainability, and employability, in addition to traditional knowledge, skills, and attitudes within particular disciplines.

> **Further Reading**: Deakin Crick, R., Goldspink, C., & Foster, M. Telling Identities: Learning as Script or Design? Learning Emergency Discussion Paper (June, 2013). URL: http://learningemergence.net/events/lasi-dla-wkshp

One of the main concepts of this theory is the experiential learning cycle – a four-step learning process that is applied multiple times in every interaction and experience: Experience – Reflect – Think – Act. It is a learning process initiated by a concrete experience, demanding reflection, review, and perspective-taking about the experience. Then it includes abstract thinking to reach conclusions and conceptualize the meaning of the experience, leading to a decision to act, engaging in active experimentation, or trying out what you have learned.

Experiential Learning Theory

One of the main concepts of this theory is the experiential learning cycle – a four-step learning process that is applied multiple times in every interaction and experience: Experience – Reflect – Think – Act. It is a learning process initiated by a concrete experience, demanding reflection, review, and perspective-taking about the experience. Then it includes abstract thinking to reach conclusions and conceptualize the meaning of the experience, leading to a decision to act, engaging in active experimentation, or trying out what you have learned.

The model of the experiential learning cycle shows the process and sequence of experiential learning with its concepts (experiencing, reflecting, thinking, and acting upon an experience.) and constructs. After having a "real" experience, learners can reflect on the experience and then move to the next stage, thinking of possible ways to accommodate the experience. After having the chance to reflect and think, learners can transfer their thoughts into actions that result in constructing learning and/or creating new experiences, leading them to go through the process again and proposition. Any experience may be transformed into a reliable source of knowledge. To make an experience a more meaningful and reliable source of knowledge, learners should go through the four-stage process (i.e., experiencing, reflecting, thinking, and acting) (Fig. 3.11).

"The primal parental educator role, with its emphasis on learning through shared direct experience, has particular relevance for the experiential educator. For educators, the magic of experiential learning lies in the unique relationship that is created between teacher, learner, and the subject matter under study. Traditional approaches to education have relied on an information-transmission model of learning where knowledge about the subject communicated, often by lecture, through the teacher's discourse about the subject …. The experiential approach places the subject to be learned in the center, to be experienced by both the educator and learner. This has a leveling effect on their relationship to the extent that both can directly experience the subject. Everyone has a perspective on the subject."[61]

Experiential learning opportunities require students to have a personal role in the direction of their learning through active participation.

1. Students will be involved in problems that are practical, social, and personal.

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[61] *Kolb Y.A., Kolb A.D. The Experiential Educator Principles and Practices of Experiential Learning. Experience Based Learning Systems. 2017. p. XXV.*

2. Students will be allowed freedom in the classroom as long as they make headway in the learning process.

3. Students often must be involved with complex and challenging situations while discovering.

4. Students will self-evaluate their progression or success in the learning process, which becomes the primary means of assessment.

5. Students will learn from the learning process and become open to change. This change includes less reliance on the instructor and more on fellow peers, developing skills to investigate (research) and learn from an authentic experience, and objectively self-evaluating one's performance.
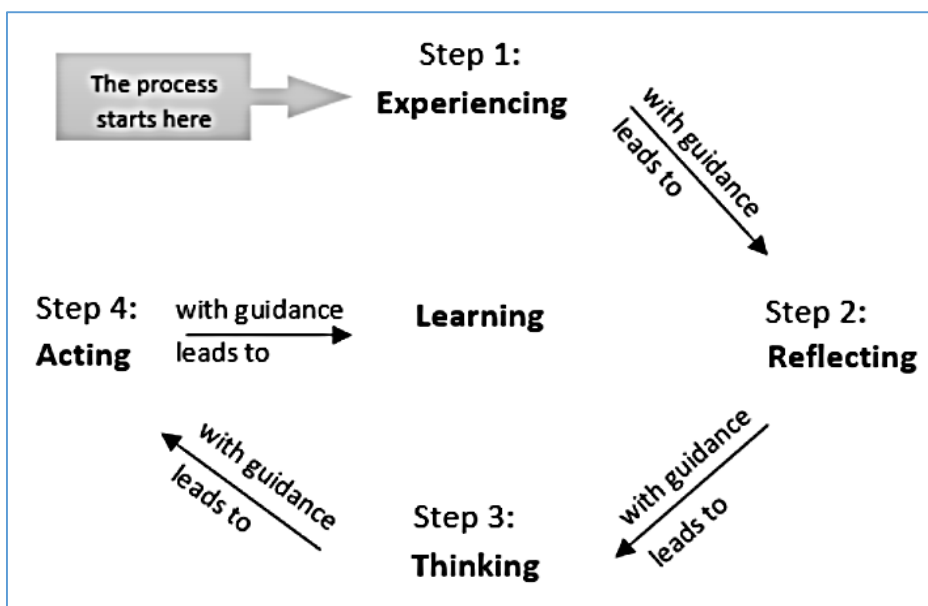
Figure 3.11 Model of experiential learning theory

Further Reading*: Experiential Learning: an Overview A discussion paper prepared for Professor Joanne Wright, Deputy Vice-Chancellor (Academic) for the Vice-Chancellor's Retreat March 23rd & 24th, 2015 Institute for Teaching and Learning Innovation https://itali.uq.edu.au/files/1264/Discussion-paper-Experiential_ learning_an_overview.pdf*

3.10 Self-assessment questions

1. What epistemological problems are raised by modern pedagogical theories?
2. Why does a teacher need knowledge and awareness of learning theories?
3. What is the difference between Western and Eastern approaches to educational philosophy?
4. What is the key thesis of the educational philosophy of Confucius expressed in the treatise 'Analects'?
5. According to Herbart, what should a teacher promote in students?
6. What is the essence of behavioral theory?
7. Reveal the main points of criticism of behaviorist theory.

8. Which of the theories is based on considering the relationship between the previous experience and new information?
9. Describe Skinner's experiment and its results.
10. What factors affect learning and behavior according to the theory of operant conditioning?
11. What are the differences between the approaches of behavioral and cognitive theory?
12. According to Piaget's theory, what is the function of disequilibrium and equilibrium in the learning process?
13. What does the concept of internalization by L. Vygotsky mean in the context of the interaction of the social and individual planes?
14. What assumptions are essential for constructivism?
15. What does Bobo Doll experiment by A. Bandura prove?

3.11 Practice exercises

3.11.1 Graphic organizer for learning theories

Theory	Representative	Concepts	Implementation (examples)

CHAPTER 4. LEARNING AND TEACHING STRATEGIES

4.1 Educational technology and its forms

Strategy instruction is a teaching practice that shows students how to learn the content or skills they need to acquire. It provides students with clear strategies (such as note-taking or thinking aloud) to help them process, remember, and express the information they learn. You teach students the what of your content-area curriculum — math facts, grammar rules, and so on. Strategy instruction is how students learn, remember, and use that information. These are strategies that students can use throughout their lives.

Instructional strategies are techniques teachers use to help students become independent, strategic learners. These strategies become learning strategies when students independently select the appropriate ones and use them effectively to accomplish tasks or meet goals.

Instructional strategies can:
*   motivate students and help them focus their attention,
*   organize information for understanding and remembering,
*   monitor and assess learning.

To become successful strategic learners, students need:
*   step-by-step strategy instruction,
*   a variety of instructional approaches and learning materials,
*   appropriate support that includes modeling, guided practice, and independent practice,
*   opportunities to transfer skills and ideas from one situation to another,
*   meaningful connections between skills and ideas, and real-life situations,
*   opportunities to be independent and show what they know,
*   encouragement to self-monitor and self-correct, and
*   tools for reflecting on and assessing own learning.

Effective instructional and learning strategies can be used across grade levels and subject areas and can accommodate a range of student differences.

Application of scientific process to man's learning conditions called educational technology (ET). Educational technology is related to the general educational administration, educational testing, and academic instruction procedures at the scientific level.

Characteristics of ET are as follows:
1. ET has contributed to developing various methods.
2. It is based on the application of scientific knowledge.
3. It helps make the teaching process objective, easy, clear, interesting, and scientific.
4. It is a continuous dynamic technology.
5. It is an essential medium of communication.
6. A desired change is possible in the behavior of teachers and students.

Educational technology has a wide range of scope and applicability in education. In a broader sense, it stands for applying the principles and techniques

of science and technology and psychology and pedagogy in teaching and learning activities. As a result, it has been capable of providing necessary, theoretical, and practical ways to improve the process and products of teaching-learning related to formal and informal education. The forms of educational technology, in general, can be classified as follows:

- Teaching technology,
- Instructional technology,
- Behavioral technology,
- Instructional design technology.

Teaching technology, as a sub-system of educational technology, is concerned with the task of systematization of the process of teaching. A teacher has to play the technician role by learning the art and science of teaching. Teaching is a scientific process; its major components are content, communication, and feedback. Teaching technology process certain basic things in the shape of the philosophy and acts of teaching.

The four steps for becoming a teaching technician are:

- Planning of teaching,
- Organization of teaching,
- Leading teaching,
- Controlling of teaching.

Instructional technology. This technology is meant to help the instructor and the learner in the desired instructional task to realize the stipulated instructional objectives in a particular teaching-learning situation. The term instructional stands for a certain command for getting specific information, knowledge, and understanding about a system or a process. In this way, instructional technology first tries to plan what type of instruction and instructional material is needed in a particular teaching-learning situation and then suggests ways and means for utilizing this instructional material to realize the instructional objectives properly. Instructional technology may be defined as a subsystem of educational technology that helps the instructor or the learner as a part of his self-learning or auto-instruction by determining the media, methods, and material for realizing the stipulated instructional objectives in a given teaching-learning situation.

Behavioral Technology, as one of the kind/type in its broad form, may be utilized to study and modify the behavior of all living organisms. In a more general technical sense, behavioral technology may also include behavior modification strategies not based on learning principles. However, in higher school situations, the task of behavioral technology has almost become synonymous with behavioral analysis and behavior modification carried out through the principles of operant conditioning (shaping of the desired behavior) and observational learning (imitation of a model behavior).

This technology is based on the following assumptions:

- The teacher's behavior is social and psychological, which means that psychological and social conditions directly affect teachers' behavior.
- Teachers' behavior can be observable and measurable.

- Teachers' behavior is relative, meaning some teachers are good and others are not.

The following are the main features of behavioral technology:
- It is the focus to achieve the psychomotor objectives.
- Specific teaching skills can be developed in teachers with the help of this technology.
- Psychology is the basic foundation.
- It is based on a software approach.
- Reinforcement and feedback are emphasized.
- It aims at producing effective teachers by modifying their behavior.
- It is more beneficial for teacher training institutions.

Teachers' behavior can be modified by training and by using reinforcement devices. A teacher learns the following subject matter (topics) under this technology:

a. Methods of observing teacher's behavior and its rating (speed).
b. Models of classroom interaction.
c. Various techniques for developing teacher behavior include micro-teaching, team teaching, and interaction analysis techniques.

Summarizing, different forms of educational technology are compared in Table 4.1.

Table 4.1

Comparative table for different forms of educational technology

	Instructional technology	Teaching technology	Behavioral technology
Goal	Development of the cognitive domain	Development of cognitive, affective, and psychomotor domains	Development of psychomotor (skills).
Types of teaching and learning	Programmed (self)learning, learner-controlled instruction	Memory understanding reflection	Interaction analysis, micro-teaching, team teaching
Role of teacher	A helper	As manager	As an observer or supervisor
Principles	Input, process, output	Art of teaching and science of learning	Principles of learning feedback and reinforcement

Instructional Design Technology. Instructional as a process stands for helping the individual as a learner to achieve a suitable teaching-learning situation. Good instruction is goal oriented with a specific purpose or purposes, implying that how the learner is imparted instructions (assisted in his learning process) should always be a well-conceived, planned, and effectively controlled phenomenon.

In its simple meaning, instructional design thus stands for layout or plan to describe how an instruction process (involving teaching and learning and its interaction) should be carried out to attain the stipulated objectives. Instructional

design technology may adopt a distinctive approach for exercising control and manipulation. It is like the systems approach, cybernetic approach, and training psychology for generating effective instructional design with a clear-cut motive and helping the learner and teacher attain the stipulated instructional objectives.

Instructional Design Services (IDS) offers a range of services for course development. Services offered to depend on several factors, including course enrollment, faculty experience, and preference. Technology has always contributed to debates about education and influenced contemporary education by creating technological resources and new learning modes. For example, the problem called "Faustian Bargain" – a kind of Monkey's Paw effect in which a wished-for result leads to unwanted side-effects.

Instructional Design
Services

It can be seen that education has adopted and adapted technology over a long period. There are some valuable lessons to be learned from past developments in the use of technology for education; in particular, many claims made for a newly emerging technology are likely to be neither true nor new.

Also, new education technology (ET) rarely wholly replaces older technology. Usually, the old technology remains, operating within a more specialized 'niche,' such as radio, or integrated as part of a more prosperous technology environment, such as video on the Internet.

Education has adopted and adapted technology over a long period.

There are some valuable lessons to be learned from past developments in the use of technology for education; in particular, many claims made for a newly emerging technology are likely to be neither true nor new. Also, new technology rarely wholly replaces older technology. Usually, the old technology remains, operating within a more specialized 'niche,' such as radio, or integrated as part of a more prosperous technology environment, such as video on the Internet.

A short history of ET

According to AECT (The Association for Education Communications & Technology), the definition of educational technology is the study and ethics of practice to facilitate learning and improve performance by creating, using, and managing appropriate technological processes and resources.

Appropriate technology in learning must be assessed based on its potential to meet educational goals. The main potential of educational technology is to support creativity and critical thinking. It is essential to identify the purpose of education, the technology of education, and how appropriate educational technology is applied. It allows one to understand better how to evaluate educational technology's feasibility.

Criteria for assessing the suitability of technology, especially for higher education in developing countries, include:

a) **Systems independence***: It relates to the ability of technology devices to stand alone, to perform their duties with little or no other facilities or supporting devices that assist in their functions.

b) **Image of modernity:** The nature of humans desires to feel important and perceived as valuable. Therefore, successful technology brings its users to meet their needs and feel a level of sophistication, which can enhance their social status.

c) **Individual technology versus collective technology:** Related to the social or cultural standards in which the proposed technology will operate.

d) **Cost of technology:** The cost of the device must be such that people can afford it.

e) **Risk factor:** The development of new technology gives the possibility of success or failure. 2 kinds of risks must be considered: internal and external. Internal risk is associated with how the technology follows the local production system. External stores related to the support of the system needed to support the technology's functioning are going well. These risks must be considered before and during the development of technological devices.

f) **Evolutionary capacity of technology***: It is preferred that technology has design characteristics that allow for continued development wherever and whenever possible.

The media is an intermediary to convey ideas about packaged things so that the concept can be well received. The use of this media can also increase student motivation. With the increasing motivation to learn, the goals of the teaching and learning process will be more easily achieved. The problem with the application of educational media is the lack of facilities and infrastructure to support the learning process. It is due to less prominent human resources, such as using computers that use English and some application programs that cannot be mastered perfectly, such as Microsoft Word, PowerPoint, and Excel.

In general, teachers use the lecture method even though not all suitable teaching materials are delivered using the lecture method. If such perceptions can occur, misperception or understanding cause learning objectives not to be achieved. If the learning objectives are not achieved well, what is blamed is that the educator is sometimes even considered a failure in the learning process. So, educators must be good at turning their brains so that the learning process takes place well and learning objectives can be achieved by what is desired.

For the learning process to run smoothly and well, teachers can use or use the media as a tool in the learning process. Media that can be used in teaching, whether it is a reference book or anything that can help in the learning process so that students understand the material presented. Because by using learning media, the learning process becomes more interesting, and students better understand what is conveyed by the instructor.

4.2 Distance, blended, and remote learning

One of the areas of application of information and communication technologies (ICT) in education is distance learning. It has now spread and is organically integrated into the unified information space of the educational institution.

Distance learning is an individualized process of acquiring knowledge, skills, and abilities through the mediated interaction of distant participants in the educational process. This process is done in a special environment based on modern psychological and pedagogical information and communication technologies. Distance learning cannot be implemented without appropriate technical support for students and teachers and without computer and Internet skills.

In English, the term "distance education" means distance teaching - the teacher's activity and distance learning - the student's activity. These activities occur within a single distance learning process, where the teacher and students are separated spatially. By this term, we understand the process of acquiring knowledge and skills with the help of a specialized environment based on modern ICTs that ensure the exchange of educational information at a distance.

The term "blended or hybrid learning" has different definitions. In general, it combines offline and online learning in different proportions. Blended learning appeared as early as the 1990s as a counterweight to online learning, but it began to be implemented only in the 2000s. Educational institutions and teachers independently set the proportions of the so-called mix.

The definition and separation of the term "remote learning" from other definitions were made recently. This term refers to temporarily changing the forms of education organization from offline to online modes in conditions that contain elements of uncertainty (introduction of quarantine restrictions, martial law, etc.). For teachers, this means new challenges. It is necessary to make lesson plans and develop educational materials so that they can be conveniently used in both modes of learning, which can be carried out in undetermined time proportions. In addition, educational resources should be designed for all the variety of modern mobile devices students can use during an unforeseen, unplanned transition to a distance.

In recent years, remote learning has become more in demand, especially during the Covid-19 pandemic and for countries that must carry out the educational process in war conditions. Schools and universities around the world must periodically transition to online learning to ensure the safety of students and staff.

However, remote learning is not something radically new. This form has been used for many years by students who cannot attend school or university in person due to disability, illness, or other reasons. In our opinion, remote learning is, to some extent, a form of organization of inclusive education. It became widespread in response to the challenges of the 21st century and requires the development of teaching methods in this form for groups of students.

Let us consider in more detail the features of distance and mixed-learning organization.

4.2.1 Distance learning

The absolute advantage of distance education is accessibility, openness, and the ability for students to complete tasks and obtain the necessary information at a convenient time and in any corner of the world. The positive side of distance learning is the possibility of adaptation to the teaching of any subject, taking into account students' individual abilities and preferences.

The disadvantage of distance learning is the lack of direct contact between the teacher and students. Online classes only partially compensate for the so-called live communication in real-time.

For distance learning to be effective, it must be organized appropriately, requiring appropriate personnel, system, and technical support.

In general, it can be said that the distance learning system should contain the following components:

- A set of technical and software tools that ensure the use of modern technologies for working with information;
- Complexes of scientific and methodological support of the educational process;
- Resources for organizing the communication of participants in the educational process;
- Repositories (libraries, media libraries, or depositories) of various types of educational materials for managing students' independent work;
- Means for organizing knowledge control and monitoring the quality of the educational process.

Distance learning can be organized in different modes: asynchronous, synchronous, and mixed.[62]

Asynchronous mode. The teacher prepares educational materials, lecture recordings, and educational tasks in advance and places them on the appropriate Internet resource. The student performs the proposed according to his own or approved general schedule. This form of work is the most common, and most educational institutions use it.

Synchronous mode (online learning). As with face-to-face learning, the interaction between students and the teacher takes place in real time. These are video conferences, online classes, and live broadcasts. The difference between real learning and this form is that the students and the teacher work and interact at a distance and not directly in the same room.

Mixed approach. It involves a combination of elements of asynchronous (providing educational material) and synchronous (direct communication between students and the teacher in real-time) modes. In the mixed approach, students and the teacher communicate, discussing problematic issues.

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[62] *O.S. Amelina, O.V. Tsurkan, Distance, and Blended Learning. Experience, Advice, Tools. Kharkiv, Osnova, 2022.*

The scientific and methodological support of distance learning includes:

- External normative documentation, at the state level, determines the requirements for the organization of the educational process. On its basis, each educational institution develops its regulations, which regulate the rules and conditions for the organization of distance learning. As external documents are considered, there can be theoretical and practical recommendations, both official (provided by the Ministry of Education or local and regional authorities) and the experience of colleagues.
- Distance learning monitoring and control systems. They help identify shortcomings and difficulties and activate interaction between participants in the educational process.
- Methodical and didactic acquisition with resources of training systems based on relevant platforms.

An important aspect is the choice of a platform for the organization of distance learning. By this term, we understand the software, which includes a set of necessary applications to ensure the functioning of the above-listed components of the distance learning system. Such a platform becomes the central element of the system.

When introducing distance learning in an educational institution, certain principles should be followed as stated in Amelina and Tsurkan (2022), namely, to ensure:

- Adaptability – personal training of the student according to his abilities and skills;
- communicativeness – active interaction between the student, the teacher, and the administration of the educational institution;
- student-centeredness – orientation to the individual learning trajectory of the student, creation of comfortable conditions;
- pedagogical prudence and expediency, which involves monitoring the effectiveness of training and adjusting, if necessary, its conditions;
- network security is one of the main principles today from the viewpoint of protecting personal data and protecting the learning process;
- basic level of education – educational services in the period of distance learning must meet the standards of education; each student must acquire a basic level of knowledge;
- mobility - educational materials should be accessible to all students with minimal technical support. It is worth creating your educational networks to save databases. Assignments and other materials stored in the cloud are accessible and can be adjusted anytime. However, information can be transferred to electronic media or a paper version after leaving distance learning or during mixed education;
- social integration - explanatory work among the public is essential;
- the use of health-saving technologies, which means preventing the overloading of students, as well as compliance with sanitary requirements regarding the time of distance classes for students of different age categories. For example,

teachers use the time of continuous work at the computer to conduct synchronous classes (online), explain educational material, consolidate what has been learned, and check learning results. Teachers can use other parts of classes for students to complete "asynchronous" tasks or review additional materials independently. At the end of the lesson, the teacher can return to the video conference mode again to discuss the completed tasks and reflect.

Distance learning can be provided via e-mail, teleconferences, educational forums, and chats. Modern trends in the development of distance learning are hosting academic multimedia courses, and distance lessons, including interactive, various visualizations on educational topics, intelligent search services, etc., on dedicated servers.

In distance learning, the student receives a set of educational materials. Usually, this set contains texts and presentation support for lectures, problem books, workshops, and tasks for independent work on various media - traditional in printed form, as well as digital of multiple types, audio and video materials, interactive computer software training tools, etc.

The distribution of time and forms of work depends on the teacher and the specifics of the educational programs. For more comfortable and systematic work, educational institutions develop a schedule of distance classes following teachers' workload and the educational program. A combination of synchronous and asynchronous training is considered the most effective. However, the key role in choosing the quantitative ratio of time for the combination belongs to the administration of the educational institution.

4.2.1 Blended learning

During blended learning, the same principles are followed as during distance learning. However, the blended form is methodologically more complex, combining traditional and distance learning tools and approaches.

At this stage of educational development, remote learning is considered even more complex, as it contains elements of the uncertainty of learning conditions in different periods. Research into the possibility of optimizing the conditions of remote learning to ensure its quality and efficiency continues and is the subject of scientific discussion by leading experts in pedagogy and psychology.

During blended learning, group forms of work are most often used in both face-to-face and remote modes. This approach allows the teacher to work with several groups simultaneously. For example, the first group works face-to-face, and the second - remotely. After some time (determined by the administration or recommendations of local authorities, etc.), the groups change places. All students are generally involved in the educational process; the teacher is constantly in contact with them.

The role of the teacher in blended learning is changing. He does not broadcast information but directs, coordinates, and organizes collective work. It forms important competencies in students - the ability to work in a group, defend one's opinion, and search and interpret data. Institutions of higher education were among the first to use blended learning technology.

The advantage of blended learning is the possibility of direct communication between the student and the teacher. Students can independently distribute their working time, complete tasks, and receive online consultations. For both parties involved in the educational process, the time spent at the computer decreases, positively affecting health.

Advantages of blended learning:

- Live communication, active communication, and interaction with the teacher;
- Working with educational materials located on distance learning platforms contributes to the development of independence;
- Cooperation, on the one hand, with the teacher, and, on the other hand, with classmates. The skills of a "team player" are formed;
- Mastering the skills of working in real conditions (laboratories, equipment, etc.);
- Creation of an evaluation system that allows determining the degree of independence of the student and the quality of his acquisition of knowledge and skills more reliably, using various forms and methods of control;
- Coordination of actions - not only in the educational sphere but also in educational and extracurricular work.
- Disadvantages of blended learning.
- The presence of students with different levels of training in the same group (the effectiveness is affected by the insufficient level of computer literacy and culture of students);
- Non-systematic attendance of classes;
- Often the passive nature of acquiring knowledge and skills;
- The quality of technical support can vary greatly depending on the type of devices used by students.

4.2.3 Webinars as a means of improving teachers' qualifications

Modern ICTs make it possible to create powerful educational electronic environments that are rapidly developing, erasing the boundaries between traditional formal and informal education. Correctly organized use of created educational settings encourages scientific and pedagogical workers to search for and find innovative educational and scientific activity methods that will motivate them to cognitive activity and develop students' independent learning skills.

At the same time, education informatization emphasizes and changes the requirements for information and communication competence (ICC) of teachers who develop educational materials of a new model using ICT means. The formation and development of ICC of teachers of educational institutions are implemented mainly through professional development programs.

Modern ICTs (blogs, wiki technologies, webinars) make it possible to implement professional development using real-time communication, cooperation, and reflection and to implement innovative pedagogical technologies. So, the main areas of use of webinars are holding group training classes; distance learning, in particular, conducting lectures, seminars, and

practical classes. Let us consider some recommendations for conducting webinars.

Conducting webinars (webinar, online seminar, online seminar) requires using special software. The level of development of modern technologies is such that the process of preparing and holding a webinar is no more complicated than the similar process of organizing a traditional training or seminar in the classroom. However, entering the network should be preceded by preparing appropriate didactic materials. They should correspond not only to the topic but also to the target audience and the peculiarities of the perception of the material in such a specific mode.

First, to successfully conduct the webinar, the teacher must check the availability of appropriate technical support for himself and the listeners: a microphone, headphones, a web camera, and an Internet connection at a speed of at least 2 Mbit/s for both the teacher and the listeners. A low-quality webcam can distort the teacher's face and movements, distracting listeners' attention and often distorting their perception. In this case, it is better to turn off the camera and draw attention to the presentation slides or the "whiteboard."

When choosing the material, the teacher should remember that the listeners' attention is kept for no more than 45 minutes, and then they get tired. So, first of all, you should not set too many goals and tasks that must be achieved during the lesson. It is better to concentrate the material around one leading idea and choose various means of its delivery: theoretical explanations, practical examples, memories of how another audience perceived this material, accompanying presentation slides, etc.

At the same time, every 7-10 minutes, the monologue should be interrupted by asking questions to the listeners, showing a video sequence, drawing on the "whiteboard," etc.

The next 45 minutes of the class should be devoted to answering questions and discussing with the listeners. The listeners will demonstrate their prepared materials if the webinar is part of a training course. A convenient option is to send handouts so listeners can prepare questions in advance or offer all webinar participants to answer 1-2 questions before it begins. Then the second half of the lesson can be devoted to analyzing the answers.

When preparing a presentation for a webinar, you should pay attention to such requirements as minimizing animation, complex drawings and pictures, a large enough font, a contrasting background, and a small number of slides. The title slide should contain the webinar's topic, the teacher's last name, first name and position, and other basic information. This slide should be included as a screen saver for the webinar 10-15 minutes before its start so that listeners who join in advance see not a teacher who is conversing with colleagues. Not a blank screen, but information that they are, not they made a mistake with the site, and they are waiting for a lesson on a specific topic.

It is also worth carefully considering the nuances of working with questions that will come to the teacher from the students. During the presentation of the material, questions should be accepted only in the chat. It is appropriate to contact

them after every 7-10 minutes of presentation, voicing the questions that have come in (otherwise, while the teacher reads the questions, there will be an awkward pause on the air). Questions relevant to the teaching can be answered immediately, but in the central part of the teaching, the answers should not take more than 5 minutes for each question-answer session. Some questions should be postponed until the end of the webinar, informing the listeners about it out loud. Irrelevant and narrowly focused questions should not be left unanswered. They should receive a response from the instructor, for example, a message that sure listeners' questions will be answered verbally or in chat after the webinar.

When conducting a webinar, it is very useful to have an assistant next to the teacher who will guide participants on solving technical issues that sometimes arise and ask questions or give provocative answers, discussed in advance with the teacher.

The experience of conducting a webinar together with another teacher is interesting. In this case, each of them should have their own computer with a headset and a camera. In the case of paired work, one of the teachers can play the role of a presenter, asking interesting and provocative questions to the other - an expert on the topic under discussion. Otherway, the teachers can act out a "debate" scene. When one defends a certain opinion, the other denies it, giving counterarguments, and listeners are involved in the debate. Such work revives listeners' interest but should be alternated with "classic" webinars with one teacher.

Here are a few rules for working on a webinar:

1. 5-7 minutes before the start, start communicating with the listeners - in chat or orally.

2. Do not start presenting the main material exactly at the beginning of the webinar - most listeners connect late. Conduct an "icebreaker" exercise that will take 5-10 minutes.

3. Announce the rules of the webinar. Those who openly violate them, for example, deviate from the topic, write or pronounce harsh, inappropriate remarks, should be punished - not to give words orally and disconnect from the chat.

4. You should not sit on a chair, put on a headset, check the microphone, and at the end of the webinar - take off the headset and get up from the chair with the camera turned on. Listeners should see the teacher only in full readiness for work.

5. Presentation slides should not be changed too quickly but should not be delayed for more than 3-4 minutes.

6. Be aware of a signal delay of about 3 seconds between when a person says something and when other participants hear it.

In our opinion, it is advisable for educational institutions, in particular for students of higher education, to use the:

- educational webinar - provision of new information on a specific topic, similar to a lecture in the educational process, can also be used as a short-term seminar (from a few hours to days);
- informative webinar - is more general, includes more interactive forms of work, informs more than teaches;

- webinar-training – a method of checking the students' performance of seminar tasks and practical classes; implemented in the form of several classes;
- consultation webinar (webinar-support) – a form of conducting consultations with the supervisor regarding final theses in a remote format;
- in-class webinar – connecting listeners engaged in webinar mode to a classroom session allows you to get a synergistic effect due to the interaction of listeners with different experiences.

The interactivity of the webinar can be ensured by various methods: an online survey of participants, visualization of the discussion, the ability to take notes during the webinar and ask questions, file sharing, and the function of recording and distributing the content of the webinar. Let us consider each of these methods in more detail.

The online survey of participants. In the beginning, during the webinar, and after its completion, the organizer can conduct an online survey, during which all participants must answer one or more questions. An online survey can be undertaken to update basic knowledge on the topic, summarize the material, and motivate participants to participate actively as listeners.

The survey settings can hide the results from the participants or, on the contrary, open them. In any case, the identification of answers with the names of the participants is available only to the organizer. Therefore, if the participant gives an incorrect answer and the results are open, only the organizer can see the participant's name who gave the wrong answer.

During the webinar, the organizer can visualize his report with the help of presentations, images of his desktop, and work in specific applications. Similarly, participants also have the option to visualize their responses (presentation during the webinar) to all participants. An important point is the ability to provide constant interactivity with the help of board elements.

So, during the presentation, the speaker can ask the participants to make some markings on certain slides, for example, markings on a geographical map, diagrams, models, tables, images, etc. Webinar visualization can be done using the Whiteboard element, allowing participants to share a part of the screen where slides, images, diagrams, or tables can be placed. Currently, all participant actions are automatically updated and can only be identified by the webinar organizer.

Each participant can use pre-prepared notes during the webinar, for example, in the Microsoft OneNote environment, or take these notes directly during the webinar. It is also possible to make these notes simultaneously to all participants, whose actions will be automatically updated and available online for shared use.

Sometimes during a webinar, it is necessary to distribute several files among the participants. A special module allows you to quickly do this and specify certain levels of permissions (for viewing, for editing).

The webinar host can record the webinar in video format, which makes it relatively easy to view its content in most players, and publish it online at any time for re-learning or analysis of the session.

4.3 Student-centered learning and its theoretical background

While the concept of student-centered learning (SCL) in its most recent form is relatively new, the idea of looking at how teaching is conducted and how learning processes work has spanned almost two centuries.

The discussion of student-centered learning initially focused on changes to the pedagogical methods used and on making learning and educational processes more flexible for students to participate as much as possible. The origins of it lie within Piagetian theory - Individuals' cognitive schemes allow them to establish orderliness and predictability in their experiential worlds. A cognitive disequilibrium triggers learning when experience does not fit the individual's schemes. This disequilibrium leads to adaptation. Reflection on successful adoptive operations leads to new or modified concepts, contributing to re-equilibrium.

Thus from a constructivist perspective, knowledge is not passively received from the world, others, or authoritative sources. Constructivism is based on the idea that learners must construct and reconstruct knowledge to learn effectively. The methodology favored by constructivism tends to discourage the traditional approach to learning. The emergence of constructivism brought with it the notion that more flexible learning paths and outcome-based learning assessments should be available to students.

In recent years it has been recognized that students engage better with student-centered learning and often develop a deeper approach to learning. It reflects an adage that students learn by doing. Consequently, there has been an increase in the proportion of the curriculum delivered through inquiry-based learning.

Conventional learning (also referred to as traditional learning) tends to consider students as passive receptors of information without consideration of the need to participate actively in the learning process. Within the conventional approach to learning, curricular design is based on low levels of student participation, as decisions in the learning process revolve around the privileged position of the academic as students' main source of knowledge. It is a non-participatory approach, where students are rarely expected to ask questions or challenge academic theories.

Student motivation within conventional learning settings tends to take the form of competition between students, primarily based on grades. The conventional approach to learning is usually based on traditional learning settings such as lecture theatres and laboratories. Within the conventional learning approach, the pedagogic method traditionally consists of lecturing, note-taking, and memorizing information for later reproduction. As defined above, the traditional approach to learning has been criticized in recent years, with the evolution of different learning theories.

Changes in how students learn from the traditional teacher- and course-centric approach to a student-centric approach must be reflected in various dimensions. For example, they reflect on how, when, and where students learn.

How they plan their learning and demonstrate mastery, how their progress is tracked and reported, how they access resources and the nature of the resources, and how they communicate and collaborate with others.

The processes of student-centered learning and the data that prove most critical to supporting student-centered learning are different from the processes and data used to support traditional classroom models. Student-centered learning represents a mindset and a culture within a higher education institution. It is a learning approach broadly related to and supported by constructivist learning theories. Innovative methods of teaching characterize it. These methods aim to promote learning in communication with teachers and other learners and take students seriously as active participants in their learning, fostering transferable skills such as problem-solving, critical thinking, and reflective thinking.

> "Tell me … and I will forget. Show me … and I will remember.
> Involve me … and I will understand. Step back … and I will act".[63]

Some of the SCL literature can be summarized into the following elements:
- The reliance on active rather than passive learning;
- An emphasis on deep learning and understanding;
- Increased responsibility and accountability on the part of the student;
- An increased sense of autonomy in the learner;
- An interdependence between teacher and learner;
- Mutual respect within the learner-teacher relationship;
- A reflexive approach to the teaching and learning process on the part of both the teacher and the learner.

It is important to note that the call for active learning does not negate the need for lectures. Instead, it provides opportunities to reflect, evaluate, synthesize, and communicate on or about the information presented in such lectures.

Student-centered learning integrated system needs to support the following:
- A reference framework for aligning learning experiences, resources, assessment, and reporting to the competencies.
- Customized learner profiles that combine data from source systems and input from students, parents, educators, and others involved in the student's education and well-being.
- Personalized learning plans that are responsive to the learner as he or she progresses and changes.
- Various learning experiences within and beyond the school setting and calendar and collecting the associated data to inform student progress.
- Access to content, digital resources, human resources, and tools through a user-centric interface.
- Meaningful, timely feedback during the learning process.
- Multiple ways of demonstrating and assessing mastery toward competency
- Relationships, collaboration, and communication.

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[63] *Ancient Chinese proverb possibly came from the Xunzi*

- Analytic tools to support data-informed practices (learning, teaching, administration).

Innovative teaching is primarily geared towards enhancing students' critical thinking, thus grooming individuals to become independent lifelong learners. In its application, innovative teaching can take different forms; examples being team learning, problem-based learning, and the like, some of which are explored below.

Activities make your course come alive and help your students achieve learning outcomes. Because activities are what students will most experience and learn from, we first articulate an active learning framework that details how to create effective activities and then addresses why to build social elements to these learning experiences. Finally, we share a variety of activities to consider in your course.

You have reviewed your learning outcomes and decided how you want students to demonstrate these outcomes. Next, break down the learning process into manageable chunks. For example, if you want your students to research and explain a specific topic, create activities that allow students to learn how to research, explain concepts clearly and appropriately, and develop skills to present in multiple modes.

A student-centered learning integrated system must support the complicated set of processes that make up:

Personalized. Personalized learning recognizes that students engage in learning in different ways and different places. Students benefit from individually-paced, targeted learning tasks that start from the student's current position, formative assess skills and knowledge, provide ample, frequent, and actionable feedback from multiple sources and address the student's needs and interests. Tasks and learning units might be either individual or collective. Learning is deepened and reinforced through participation in collaborative group work, focused on engaging and increasingly complex and authentic problems and projects, as well as through relationships and community structures in the larger learning environment beyond the classroom itself (e.g., advisory groups, mentoring, internships and community support partnerships).

Student-owned. Student-centered learning engages students in their success and incorporates their interests and skills into the learning process. They clearly understand what they have mastered, set goals for what they need to know and master long-range, determine what they need to master short-term to reach their long-term goals and receive frequent feedback on their progress. They use data to diagnose, direct and drive their learning. They have multiple opportunities to direct, reflect and improve their learning through formative assessments and data reports that help them understand their strengths and learning challenges. Students take increasing responsibility for their learning, using self-regulation and reflection strategies. Students support one another's progress and celebrate success.

Anytime, anywhere learning. Learning takes place during and beyond traditional academic hours. Learning is not restricted to the classroom or the building. Time and place are used flexibly to optimize and extend student learning

and allow educators to engage in reflection and planning. Students have equitable opportunities to use digital technologies that enhance learning. They can receive credit for their learning outside of school based on their demonstration of skills and knowledge.

Competency-based education. Student-centered learning implies mastering the necessary competencies, essentially an education based on competencies. This issue is considered in more detail in Section 4.4.

4.4 Student-centered activities that promote active learning

Teaching methods are the broader techniques used to help students achieve learning outcomes, while activities are the different ways of implementing these methods. Teaching methods help students:
• To master the content of the course and
• to learn how to apply the content in particular contexts.

Instructors should identify which teaching methods will adequately support a particular learning outcome, and their effectiveness depends on this alignment. An instructor should consider learning outcomes, student needs, and the learning environment to make the most appropriate choice.

4.4.1 Pre-class activities

Pre-class activities allow students to review previous content and engage with new content before the next lesson. It will enable the students to monitor their understanding. The instructor can also gauge student understanding and misconceptions

Advanced organizers. It is an activity to help students collect and organize their thoughts, knowledge, and connections. It is beneficial when using guiding questions to prompt information.

Know-Wonder-Learn (KWL) is an advanced organizer that helps instructors and students access background knowledge. Students are asked to complete the first two columns before instruction and share what they have written (Table 4.2). The final column can be filled in for reflection or submission.

Table 4.2

Table to be completed during Know-Wonder-Learn

K What do you KNOW?	W What do you WANT to know?	L What have you LEARNED?

Entry ticket. It is a small assignment, activity, or question that helps students recall the previous lesson's objectives or helps prepare students for the current day's lesson.

Example: Based on the readings for class today, what is your understanding of _____?"

Interactive lecture activities are activities that can be added to your lecture or that can replace parts of your lecture. Remember, active learning does not mean

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that lectures should be removed entirely. Breaking a long lecture into smaller parts helps students refocus and build understanding.

Concept (mind) maps: These visual representations depict relationships between multiple concepts (Fig. 4.1). Students fill in a graphic organizer with the identified concepts, draw arrows between related concepts and label them with a short phrase to describe the relationship. This approach helps students build an external representation of their mental model and its organization and supports multi-modal learning.
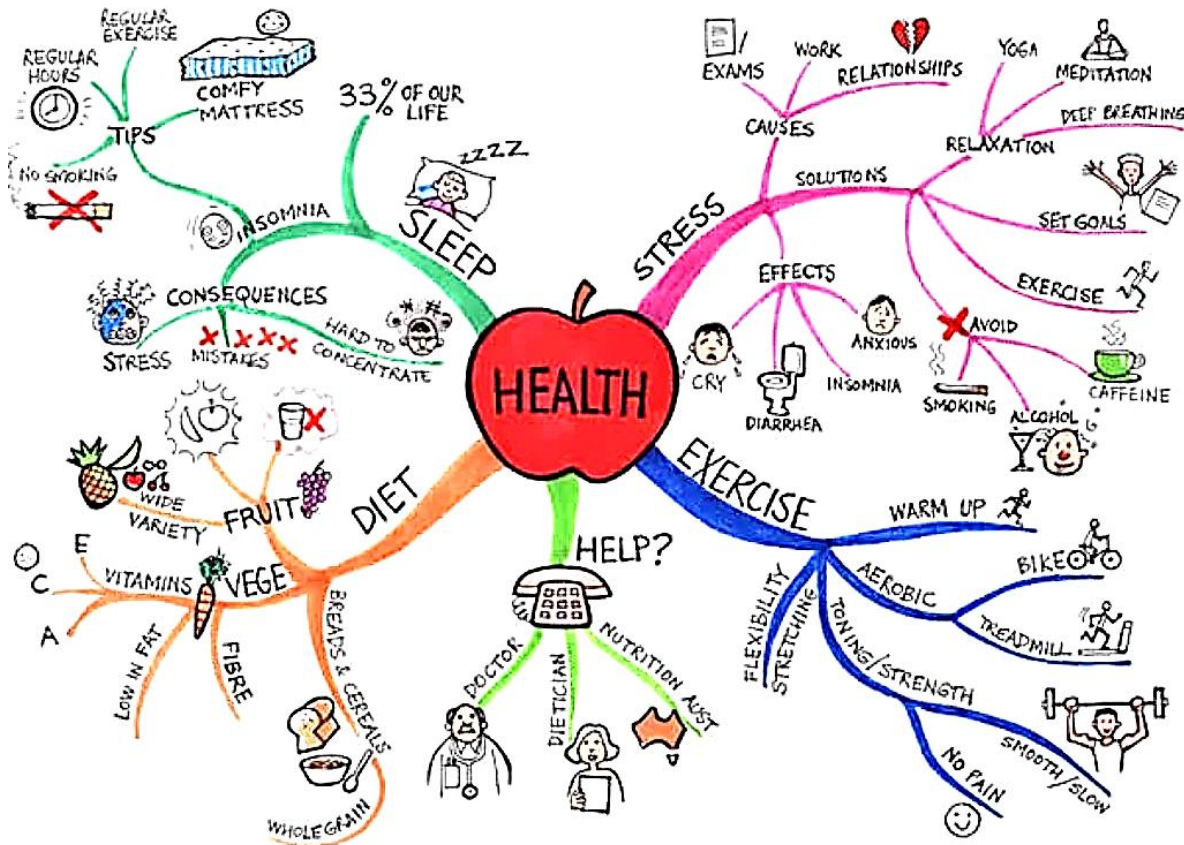

Figure 4.1 An example of the concept map

"Mind Map" was first popularized by British psychologist and author Tony Buzan. Still, diagrams visually map information using branching and radial maps tracing centuries. These pictorial methods record knowledge and model systems and have a long history in learning, brainstorming, memory, visual thinking, and problem-solving by educators, engineers, psychologists, and others.

A Mind Map is a diagram used to organize information visually. It is hierarchical and shows relationships among pieces of the whole. It is often created around a single concept, drawn as an image in the center of a blank page, to which associated representations of ideas such as images, words, and parts of words are added. Major ideas are connected directly to the central concept, and others branch out from those. Mind Maps can be drawn by hand, as rough notes during a lecture, meeting, or planning session, for example, or as higher quality pictures when more time is available.

Mind Maps are ideal for teaching and presenting concepts in the classroom as they provide a valuable focus for students, delivering an overview of the topic

without excessive information. Online Mind Maps can be used in class to brainstorm and generate discussions. It will encourage students to participate and fully understand a subject and its nuances by creating connections between ideas.

Demonstrations: Ask students to predict a demonstration's result, briefly discuss it with a peer or take a class poll. After the demonstration, ask them to discuss the observed outcome and how it may have differed from their prediction; follow up with an explanation. Incorrect predictions help students see their misconceptions and prompt them to restructure their mental models.

Guided notes: An instructor-prepared handout that helps guide students to take notes during the lecture. The handout includes background information, terms, concepts, main ideas, etc.

Pair-compare-ask: Modeled after the think-pair-share activity, students pair up with another student and discuss their notes together after taking notes. Next, they work together to create questions during the group discussion.

Pause procedure: Pause for approximately two minutes every 12-18 minutes. Encourage students to discuss and rework notes individually or in pairs. Allow students to ask questions and receive clarification.

Polls: Can be used to take attendance, administer surveys and quizzes, play games, share notes, etc. Many technology-based polling tools can be accessed using apps or websites.

Retrieval practice: Pause for approximately two minutes every 15 minutes. Students write everything they remember from this class segment.

Encourage questions. This strategy can be used during a lesson to review or before a class to activate prior knowledge.

4.4.2 Writing activities

Writing activities help students reflect, process, and document their understandings and misunderstandings. If reflective writing is an expectation in a course, students become more focused and self-regulated learners.

To write a paper for a class, students need ways to move from the received knowledge of the course material to some separate, more synthesized, or analyzed understanding of the course material. For some students, this begins internally or through what we call "thinking," unvoiced mulling, sorting, comparing, speculating, applying, etc., leading them to new perspectives, understanding, questions, and reactions about the course material. This thinking is often furthered through class discussion, and some students automatically, internally move from these initial sortings of ideas into complex, logical interpretations of material at this point. But, for more students, their thinking will remain an unorganized set of ideas referring to the subject. Many will have trouble moving beyond this vague sense or simple reaction toward ideas that are more processed, complex, or what we often call "deep." We can foster that move to a deeper understanding by providing opportunities to externalize and fix their ideas on paper so that they may both see their ideas and then begin to see their relationships. The following activities will help students generate and clarify initial responses to course material.

- **Free writing**: Students write a paragraph or two on a topic without stopping. For students, the objective is to get as many ideas as possible on paper and not focus on their quantity or quality. Students can then use these ideas to participate in a class discussion, develop an essay, prepare for a debate, etc.
- **Journals**: These self-reflective tools can be private between student and instructor or can strictly be a place for a student to share their personal learning experiences privately with themselves. Journaling gives students a way to articulate how they are doing in the class, the challenges they may be experiencing, or their questions.
- **Learning logs**: Students write about the concepts they are learning and can be customized by the instructor to elicit specific types of information. Usually, learning logs consist of a two-column chart where the first column lists the topics and their associated questions. The second column on the right is used by the students to answer these questions or write additional notes.
- **One-minute paper**: This brief activity allows students one minute to answer an instructor-generated question. It can also summarize part or all of the class session. Students then can share responses to stimulate class discussions, or the instructor can collect the papers to assess student responses.
- **One-sentence summaries**: Students answer "who, what, when, where, how, why" questions about a particular topic in one sentence.

The following activities will help students make decisions as they shape ideas:

Drawing diagrams. Sometimes it helps to look for the shape your ideas seem to take as you develop them. Jot down your main ideas on the page and see if you can connect them. Do they form a square? A circle? An umbrella with spokes coming down? A pyramid? Does one idea seem to sit on a shelf above another idea? Would equal signs, greater or fewer signs, help you express the relationships you see between your idea? Can you make a flow chart depicting the connections between your ideas?

Making charts or piles. Try sorting your ideas into separate piles. You can do this by putting ideas on note cards or scraps of paper and physically moving them into different piles. You can do this on the page by cutting and pasting ideas into various groups on the computer screen. You can also make charts that illustrate the relationships between concepts. Common charts include timelines, authors sitting around a dinner table, and comparison/contrast charts.

Applying an idea to a new situation. If you have developed a working thesis, test it out by applying it to another event or situation. If your idea is clear, it will probably work again, or you will find other supporting instances of your theory.

Problem/Solution writing. Sometimes it helps to look at your ideas through a problem-solving lens. To do so, first, briefly outline the problem as you see it or define it. Ensure you thoroughly list all the elements that contribute to creating the problem. Next, make a list of potential solutions. Remember, there is likely to be more than one solution.

Theory/application writing. If your assignment asks you to develop a theory or an argument, abstract it from the situation at hand. Does your theory hold through the text? Would it apply to a new position, or can you think of a similar situation that works similarly? Explain your ideas to a friend.

Defining critical questions. You may have lots of evidence or information and still feel uncertain about what to do with it or how to write about it. Look at your evidence and see if you can find repeated information or a repeated missing piece. See if you can write a question or a series of questions summarizing your paper's most important ideas. Once you have the critical questions, you can begin to organize your ideas around potential answers to the question.

Explaining/teaching ideas to someone else. Sometimes the most efficient way to clarify ideas is to explain them to someone else. The other person need not be knowledgeable about your subject; it sometimes helps if they are not familiar with your topic but should be willing to listen and interrupt you when he or she does not follow you. As you teach your ideas to someone else, you may begin to have more confidence in the shape of your ideas, or you may be able to identify the holes in your argument and be more able to fix them.

4.4.3 Discussion-based activities

Discussion-based activities allow for a supportive and inclusive exchange of viewpoints and can be challenging, but the benefit to student learning outweighs the challenges.

Higher education is essential for critical engagement with challenging issues with apparent differences in opinion (e.g., sustainability and strategies for dealing with pandemics). One way of highlighting these differences is through debate. Debates are distinct as an active, argument form of oral pedagogy, which can bring drama to the classroom and engage students in a lively discussion. The method makes it necessary for students to seek reasons to justify their viewpoint by developing such abilities as identifying value assumptions within arguments and judging whether data are misleading or absent.

Backchannel discussions*:* This is a secondary channel of communication that often happens in real-time. For example, students engage with each other alongside a lecture or activity and can support one another by asking and answering questions. A teaching assistant can also be included to support and monitor the chat so questions, concerns, or misconceptions can be brought to the instructor's attention.

Discussion boards: These can be used for many purposes. However, the most common is to pose questions that require students to think critically and post a response. The discussion becomes robust when students thoughtfully reply to additional posts.

Scenario-based discussions: An activity designed to have students analyze and think critically to solve a problem, decide, or explore an issue. The scenarios are culturally, socially, or contextually relevant and highly interesting to students.

Socratic seminar*:* This activity helps students develop a deep understanding through thought-provoking questions. Furthermore, students practice their critical

thinking skills through dialogue and (re)examine their thoughts and opinions about a particular topic. The objective is not for students to come to an answer but to delve deeper into a topic and spark curiosity.

Student-generated questions: Challenge students to create quality questions related to learning outcomes and their levels of cognitive complexity.

Think-pair-share (TPS): Students independently think about or write the answer to a question. Students then work with a peer to discuss their responses. From there, students share with a larger group or the whole class. Instructors pose a question, and students first THINK to themselves before being instructed to discuss their response with someone sitting near them (PAIR). Finally, the groups SHARE what they discussed with their partner with the entire class, and the discussion continues. Students get time to think critically, creating a learning environment that encourages high-quality responses. TPS allows students to work in groups toward a common goal, increasing their and others' understanding in a safe environment to make mistakes.

4.4.4 Small group learning activities

Small group learning activities are designed for students to benefit from peer-to-peer interactions. When students collaborate, it allows them to work together and maximize each other's learning, leading to increased student success.

Brainstorming techniques. Brainstorming is a creative problem-solving technique that originated in the 1930s. Alex Osborn, a businessman, developed it. He wrote a book called How to Think Up Ideas, describing a method for generating new ideas. The basic concept of brainstorming is that it is a way to generate many ideas quickly and evaluate them later to see which ones are most promising. The original brainstorming technique involved people getting together in a room and generating ideas. The goal was to gather as many ideas as possible without judging or evaluating them. Participants were encouraged to think outside the box and develop unconventional or impractical ideas.

The most effective techniques for brainstorming are as follows.

1. The questioning technique: In doing so, the "Who, What, Why, When, Where?" are asked repeatedly. Example questions can be "Why does someone have problem X," "Who could need product Y," and "Where can technology Z be used elsewhere?"

2. The reversal technique: The opposite is deliberately played out here. The question here is not "Who could need product Y and why" but the exact opposite question, "Who can NOT need product Y and why? You can also clarify important questions like it should not be and then make them more efficient. It is advised to use this technique at the beginning of each session to let the creative juices flow.

3. The subjunctive method: Set no limits for yourself and consciously think "out of the box." The method consciously asks questions such as "What would have to happen for…." or "Under what circumstances would X work?" It should help make the thoughts more accessible, so one could find possibilities to make the initially impossible possible by just figuring out the impossible.

4. Why-analysis: The problem is presented in groups or smaller subgroups. The respective group then defines five questions with "why" to shed more light on the problem and possibly get more perspectives. This simple technique can help better analyze complex issues and promote the flow of ideas through open conversations. This process can be repeated at will and also used for sub-problems.

5. Reverse brainstorming: A classic brainstorming method. Here, the first goal of the workshop is not the solution but the problem. It is especially helpful because you focus on the problem and possible causes for the problem beforehand. This results in discussions and insights that go much deeper than the initial understanding of the problem.

Step 1: All group members are encouraged to brainstorm how to cause the problem. It involves collecting all ideas.

Step 2: The identified problems and problem triggers are then used as the basis for the next step. As with classic brainstorming, the focus is then back on the solution. This way, elements that may impact the problem can be addressed.

6. Fishbowl: A small group of students is broken into two small subgroups (Fig. 4.2).

One group sits in an inner circle called the fishbowl. These students discuss their opinion about a topic. The other students in the outer circle actively listen to the students in the fishbowl. After several minutes, the two groups switch, and the new group can provide counterarguments until the instructor ends the fishbowl.

Figure 4.2 A scheme to illustrate students' location in the fishbowl approach

Therefore, this technique serves two purposes: to provide structure for in-depth discussion and opportunities for students to model or observe group processes in a discussion setting.

Students discuss a prompt using different question types inside the circle (Table 4.3), while outside the circle, students listen and observe. Creating an open-ended discussion prompt related to the course learning goals is important and will likely generate rich discussion.

As you set parameters, consider aspects such as:
- Whether you want to facilitate the inner circle discussion, sit with the outer circle, or separate yourself so that you can observe both circles.
- Whether you want one fishbowl or multiple smaller fishbowls, and the size of the inner circles, for one fishbowl, the inner circle generally consists of 3-5 students; for multiple fishbowls, the inner circle typically consists of 2-3 students.

How will you move students into circles? If the physical constraints of the classroom do not allow the movement of chairs into circles, consider having the inner circle of students sit in chairs and participate in the discussion at the front of the classroom.

Table 4.3

Question types used in Fishbowl

Question type	Purpose	Example
Exploratory	Probe facts and basic knowledge	What research evidence supports ____ ?
Challenge	Examine assumptions, conditions, and interpretations	How else might we account for ___ ?
Relational	Ask for a comparison of themes, ideas, or issues	How does ___ compare to ___ ?
Diagnostic	Probe motives and causes	Why did ___ ?
Action	Call for a conclusion or action	In response to ___, what should ___ do?
Cause and effect	Ask for casual relationships between ideas, actions, or events	If ___ occurred, what would happen?
Extension	Expand the discussion	What are additional ways that ___?

Details of the Fishbowl technique are well described in the YouTube channel of K. Patricia Cross Academy. This resource is devoted to modern problems of education, emphasizing higher education.

"The task of the excellent teacher is to stimulate 'apparently ordinary' people to unusual effort. The tough problem is not in identifying winners but in making winners out of ordinary people." (Dr. K. Patricia Cross)

The K. Patricia Cross Academy

Ask students to form concentric circles for either a single or multiple fishbowls. Give students the following guidelines: only inner circle students will speak; outer circle students will be 'observers' and take notes on both content and group process; although observers will not speak during the Fishbowl discussion, they will have the opportunity to address any issues that arise in the follow-up discussion.

7. Jigsaw: Students work on a part or "piece" of a concept. Students share their "pieces" with others to create the whole. This activity can be done with sections of an article, book chapters, parts of a problem, and sections of a study review. In a Jigsaw, students work in small groups to develop knowledge about a given topic before teaching what they have learned to another group. The main steps of the Jigsaw process are illustrated in Fig. 4.3.

Jigsaw was initially developed in the early 1970s to improve student relations and collaboration in recently desegregated schools. It has since been

used in classrooms, labs, and fieldwork across all educational levels, from grade school to graduate school. Jigsaw is a flexible technique; you can use it for almost any content that you can divide into equal parts. The technique is appropriate across disciplines and fields.

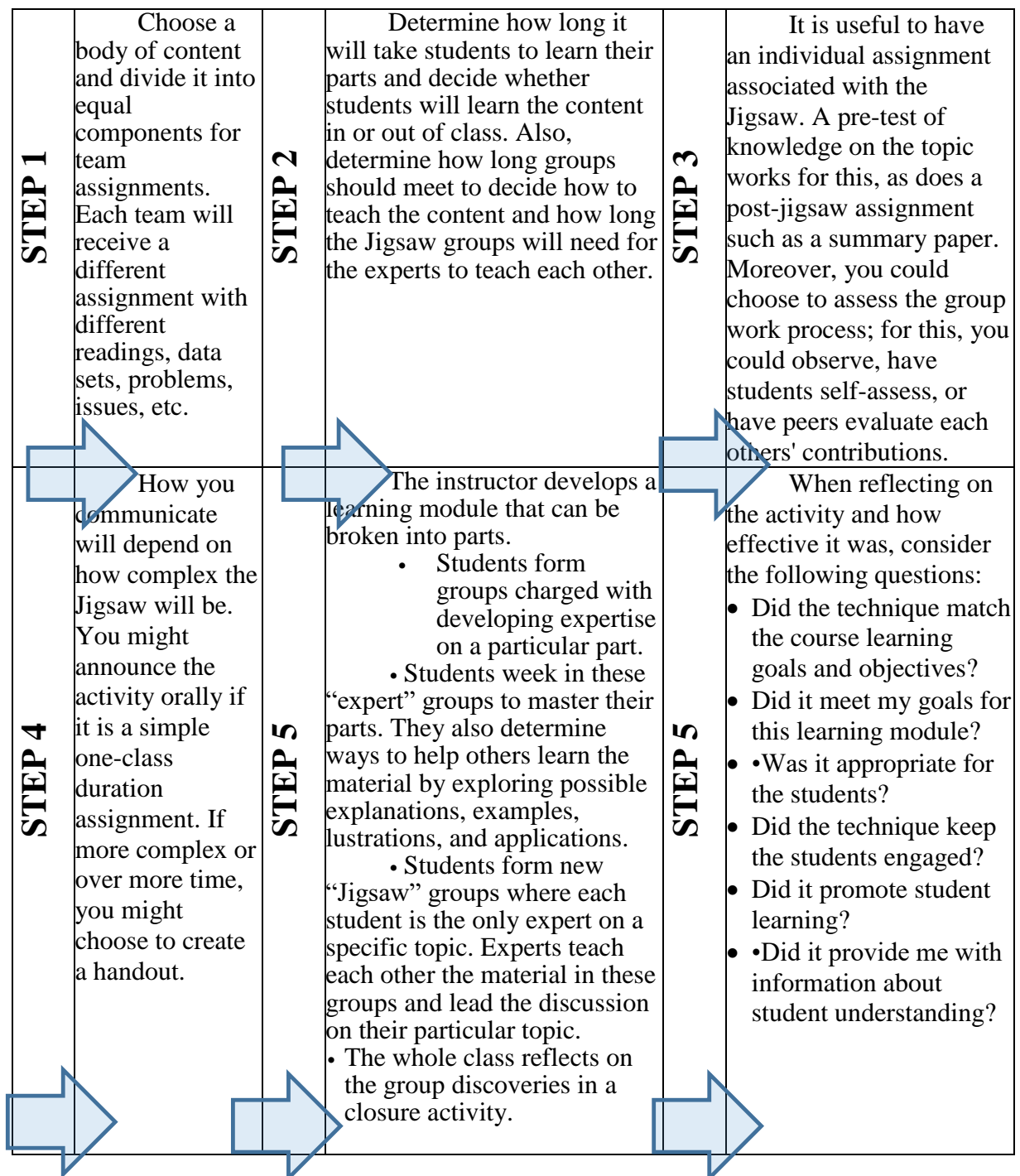| STEP 1	Choose a body of content and divide it into equal components for team assignments. Each team will receive a different assignment with different readings, data sets, problems, issues, etc.	STEP 2	Determine how long it will take students to learn their parts and decide whether students will learn the content in or out of class. Also, determine how long groups should meet to decide how to teach the content and how long the Jigsaw groups will need for the experts to teach each other.	STEP 3	It is useful to have an individual assignment associated with the Jigsaw. A pre-test of knowledge on the topic works for this, as does a post-jigsaw assignment such as a summary paper. Moreover, you could choose to assess the group work process; for this, you could observe, have students self-assess, or have peers evaluate each others' contributions.
STEP 4	How you communicate will depend on how complex the Jigsaw will be. You might announce the activity orally if it is a simple one-class duration assignment. If more complex or over more time, you might choose to create a handout.	STEP 5	The instructor develops a learning module that can be broken into parts. • Students form groups charged with developing expertise on a particular part. • Students week in these "expert" groups to master their parts. They also determine ways to help others learn the material by exploring possible explanations, examples, lustrations, and applications. • Students form new "Jigsaw" groups where each student is the only expert on a specific topic. Experts teach each other the material in these groups and lead the discussion on their particular topic. • The whole class reflects on the group discoveries in a closure activity.	STEP 5	When reflecting on the activity and how effective it was, consider the following questions: • Did the technique match the course learning goals and objectives? • Did it meet my goals for this learning module? • •Was it appropriate for the students? • Did the technique keep the students engaged? • Did it promote student learning? • •Did it provide me with information about student understanding?

Figure 4.3 Main steps of the Jigsaw process

The Jigsaw technique allows students to achieve multiple learning goals. It helps students to cover and master foundational knowledge. It also prompts them to analyze information to see how an entire content unit can be divided into parts. This approach, in turn, also helps students learn how to learn. It motivates students to accept responsibility for learning something well enough to teach it to their peers, which promotes their caring about a topic. It gives each student a chance to

be in the spotlight, which is also motivating. Use the technique for complex problem-solving tasks and have expert groups learn a skill necessary to solve the problem. Increase student interest in this exercise by asking students to help generate lists of topics.

Instead of asking students to work in two groups (the Expert one for mastery and the Jigsaw one for teaching), have students work with only one group. In this case, pairs form and break off to develop expertise on a specific topic and then rejoin the entire group for teaching. This variation is called "Within Team Jigsaw." Give students a list of the key points representing your initial thinking on teaching the topic.

Invite them to critique your approach and then either go beyond it or think differently and devise an alternative way to teach the topic.

Ask groups to choose a spokesperson for an all-class review. The spokespersons make a presentation to the whole class, and the remaining group members can elaborate or contribute additional views.

Explanation of Jigsaw

4.4.5 Experiential-based activities

Experiential activity is a pedagogical process. Instructors engage students through direct experience and reflection, and students can analyze and experiment to deepen their understanding. The following activities allow students to learn by actively engaging in the learning process.

Debates: A formal argument on a particular topic. Students apply their understanding to form arguments for and against a particular topic. The objective is for students to be able to argue for both opposing viewpoints using their content knowledge and, if allowed by the instructor, supporting resources.

Field trips: Students have first-hand experiences outside the classroom. Allowing students to observe and interact with the real world will enable them to apply their new understandings to authentic contexts.

Panel discussions: Panels often focus on a particular topic and can include various people such as experts, former students, career-oriented professionals, or community members impacted by a relevant issue. Students then engage with the panel members by asking thought-provoking questions while deepening their understanding through higher cognitive skills.

Press conference: This activity is role-playing in which students act as interviewers by developing questions on a particular topic, lesson, or unit. Students take turns asking the instructor their generated questions during the press conference. Students jot down notes and ask follow-up questions as needed. Students build knowledge, think critically, and connect by engaging in this dialogue.

4.4.6 End-of-class activities

Exit tickets: Students answer a question or solve a problem. Students hand their exit tickets to the instructor before leaving class. The instructor reviews the

exit tickets and uses the information to prepare for the following class. It might include identifying misconceptions to review or to confirm that students grasped new content and are ready to learn subsequent concepts.

Muddiest point: Students identify concepts that are confusing or need clarification. It can be done in various ways, such as a one-minute paper, discussion board response, index card, survey, etc.

Peer assessment: Students work collaboratively to review each other's work using an objective tool such as a rubric.

Reflection/Reaction paragraph: Students take several minutes at the end of class to reflect on and write about their learning experience. This reflection could include a sentence about what they understood if they felt they achieved the learning outcome for the day, and the remaining questions or concerns. The objective of the paragraph is for students to strengthen their self-regulation skills.

Self-assessment: Students review their work from a supportive and constructive perspective. Students identify their strengths and growth areas on a particular assignment or project. Doing so helps students become self-regulated learners.

4.5 Inquiry-based learning

Inquiry-based learning is a form of learning based solely on questioning to seek knowledge. At times, inquiry-based learning is presented as a problem or scenario for students to solve. In all formats of inquiry-based learning, student exploration is at the forefront of the teaching and learning experience.

Inquiry-based learning occurs when students formulate questions, research answers to their posed questions, share their solutions and new knowledge and then reflect on the process. Rather than having the classroom teacher determine the topic or targeted questions of a unit of study, the students can choose the questions about the subject they want to explore further.

While there are several different types of inquiry-based learning, the result is the same. Students use open-ended questions to direct their learning based on their interests. They are making connections and deepening their knowledge. Inquiry-based learning allows students to understand the content and increase comprehension indeed.

What are the benefits of inquiry-based learning? This learning style promotes a student's curiosity and the opportunity for collaboration, which increases student engagement. When students own their education, their interest level increases, leading to higher comprehension skills. A deeper level of knowledge takes place in this style of learning. Instead of a traditional type of learning that often involves teacher talk, teacher-posed questions, student memorization, and student recall, students plan and implement their learning. Teachers become a facilitator of learning.

Approaches to inquiry-based learning include:
- problem-based learning (PBL);
- project-based learning (PjBL);
- investigative case-based learning (ICBL).

4.5.1 Problem-based learning

Problem-based learning (PBL) encourages academics to place that aspect at the center of the learning process. PBL is where students are confronted with the materials and facts underlying a problem from which they have to work out the nature of the problem and an appropriate solution, usually without prior instruction or the necessary knowledge to solve it.

The underpinning philosophy of PBL is that learning can be considered a "constructive, self-directed, collaborative and contextual" activity. The principle of constructivism considers students as active knowledge seekers and co-creators who organize new relevant experiences into personal mental representations or schemata with the help of prior knowledge. Such an approach is further reinforced by social theories of learning that postulate the merits of social interaction in cognitive development.

In PBL, students work in small collaborative groups and learn what they need to know to solve a problem (Fig 4.4). The teacher acts as a facilitator to guide student learning through the learning cycle.
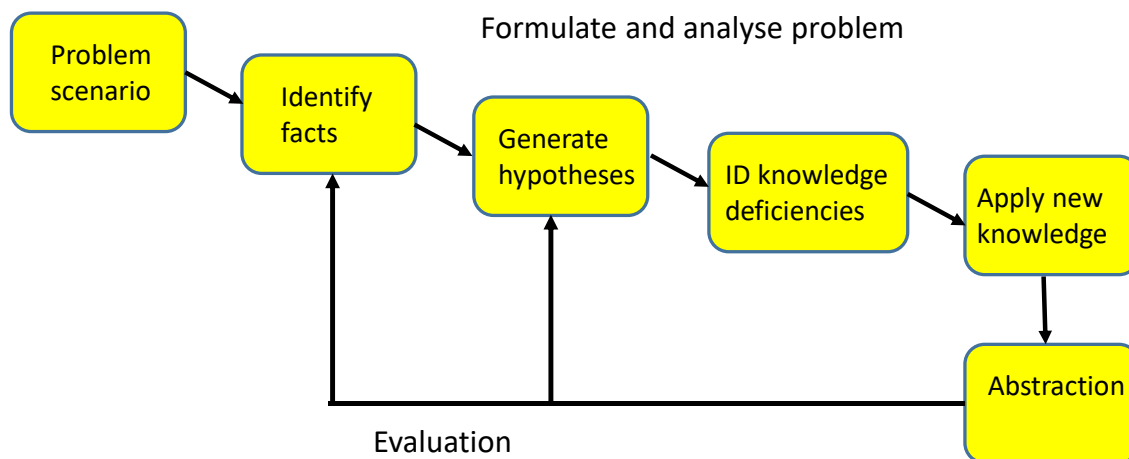
Figure 4.4 Main steps of Problem-based learning

In this cycle, also known as the PBL tutorial process, the students are presented with a problem scenario. They formulate and analyze the problem by identifying the relevant facts from the scenario. This fact-identification step helps students represent the problem. As students understand the problem better, they generate hypotheses about possible solutions. An essential part of this cycle is identifying knowledge deficiencies relative to the problem. These knowledge deficiencies become what is known as the learning issues that students research during their self-directed learning.

A PBL tutorial session begins by presenting a group of students with minimal information about a complex problem. From the outset, students must question the facilitator to obtain additional problem information; they may also gather facts by doing experiments or other research during their problem-solving. Students typically pause to reflect on the data they have collected so far, generate questions about those data, and hypothesize about underlying causal mechanisms that might help explain the data. Students also identify concepts they need to learn more about to solve the problem, labeling them "learning issues." After considering the

problem with their knowledge, students independently research their chosen learning issues. They then regroup to share what they have learned, reconsider their hypotheses, and/or generate new hypotheses in light of their new learning. When completing the task, learners deliberately reflect on the problem to abstract the lessons learned about it and their self-directed learning and collaborative problem-solving processes.

Schwartz and Bransford conducted a controlled study of students in an undergraduate psychology course. They compared students in three groups:
(a) students who just solved problems,
(b) students who read a textbook chapter before attending a lecture,
(c) students who solved problems before attending a lecture.
They found that students who solved problems before the lecture performed better on a problem-solving task than students who read the chapter or solved problems. This finding suggests that attempting to solve a problem helps create a readiness to learn from a lecture.[64]

Collaborative problem-solving groups are a vital feature of PBL. One assumption of PBL is that the small group structure helps distribute the cognitive load among the group members. Such a structure takes advantage of group members' distributed expertise by allowing the whole group to tackle problems that are generally too difficult for each student alone.

There are many strategies to choose from when forming cooperative learning groups. Using a variety of strategies ensures that students have an opportunity to work with many different group members throughout the year. Consider the following strategies for forming groups.

- Pairing up partners—Students pair up with someone in the same category.
- Pick a card—Use old decks of cards to form groups. Distribute the cards randomly and ask students to find the others with matching cards.
- Chalkboard list—This is a good strategy when students finish their work at different times. As students complete one assignment, they write their names on the chalkboard. When three names accumulate, they form a new group and move on to the next activity.

The commonly acknowledged characteristics of problem-based learning are:

1. Stimulus materials help students define and discuss a significant problem, question, or issue.
2. Problems are presented as a simulation of professional practice or a real-life situation.
3. Students are guided in critical thinking and provided with limited resources to help them learn from defining and attempting to resolve the problem.
4. Students work cooperatively as a group, exploring information in and out of class with access to a tutor who knows the problem well.
5. Students are encouraged to identify their learning needs and the appropriate use of available resources.

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[64] *Schwartz, D. L., and Bransford, J. D. (1998). A time for telling. Cognitive Instuction. 1998 16.*

6. Students use the knowledge gained to solve the original problem and define new learning issues.

The curriculum is organized around the problems. So problems have to be carefully matched to the desired learning outcomes. There are no lectures where PBL has been fully taken on board; students, usually working in groups, engage in self-directed learning, and the tutor acts as a facilitator, mentor, or guide. There are some disadvantages to using a wholly PBL approach. The content covered in this way is reduced compared to the amount that can be covered in lecture-based courses. In addition, many institutions may be short of the space that helps PBL work well. It also requires considerable staff time to manage the groups and develop effective problems, but many academics think the initial investment is worth the effort.

Problem-based learning is commonly confused with problem-solving learning. The latter means setting problems for students to solve after they have been taught conventionally and then discussing them later. In PBL, conversely, a problem, query, or puzzle the learner wishes to solve forms the starting point for learning. The problem, or a series of problems, is where learning starts, and in solving those problems, the learner seeks the knowledge of disciplines, facts, and procedures needed to solve the problems. The traditional disciplines do not define what is to be learned; the problems do. However, the aim is not only to solve those particular problems, but in the course of doing so, the learner acquires knowledge, content-related skills, self-management skills, attitudes, and know-how: in a word, professional wisdom. It means the problems have to be carefully selected.

Problems need to be complex, ill-structured, and open-ended; to support intrinsic motivation to foster flexible thinking. They must also be realistic and resonate with the student's experiences. A good problem affords feedback that allows students to evaluate the effectiveness of their knowledge, reasoning, and learning strategies. The problems should also promote conjecture and argumentation. Problem solutions should be complex enough to require many interrelated pieces and should motivate the students' need to know and learn

A good problem has the following characteristics:
1. It calls on different disciplines and integrates them in solving the problem.
2. It raises options that promote discussion.
3. It activates and incorporates previous knowledge.
4. It requires new knowledge the students do not yet have.
5. It stimulates participants to elaborate.
6. It requires self-directed learning.

Designing a problem.
1. Map all the concepts. They will likely be involved from different disciplines, including the knowledge and skills required to solve the situation.
2. What do you expect the students to do with the new knowledge and skills?
3. Identify a real problem from a real-life situation important to students, such as one they will likely meet in their future employment. Authenticity is highly motivating.
4. Provide a context and specific role of the practitioner: what, when, and where.

5. Many situations or problems evolve over time. Providing an extended problem (called the 'roll-out' problem or case) might be appropriate. Such a problem is, in parts, covering a sequence of events, or the problem is addressed in stages as more data become available and may last over more than one semester.

Practical works are by their very nature student-centered and deliver a wide range of learning outcomes that may include:

- gaining practical skills,
- gaining experience with particular pieces of equipment/tools,
- planning a testing program,
- making links between theory and practice,
- gathering data,
- analysis of data,
- making observations,
- forming and testing hypotheses,
- using judgment,
- developing problem-solving skills,
- communicating data and concepts,
- developing personal skills.

Problem-based learning is one of a family of approaches that include project-based science. As shown in Table 4.4, all three approaches use a common problem and rely on the teacher to help guide the learning process.

Table 4.4

Comparing problem-based and project-based learning

	Problem-based learning	Project-based learning
Problem	Realistic ill-structured problem.	Driving question.
	Problem-based Learning begins with a problem that determines what students study. The problem derives from observable phenomena or events; the emphasis is on acquiring new knowledge, and the solution is less important.	Project-based learning begins with assigning tasks to create a final product or artifact. The emphasis is on the end product.
Role of problem	Focus on learning information and reasoning strategies	Focus on scientific inquiry process leading to artifact production
Process	Identify facts, generate ideas and learning issues, revisit and reflect	Prediction, observation, and explanation cycles
Role of teacher	Facilitate learning process and model reasoning	Introduce relevant content before and during the inquiry
Collaboration	Negotiation of ideas Individual students bring new knowledge to the group for application to the problem	Negotiation of ideas with peers and local community members

They differ in terms of the type and role of the problem, the problem-solving process, and the specific tools employed. For example, PBL uses realistic, ill-

structured problems. In this setting, the problem is the focus on acquiring knowledge and reasoning strategies.

4.5.2 Project-based learning

Project-based learning (PjBL) is a collaborative inquiry-based teaching method where students integrate, apply, and construct their knowledge as they work together to solve complex problems. Project-based learning allows students to combine knowledge-based skills from several subject areas and use them in real-life situations. It also helps to reinforce existing knowledge and provides a context to the theory.

Projects can operate within hugely diverse contexts and along a broad continuum of approaches. They may be used by a single lecturer or course team within a department, mainly using more traditional teaching methods. The choice of project work type will depend on the intended learning outcomes and whether you seek depth of knowledge-based skills. Projects may be open or closed; individual or group; conducted over a day or a year; or multidisciplinary. Projects are often well suited to applied topics, where different solutions may have equal validity. Students will be required to discover new information and use that knowledge to find solutions and answers, but they will need support to become independent learners.

The scientific practices identified from inquiry-based learning research can be used to describe these practices found in PjBL. Students engage in the following scientific practices within a research project:

1. Orientation into the topic: at the end, students have a problem they must solve.
2. Conceptualization:
    a. Presenting research questions.
    b. Presenting hypotheses.
3. Investigation:
    a. Exploration (if there is only a research question but no hypothesis).
    b. Experimentation (if there is a hypothesis).
    c. Data interpretation.
4. Conclusions: students draw them based on the collected data.
5. Discussion:
    a. Communicating the results.
    b. Reflection.

In PjBL, the learning process involves producing an artifact or an end product that answers the driving question. The artifacts are concrete, for example, games, posters, models, plays, websites, or drawings. The artifact should:

1. Answer the driving question.
2. Reveal the students' level of understanding.
3. Support students in gaining an understanding of the topic when they are creating the artifact.

The PjBL unit could lead to multiple artifacts, but they should culminate into one artifact that answers the driving question. Creating artifacts is beneficial for learning: students can be expected to learn more effectively when they make

external representations of their conceptions. Deploying physical objects in the learning process also expands the limitations set by working memory. Creating artifacts forces the students to rebuild their understanding constantly.

Ideally, the artifacts should be made public and presented to an audience. However, within science education, there is a need to conceptualize artifacts better; articles tend not to specify why certain artifacts are specific to PjBL, and the artifacts rarely serve a real purpose, disregarding the overarching goal of striving towards authenticity in PjBL.

The driving question has an authentic link to the real world experienced by the learners (learning environments are local or otherwise familiar to students; use of socio-scientific issues). The driving question is open-ended.

The idea behind retrieval practice is to develop ways to turn passively-absorbed information into more embedded knowledge and understanding. Instead of re-reading books and notes, retrieval depends on one's ability to "hack" their ability to recall information. This step occurs through visual note-taking, peer-to-peer teaching, or with hands-on experiences.

The exceptional relationship between curiosity, critical thinking, and problem-solving is a cornerstone of all project-based learning models. These strengthen connections through guided discovery problems. These carefully constructed puzzles, challenges, or discrete questions push students to learn how to solve the issues and build a knowledge framework from these inquiries — before explaining the content to them. This discovery learning method is based on the profound and straightforward notion that students are more likely to remember concepts and principles when they initially discover them. These "learning-by-doing" exercises combine experiential learning and haptic engagement exercises. Ideally, introducing these lessons in a collaborative setting in which individuals experience the learning, reflect upon it, and convey the lessons they have learned to their teammates.

Project-based activities.

Create a poster session: Students create a dynamic or interactive poster to explain, pose, solve, and answer a particular topic and its surrounding questions. A poster is a tool for students to demonstrate their understanding of a topic and

Build a wiki: Students collaborate to create a "living document" (students can work simultaneously to build the document on a particular topic. This document can be made over time.

Design a vlog: This is similar to a blog, but the content is not written but presented in short videos.

Record a podcast: Students can create an audio file that discusses, interviews, reenacts, or reviews a particular topic, person, event, or place.

Write a blog: Students can comment on current topics or events, and it is often written in an informal conversational tone. A blog is typically a website that is continually added to.

The influence of contextual factors on cognition has also engendered a good deal of research and has, according to the citations in PjBL research, had an important influence on the authenticity and autonomy elements of Project-Based

Learning. According to research on "situated cognition," learning is maximized if the context for learning resembles the real-life context in which the to-be-learned material will be used.

Learning is minimized if the context in which learning occurs is dissimilar to the context in which the learning will be used. Additionally, research on contextual factors has led to the recommendation that, to the extent that students need to be able to apply what they learn to solve problems and make decisions, instruction be carried out in a problem-solving context. Learning that occurs in the context of problem-solving is more likely to be retained and applied. Such learning is also seen as being more flexible than the inert knowledge acquired due to more traditional didactic teaching methods.

The relationship between teaching and research is widely seen as important. For some, the proximity of teaching to knowledge creation processes gives higher education its 'higher' quality. Exercise strategies may distance research from undergraduate teaching in particular and reflect an alternative, common view that teaching and research may be largely independent activities.

Conventionally it has been assumed that insofar as there is a connection between research and teaching, it lies in the subject expertise of the staff. In other words, teaching will be research-led, where teaching and learning reflect and are directly based on the specialist research interests of the staff delivering the curriculum.

Such an approach can leave students as spectators rather than participants. They can admire the scholarship from a distance but not necessarily gain any deeper understanding of research as a learning process. However, there are methods of enabling undergraduate students to participate in research through learning and teaching which are explicitly research-tutored or research-based. The difference between these is that the former allows students to engage critically and reflectively with research literature and data. In contrast, the latter enables students to research and learn through inquiry. It is argued that such methods add real value to undergraduate work for learners and teachers. Learning becomes linked to the lecturer's research interests in ways that develop new and original research for the lecturer while giving students a direct experience of research and increasing their motivation to learn.

Regarding measuring the perceived impact of PjBL on learning, 69% of all students in both samples agreed or strongly agreed that the project-based assignment enabled them to gain an in-depth understanding of project management concepts. Furthermore, 71% of students agreed or strongly agreed that the assignment allowed them to relate better to the project management concepts. 92% of students agreed or strongly agreed that the assignment enabled them to recognize the triple tasks of digitalization projects. And 64% of students agreed or strongly agreed that the assignment provided an authentic learning experience.[65]

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[65] *Ngereja B, Hussein B, Andersen B. Does Project-Based Learning (PjBL) Promote Student Learning? A Performance Evaluation. Education Sciences. 2020; 10(11):330.*

4.5.3 Investigative case-based learning

Investigative case-based learning (ICBL) is a variant of PjBL that encourages students to develop questions that can be explored further by reasonable investigative approaches. Students then gather data and information for testing their hypotheses, producing materials that can be used to persuade others of their findings. Students employ various methods and resources, including traditional laboratory and field techniques, software simulations and models, data sets, internet-based tools, and information retrieval methods.

Investigative cases draw from realistic situations in which scientific reasoning can be applied. Although the case defines a general area of geoscience under investigation, students generate specific questions to guide their study. Students investigate scientific problems. In the process, they also learn to:

- locate and manage information;
- develop reasonable answers to the questions;
- use scientific inquiry strategies and methods
- provide support for their conclusions, and;
- work on decision-making abilities.

Investigative case-based learning methods incorporate problem-posing, problem-solving, and peer persuasion. Instructors and students are collaborators in this three-phase process, often providing additional insights and defining potential strengths and weaknesses in the design of the problem statement and the investigation. The resolution (or clarification) of the problem and its presentation extend opportunities for student practice in utilizing and evaluating scientific approaches to problem-solving.

Learners use the case to brainstorm questions they will try to answer. Students become more aware of what they know and need to know, thus becoming more directed in their reading and more motivated in subsequent lectures, labs, and discussions. In fact, they are learning just as most of us learn – they have a problem or question first. A case could be introduced at the start of the lecture with a short discussion (5-10 minutes) for generating a Know/Need to Know chart on the board. Students share their prior knowledge and experience while at the same time identifying what they need to learn more about. This pre-assessment strategy might then be tied into a lab or field assignment.

The Harvard Kennedy School website illustrates techniques for organizing the case method and recording case studies and additional sources.

Teaching with cases

4.6 Student self-regulated learning

Zimmerman, one of the first **Self-Regulated Learning** (SRL) authors, who has developed three different models of SRL, gives a helpful description of what a successful self-regulated learner looks like:

> These learners are proactive in their efforts to learn because they are aware of their strengths and limitations and because they are guided by personally set goals and task-related strategies, such as using an arithmetic addition strategy to check the accuracy of solutions to subtraction problems. These learners monitor their behavior in terms of their goals and self-reflect on their increasing effectiveness. It enhances their self-satisfaction and motivation to continue improving their learning methods.'[66]

Zimmerman's Cyclical Phases model is organized into three phases: forethought, performance, and self-reflection (Fig. 4.5). In the forethought phase, the students analyze the task, set goals, and plan how to reach them. Several motivational beliefs energize the process and influence the activation of learning strategies.

Performance phase

Self-Control
Task strategies; Self-instruction;
Imagery; Time management;
Environmental structuring;
Help-seeking;
Interest incentives;
Self-consequences.

Self observation
Metacognitive monitoring
Self-recording

Forethought phase

Task Analysis
Goal setting
Strategic planning

Self-Motivation Beliefs
Self-efficacy
Outcome expectations
Task interest/value
Goal orientation

Self-Reflection Phase

Self-Judgement
Self-evaluation
Casual attribution

Self-Reaction
Self-satisfaction/affect
Adaptive/defensive

Figure 4.5 Zimmerman's Cyclical Phases model

In the performance phase, the students actually execute the task. At the same time, they monitor how they are progressing and use several self-control strategies to keep themselves cognitively engaged and motivated to finish the task. Finally, in the self-reflection phase, students assess how they have performed the task, making attributions about their success or failure. These attributions generate self-

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[66] *Zimmerman, B. J. (2000). Attainment of self-regulation: A social cognitive perspective.In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), Handbook of self-regulation, research, and applications (pp. 13–39). Orlando, FL: Academic Press.*

reactions that can positively or negatively influence how the students approach the task in later performances.

Effective learners use several strategies to help them learn well independently. According to Zimmerman, these can include:
• setting specific short-term goals;
• adopting powerful strategies for attaining the goals;
• monitoring performance for signs of progress;
• restructuring one's physical and social context to make it compatible with one's goals;
• managing time use efficiently;
• self-evaluating one's methods;
• attributing causation to results and adapting future methods.

Self-regulated learning includes the cognitive, metacognitive, behavioral, motivational, and emotional/affective aspects of learning. **Metacognition** is about the ways learners monitor and purposefully direct their learning. Self-regulated learners know their strengths and weaknesses and can motivate themselves to engage in and improve their learning. At the heart of this is metacognition.

When undertaking a learning task, we start with this knowledge, then apply and adapt it. It is metacognitive regulation. It is about planning how to launch a task, working on it while monitoring the strategy to check progress, then evaluating the overall success (Fig. 4.6). This is not a one-off process of discrete steps but an ongoing cycle. In progress through the task of applying your metacognitive and cognitive skills, you update your metacognitive knowledge (of yourself, strategies, and tasks), as well as update your subject knowledge and skills.
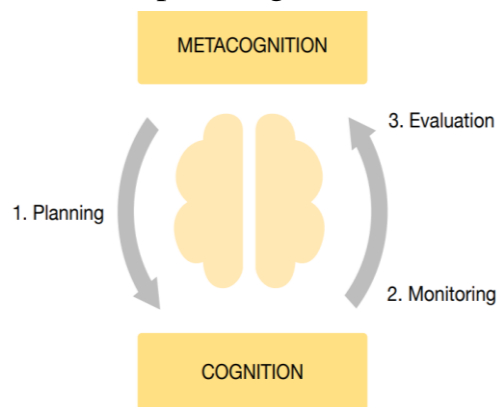
Figure 4.6 Zimmerman's Cyclical Phases model

Planning – encouraging students to think about the goal of their learning and to consider how they will approach the task; this includes ensuring they understand the goal, activate relevant prior knowledge about the task, select appropriate strategies, and consider how to allocate their effort;

Monitoring – emphasizing the need, while undertaking the learning task, for students to assess the progress they are making; this includes the self-testing and self-questioning activities that are necessary to control learning and make changes to their chosen strategies;

Evaluating – appraising the effectiveness of their plan and its implementation.

Metacognition is the knowledge of cognition and the strategies to regulate and control it. However, it would be a mistake to see metacognition as somewhat 'higher order,' surpassing cognitive activities such as remembering knowledge. As pointed out, it is tough to have metacognitive knowledge about your

competence in a given subject domain or how best you can learn without sound subject knowledge.

4.7 Scenario-based learning

Scenario-based learning (SBL) is a form of training that focuses on learning by doing. It uses **real-life situations** to support **active learning**. Rather than passively absorbing information, learners are immersed in a story. Using realistic work situations provides relatable, relevant, and impactful learning experiences. Adding **interactivity** to the scenario enables users to make decisions and learn by experiencing the consequences of their choices. Within higher education, "scenario-based learning" refers to any pedagogical approach that involves intentionally using scenarios to bring about desired learning intentions. Scenarios can facilitate other significant aspects of identity formation: in particular, a proactive deployment in learning and knowledge construction, involving a growing ability for students to interact with all kinds of situations and people within the quasi-professional setting.

The strategy takes from the works and ideas of Jean Lave and Etienne Wenger. They proposed the situated learning theory back in 1991, stating that the most effective learning is context-dependent. A relevant context or a story joins the points to create a bigger picture. Then, this bigger picture helps learners make sense of things and remember them for longer. Knowledge retention is a constant struggle for people.

In fact, the forgetting curve by Ebbinghaus shows that people forget up to 70% of what they learn within 24 hours (Fig. 4.7). Hence, it is nearly impossible to retain all of what we learn daily. SBL is an intelligent strategy that offers an optimal and easy solution to this crisis. A contextual setting enables learners to easily manage it within their working memory and commit it to their long-term memory.
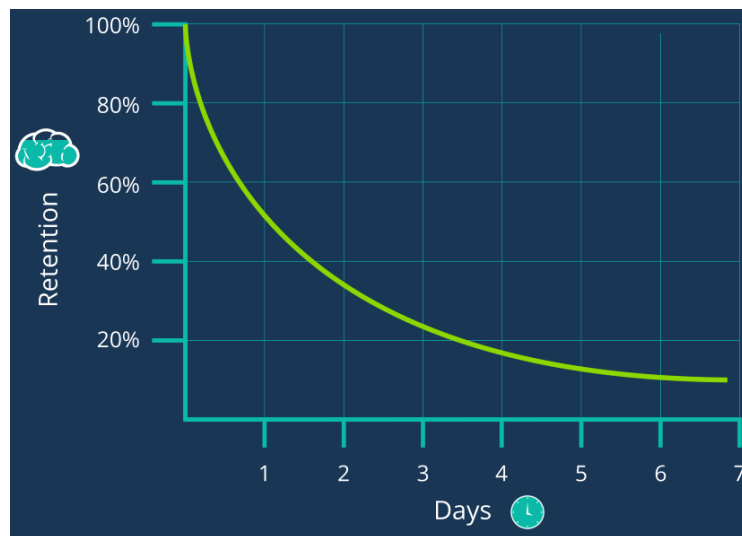

Figure 4.7 The forgetting curve

Scenarios help learners understand how the knowledge they gain can be applied in a professional environment. Within a scenario-based learning framework, students, as potential professionals, are presented with a scenario descriptor or set of realistic circumstances. It is accompanied by one or more focus questions and/or dilemmas designed to pursue particular lines of inquiry and fulfill specific learning intentions along possible pathways. Students often assume specific roles and/or at least consider perspectives that will allow them to explore the scenario from a range of vantage points. Students often work in teams and

present their findings to the class, forming a collegial audience. Participants and the audience then evaluate and reflect on the process from various personal/professional perspectives. There is a clear overlap between problem-based learning per se and problem-based scenarios (Table 4.5). Scenarios can add to the realism of potentially abstract problems.

Not all scenarios are problem-based, and some simply require students to demonstrate what they already know by reproducing set procedures and facts (skills-based scenarios). Students may explore concerns underpinning the discipline/profession (issues-based scenarios) and/or deliberate on past/future events supported by evidence (speculative-based scenarios). One or more scenario options may be combined to map and deliver a rich set of simulated professional experiences for future graduates.

Table 4.5

Comparing project-based and predictive models

Problem-based Model	Predictive Model
These scenarios present learners with an open-ended problem to solve. For example, you can provide your teams with a data set containing the results of a marketing survey and ask the teams to create a marketing plan based on that data.	These scenarios have learners speculating on the outcome of an event based on their knowledge, supplied details and content, and assumptions.
Example: imagine you are creating a marketing plan for a new WordPress plugin, and the data set represents your potential market. Then ask them to figure out: What is your plan? How would you enter and create an impact in the market? It is an example of a problem-based scenario	Example: you are trying to teach bank tellers how to identify fraud. Provide different scenarios and ask learners to predict what a computer hacker might do next. Keep track of answers on a whiteboard to support a meaningful debrief.

Scenarios are best used for having students explore, rather than simply replicate, the repositories of knowledge belonging to the discipline. "Content" will incorporate key themes, specific issues, competencies, and professional concepts idiosyncratic to the profession. Scenario learning can fail if and when the amount of subject matter, albeit "useful," overwhelms the scenario and, subsequently, the student with too much detail.

4.7.1 Core characteristics for scenario-based learning

Realism. To fully engage learners, the scenarios must be as realistic as possible while providing students or employees with the required information.

Learner-centric. The task should draw upon learners' core strengths and allow them to use skill sets that they are developing while improving upon their weak points.

Involve applied learning strategies. Each scenario should involve skills or knowledge that learners have already gathered and which can be applied to the current task. Under this method, learners learn by doing rather than just merely reading or hearing about the information.

Interactive. Thanks to a high level of interactivity (even in virtual classroom settings), learners become fully immersed in the task and scenario. The interactive

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modules should rely upon real-world experience rather than theoretical information.

4.7.2 Top benefits of scenario-based training

The benefits of scenario-based training:

Context: Learning is more effective if real, relevant, and practical. Set in familiar situations, and acknowledging the nuance involved in their choices, makes the learning easier to transfer to the real world.

Engagement: Humans respond well to emotionally impactful and memorable stories. A well-constructed realistic scenario will fuel a learner's motivation. Real characters and a relevant storyline will keep learners engaged. They'll want to find out what happens next and see the outcome of their choices.

A safe space: Learners can make mistakes and take remedial action to recover in a safe online simulation. This approach can explore situations that might be too risky, difficult, sensitive, or expensive to explore in real life.

The following five key aspects that we consider are characteristic of scenario-based learning: challenge, narrative, choice, roles and role-play, and authenticity:

Challenge – a clear purpose is presented to the student in a way that intends to inspire interest and encourage a solution-focused approach.

Narrative – as the scenario evolves, there are opportunities to develop the plot in response to levels of student engagement, adding unexpected issues to change its course.

Choice – is fundamental to the learning experience of scenarios. It encourages learner autonomy and critical thinking, allowing students to reach a deeper level of learning as they evaluate the options and analyze the implications of their decisions.

Roles and role-play – through our experiences of developing scenarios, we identified two types of roles that students undertake in scenario-based learning. The first is function-based roles in which a student 'plays' a fictional role, e.g., health officer or forensic scientist. The second is intrinsic roles (or natural roles), which people take within a group, for example, a leader or a scribe.

Authenticity – for the experience of learning from and for real situations to be positive, a certain level of realism must be achieved. The authenticity is provided by the environment (a biomedical lab) and the students' real-world methods, tools, and technologies.

When learner motivation is low – when learners simply do not care, a well-designed scenario plays on their natural curiosity and that human tendency to want to know what happens next and where the story goes. A good scenario also encourages intrinsic motivation by striking a balance between challenging learners (to use existing skills and knowledge) without overwhelming them: success (and new skills or knowledge) has to feel within reach.

When the core content is dry or complex – legal topics, compliance, etc. It can be challenging for learners to realize how this content relates to their everyday life. Opening with a story illustrating the relevance and why it matters

is much more effective than just stating the facts. It means the core content, when it comes, is more likely to stick, and it provides a memorable hook for that core content. It helps with the transfer from short-term to long-term memory.

When there is not a single correct answer – scenarios, again particularly branching scenarios, can be a great choice to encourage reflection and discovery, test learners' assumptions, and encourage them to consider different perspectives. It is often the case with soft skills like leadership or negotiation. Social polling can also add a useful extra dimension here, showing learners how others responded in the same situation and prompting further thought and reflection.

When you must test learners' ability to apply the learning in context– sales skills, product knowledge, and customer service skills are good examples. A traditional multiple-choice quiz tests recall facts but do nothing to indicate what learners can do with those facts. Adding a scenario into the mix turns a quiz into a more challenging situation, giving you confidence that – if they perform well here – they will perform well where it counts. It also makes it easier for learners to transfer the concepts to their real-life context.

Where do you start?

- **Understand your learning needs:** Begin by understanding the problem you are trying to solve and your target audience. It will help you identify an approach that resonates and creates real business impact.
- **Explore the critical situations:** Identity what triggers the event, as this will be the starting point of your scenario.
- **Identify the decision points:** Walk through the work situation. Pinpoint the key decision points and the motivations behind these decisions. Identify the common mistakes people make and the key feedback and reflection points that should be highlighted.

Scenarios can provide exploratory snapshots of the culture, partial "stories" of the culture's past, present, and possible future. Culture members constitute "communities of practice" in which students acquaint themselves with the cultural norms and practices of the profession to survive and prosper. Scenario-based learning relies heavily on narrative; people would not trust your course if you failed to narrate it properly. Each scenario must tell a unique story with characters, setting, plot, challenge, and resolution. For many designers, crafting the story at the heart of a scenario poses a challenge. The best scenario stories feel authentic, relatable, and realistic to the learners. You should try to put them in the situations they will face on the job. When selecting timing for the scenario components, connect them to specific outcomes for the entire blend.

Why it works:

- The (true) story has suspense and drama without being contrived or unbelievable, and music clips and engaging visuals bring it to life.
- Decision points with immediate feedback in the narrator's voice maintain immersion and the story's momentum.
- Ultimately, those low-stakes decisions are played back with commentary on what they might suggest about the learner's responses in higher-stakes situations.

- No judgment is given – the scenario is about drawing the learner in, prompting some self-reflection, and priming them for the true learning content.
- A low-tech interactive scenario makes a big, potentially daunting topic accessible and engaging.

4.7.3 How to create scenarios for student-centered learning

The key components of designing a scenario for scenario-based learning are **where**, **who**, and **what**. These three words help in focusing the content per the requirements of SBL. Where determines the scenario's setting, location, environment, etc., whereas who looks at the people involved. Lastly, what focuses on the content of the scenario, i.e., *what is happening*?

These pointers help make a story that connects the dots for learners to get the hang of concepts. In a way, scenario-based eLearning allows fake learning where one can learn in a safe and controlled environment. For instance, think of hazard or safety training. Training people for emergencies with real experiences is not advisable, which is why simulations come in handy here.

Determine where and why learners are making errors in the real world.

The goal of any effective scenario is to allow learners to solve problems they might encounter outside of the virtual classroom. In essence, you need to ask why learners are making mistakes and what behaviors must be changed to avoid these errors.

Focus on a specific challenge or obstacle.

The scenario must mimic real-world experiences rather than trying to overload learners with information or ideas. It must show them how to behave or what to think rather than telling them. Various examples and tools for creating your own script can be found on the resource Elucidat.

Elucidat: Create engaging e-learning for your people

4.7.4 Decision-tree scenarios

A decision tree is a non-parametric supervised learning algorithm for classification and regression tasks. It has a hierarchical tree structure consisting of a root node, branches, internal nodes, and leaf nodes. It is based on the classification principles that predict the outcome of a decision, leading to different branches of a tree. Tree-based methods can help us predict and discover structure in observational data: data with many interrelated covariates, mixed-type variables, non-linear relationships, confounders, co-linearity, etc. They work particularly well when dividing the data into relatively homogeneous groups according to some outcome variable is possible. When the target variable is metric (numerical), we call the tree a regression tree and can use it to predict, for example, the mean or median value in the group. This manuscript focuses on categorical outcome variables: our trees will be classification trees. Each

branching in our tree represents a question we ask of the data, and the terminal nodes or leaves of the resulting trees can be interpreted as decisions

Ideally, a decision tree can be used in almost every sector. It is because we can take any real-world or hypothetical instance and represent it using a decision tree diagram (Fig. 4.8). Let us consider this example to understand a decision tree further. It asks a simple question – whether to buy new software or not. If we buy a new tool, it further leads to comparing the two options. If not, we can continue using the present software or borrow a friend's tool.
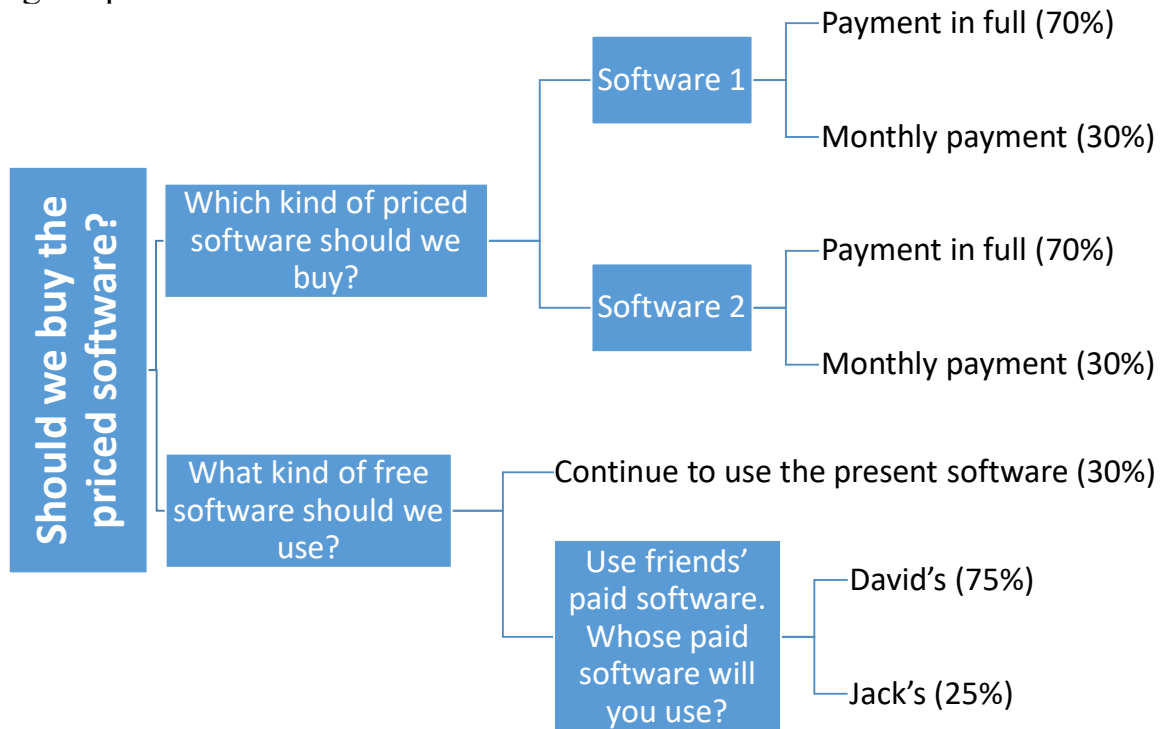
Figure 4.8 Zimmerman's Cyclical Phases model

Why do we need a Decision Tree?
- Since a decision tree provides a systematic map of the present scenario and the available options, it certainly has a wide range of applications. Following are some advantages and reasons for using a decision tree diagram.
- With the help of these tree diagrams, we can resolve a problem by covering all the possible aspects.
- It plays a crucial role in decision-making by helping us weigh the pros and cons of different options and their long-term impact.
- No computation is needed to create a decision tree, which makes them universal to every sector.
- These prediction tree diagrams can represent all kinds of categorical and continuous scenarios that can be tough to depict otherwise.
- In the present scenario, decision trees are vital in futuristic technologies like machine learning and artificial intelligence.
- They can represent quantitative and qualitative data visually without applying too much computation.

4.8 Competency-based education

Students move ahead when they have demonstrated mastery of content, not when they have reached a certain birthday or met the required hours in a classroom. "Competencies are defined by explicit learning objectives that empower students. Students receive timely, differentiated support and advance by demonstrating evidence with meaningful assessments via mastery, not seat time."[67]

Students have multiple means and opportunities to demonstrate mastery through performance-based and other assessments. Each student is assured of the scaffolding and differentiated support needed to keep progressing at a pace appropriate to reaching college, career, and civic outcomes.

Before the industrial revolution, higher education was for the elite and prepared learners to be thinkers, not doers. The progressive education movement, attempting to accommodate the post-industrial labor force, contributed to the philosophical foundation of competency-based education *(CBE)*. Education needed to focus less on a traditional-based learning environment to one that was more student-centered and prepared students for their societal role.

CBE's theoretical foundation has multiple learning theory roots: behaviorist, functionalist, and humanistic learning theories. CBE is an eclectic model adopting concepts from several modern learning theorists. One such theorist is Ralph W. Tyler. Ralph Tyler was an educator renowned for linking measurable learning objectives and assessment strategies. CBE is a synthesis between a liberal arts education and the professional education movement. The professional education movement emphasized practical preparation for a profession, and Tyler advocated for students to learn the theoretical foundations to understand best how to apply their learning to practice. This approach merged the concept of applying theory to practice.

Fred Keller, the developer of the Keller Plan, was a theorist and behavioral psychologist who, like Bloom, focused on instruction delivery that allowed for mastery and self-paced learning. Keller developed a method of instructional design called learning modules. Keller's learning modules break down learning objectives into specific activities a student performs to gain knowledge of the material and demonstrate their learning. Demonstration of mastery is through the achievement of these learning objectives. Once a lesson is complete, a post-assessment determines where learning gaps exist, and additional support is needed. Individualized learning is offered to assist students still struggling with achieving competence.

The theoretical foundation of CBE provides an overall structure for the education model. The goal of this work is to provide specific components that encompass a CBE model. Five key changes to provide competency-based learning are illustrated in Fig. 4.9.

A student demonstrates readiness to graduate when they can demonstrate

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[67] *Levine, E. & Patrick, S. (2019). What is competency-based education? An updated definition. Vienna, VA: Aurora Institute*

the knowledge, skills, attitudes, values, and behavior gained by attaining the identified competencies.

The research agrees that a CBE model includes an emphasis on outcomes, a strong pedagogy, the use of interdisciplinary resources, and an assessment of a student's attainment of competencies across the curriculum.
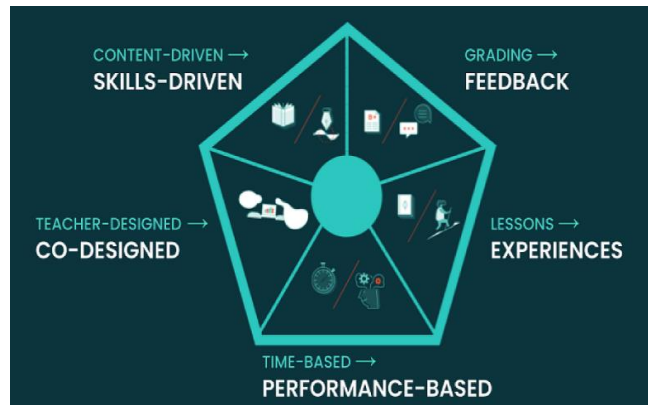

Figure 4.9 Five shifts for competency-based learning

Competencies are developed based on the feedback and contribution from all stakeholders: students, teachers, and community partners. Programs are encouraged to develop advisory councils of stakeholders to provide information and feedback to help aid in curriculum construction. It also ensures that professionals in the field inform the curriculum. As the needs of a profession change, so should the preparation for that profession.

In a CBE model, students can receive credit for prior learning. Suppose a student has acquired prior knowledge and/or skill and can pass the assessment(s) structured to assess the demonstration of the competency. In that case, the student can proceed to the next learning module or course.

Arguably, the most widely used definition has been established by iNACOL, an international non-profit organization. This organization is dedicated to catalyzing "the transformation of K-12 education policy and practice to advance powerful, personalized, learner-centered experiences through competency-based, blended, and online learning." Competency Works is a project of iNACOL dedicated to providing information and knowledge about K-12 competency education. Both organizations, together with 100 leaders in competency education, came together in 2011 to develop a working definition of competency-based education which encompasses five elements:

Students advance upon demonstrated mastery. Moving towards mastery allows students to potentially spend more time working in those areas that are more difficult for them. They may even advance beyond grade level in some domains while taking more time in more challenging ones. Mastery also allows the teacher to focus on where students need the most help while ensuring they learn what is required to advance to the next level of learning.

Competencies include explicit, measurable, transferable learning objectives that empower students. With greater transparency in learning objectives, students have greater ownership over their education and increased opportunity for choice in how they learn and demonstrate their learning. In this process, teachers also collaborate more with students as they increase their intentionality on what they want students to know and be able to do.

Assessment is meaningful and a positive learning experience for students. Formative assessments are emphasized so teachers better understand where

students have misconceptions and students receive the feedback they need to improve. Students receive timely and differentiated support based on their individual learning needs. Flex time during the day is provided for students to receive additional instructional support and ensure misconceptions are addressed quickly. For example, when students do not complete a course, they focus on the skills they need to develop rather than retaking it.

Students develop and apply a broad set of skills and dispositions. Students actively learn and apply critical thinking, problem-solving, key communication, collaboration, and cultural responsiveness skills. All they help them work in ever-changing, diverse workplaces.

Society and its needs are changing rapidly. Accordingly, the requirements for education and competencies are being transformed, which has led to rethinking and supplementing the basic definitions of competency-based education.

For example, this conception, with many applications and competency work resources, was presented by Aurora Institute (Table 4.6).

Aurora Institute

Table 4.6

Original and revised definitions of competency-based education

The original definition of competency-based education (2011)	Revised definition of competency-based education (2019)
1. Students advance upon demonstrated mastery.	1. Students are empowered daily to make important decisions about their learning experiences and how they will demonstrate their learning.
2. Competencies include explicit, measurable, transferable learning objectives that empower students.	2. Assessment is a meaningful, positive, and empowering learning experience for students that yields timely, relevant, actionable evidence.
3. Assessment is a meaningful and a positive learning experience for students.	3. Students receive timely, differentiated support based on their learning needs.
4. Students receive timely, differentiated support based on their individual learning needs.	4. Students progress based on evidence of mastery, not seat time.
5. Learning outcomes emphasize competencies that include applying and creating knowledge and the development of essential skills and dispositions.	5. Students learn actively using different pathways and varied pacing.
	6. Strategies to ensure equity for all students are embedded in the culture, structure, and pedagogy of schools and education systems.
	7. Rigorous, common expectations for learning (knowledge, skills, and dispositions) are explicit, transparent, measurable, and transferable.

4.9 Self-assessment questions

1. What does inquiry-based learning mean?
2. What processes does the student-oriented approach focus on?
3. What is the theoretical origin of the student-oriented approach?

4. What stages of development did competency-based education go through?
5. What is its basis?
6. How do cooperative study groups help to overcome cognitive overload?
7. What teaching activities contribute to the effectiveness of the problem-oriented method?
8. Identify the differences between problem-oriented and project-oriented learning methods
9. What activities are included in project-oriented learning?
10. What skills does the scenario-oriented approach help to develop?
11. Outline the key characteristics of scenario-based learning.
12. What learning components does self-regulated learning include?
13. What defines the features of metacognitive knowledge?
14. What is its significance in the development of self-regulated learning?
15. What is the role of the teacher in the process of the fishbowl method?
16. Specify the activities aimed at the development of interactive learning.
17. What skills are writing activities aimed to advance?
18. What are the advantages of using the method of conceptual maps?
19. What teaching techniques are effective for small-group learning?
20. What are the commonly acknowledged characteristics of experiential-based learning?
21. Identify activities to implement discussion as a teaching method.
22. What are the objectives of the end-of-class activities?

4.10 Practice exercises

4.10.1 Developing activities in the frame of innovative teaching

Determine the activities you will build to support your students in achieving the learning outcome. Include the steps, stages, or parts students need to learn or practice to develop proficiency.

Build your activities. Ensure they are aligned and will help students progress through the course. Consider these questions when building:
• What activity will help students achieve the learning outcomes?
• How will the activity orient students (e.g., connected to the unit, where the unit is going and includes clear criteria and expectations)?
• Is the activity authentic, relevant, interesting, and meaningful for your students?
• Does the activity give students the tools necessary to process and analyze key concepts and issues?
• Have you included an opportunity for students to reflect on and evaluate their learning experience?
• Is the activity inclusive and equitable for all learners?
  Identify activities for your course (Table 4.7)
  • the teaching methods you have chosen for each outcome (refer to the verb lists for Bloom's Taxonomy),
  • the activity should support student growth in this outcome.

Table 4.7

Planning

Learning outcomes	Method	Activity
Students will understand the main features of a teacher's professionalism	Experimental learning	Fishbowl
Students will analyze and design a course plan (a syllabus)	Guided instruction	Showing and explaining examples, scaffold steps
Students will develop methods and activities for the course	Interactive lecture Case-based study	Multiple-choice items, solving the problem, applying knowledge to a realistic situation

Choose one of the topics of your course. Collect your experience and ideas about strategies and activities for teaching it, answering some questions:
- What should prior knowledge be activated, and by what means?
- What theoretical issues are the most essential? Which of them are the most challenging and are needed to explain? What methods would be the most effective for this problem?
- What practical skills should the student acquire? What is your approach according to them? What are the most effective activities?
- If you are going to use the display method, describe your visuals.
- How to avoid surface approaches as well as cognitive overload?

4.10.2 Designing activities for Fishbowl

Develop a step-by-step scenario for conducting an activity using the examples.

STEP 1: Clarify your teaching purpose and learning goals.
Why are you choosing this technique?
What do you hope to accomplish?

STEP 2: Identify the learning task's underlying problem and prompt.
What is the question you want learners to address or the problem you want them to solve?

STEP 3: Set assignment parameters.
What are the assignment logistics? For example, will this be assigned individually or in group work?
How long will the assignment take?
Will students be submitting a product?
What materials, resources, or additional information do you anticipate needing?

STEP 4: Develop a plan for learning assessment or grading.
If you decide to assess learning, how will you determine that learning has occurred? For example, will you use a simple +/check/- grading system?

STEP 5. Implement the technique.
How will you adapt steps/procedures for your students?
Are there any additional logistical aspects to consider?

CHAPTER 5. LEARNING AND TEACHING METHODS

5.1 Approaches to learning-teaching methods for adult learning

The term 'teaching method' refers to the general principles, pedagogy, and management strategies used for classroom instruction. Teaching methods are the broader techniques used to help students achieve learning outcomes. Otherwise, activities are different ways of implementing these methods. Teaching methods help students master the content of the course and learn how to apply the content in particular contexts. Instructors should identify which teaching methods will properly support a particular learning outcome, and their effectiveness depends on this alignment.

An instructor should consider learning outcomes, student needs, and the learning environment to make the most appropriate choice.

Teaching Approaches, Methods, Procedures, Techniques, and Strategies

Considering the diversity of learning theories, demarcation and definition of different teaching methods is a rather complex issue. It can be seen in V. M. Zupančič's research, which is devoted to the systematization and evaluation of the leading classifications, their criteria, and theoretical foundations.[68]

Modern didactics and educational psychology divide them into student-focused and teacher-focused methods (Table 5.1).

Table 5.1

Teacher-centered and student-centered teaching methods

Teacher-Centered Teaching Methods	Student-Centered Teaching Methods
Content-oriented	Process-oriented
Lecture	Discussion, presentation, reflection, etc.
Unidirectional	Bidirectional
Teacher occupies the central position	Students occupy the central position
Students are passive recipient of information	Students construct their own knowledge
Learning starts from outside	Learning starts from within

Teacher-focused methods emphasize information transmission, whereas student-focused methods emphasize conceptual change. Constructivist theories of learning emphasize the shift in focus from conventional lectures to teaching methods that activate the learner and are student-focused. Active teaching

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[68] *Zupančič M.V. Taxonomy of Teaching Methods and Teaching Forms for Youth in Non-Formal Education in the National Youth Council of Slovenia. CEPS Journal: Center for Educational Policy Studies Journal. 2018. 1. P. 120 – 122.*

methods include case studies, problem-based learning, collaborative assignments, and participatory, experiential, peer, and project-based learning *(See Chapter 4).*

The cognitive-constructivist model overcomes the division of teacher-focused and student-focused methods, thereby stressing the construction of knowledge in the interaction between both sides. The teaching process is a communication process by nature; therefore, teaching methods can be classified according to the message's source to the learner. Classification by the source divides teaching methods into:

- The verbal textual method (spoken explanation method, conversation method, working with texts) (Fig. 5.1),
- the illustrative demonstration method (Fig. 5.2), and
- the experiential learning method (according to Kolb *(see Chapter 2).*
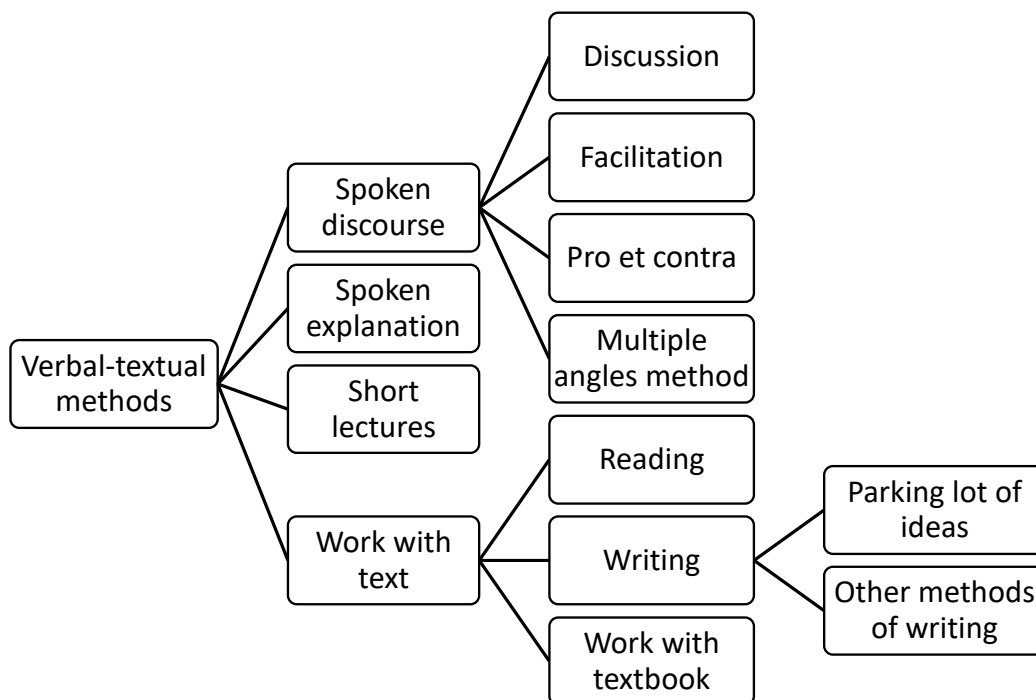
Figure 5.1 Verbal textual methods of teaching

The heuristic teaching method is an excellent example of an experience-based technique that promotes problem-solving learning and discovery. The word Heuristic is derived from the Greek language that means 'to find' or 'to discover.'

The student is free to discover the facts using experiments, apparatus, or books. Students are directed to observe facts properly, systematize knowledge learned, and arrive at generalizations through their attempts. Things that work well should be kept up, while those causing problems should be changed.

The role of teachers is as follows:

- The teacher assists in recognizing the problem that the students will investigate.
- The teacher encourages the students to share, test, and challenge their ideas.
- The teacher never offers any suggestions or solutions to the students.
- The teacher maintains a compassionate, polite, and respectful demeanor and is open to all points of view and ideas.

- The teacher only supports and guides the student if he or she requests it but always supervises the learners' work without interfering.
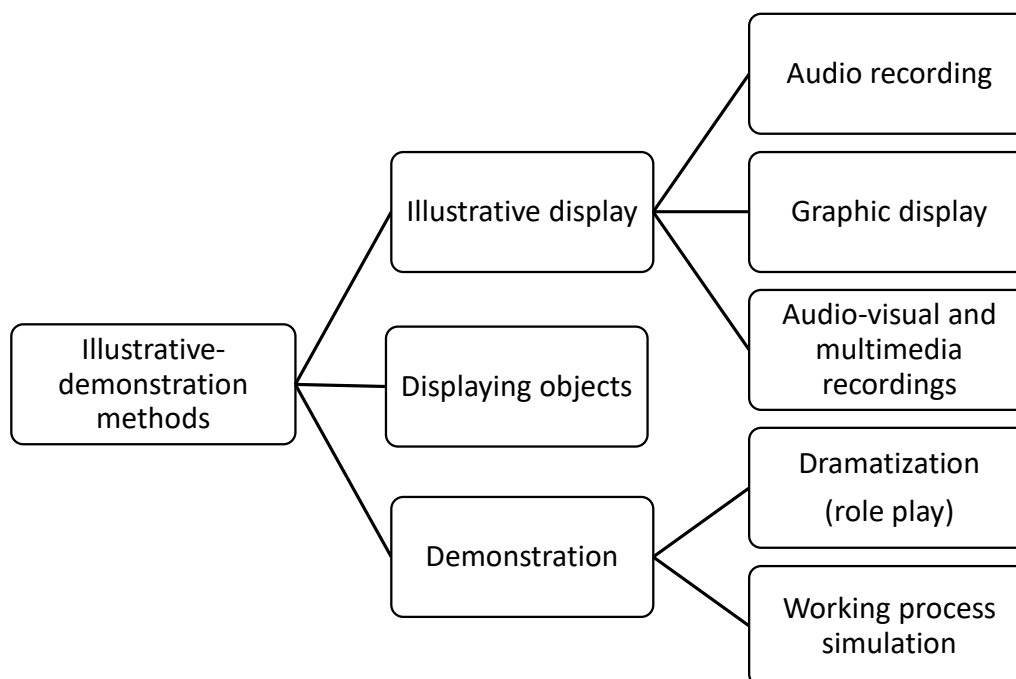
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Illustrative-          ┌── Illustrative display ──┬── Audio recording
demonstration ─────────┤                          ├── Graphic display
methods                │                          └── Audio-visual and
                       ├── Displaying objects          multimedia recordings
                       └── Demonstration ──────────┬── Dramatization (role play)
                                                   └── Working process simulation
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Figure 5.2 Illustrative demonstration methods of teaching

Principles of Heuristic Method of Teaching:
- The Principle of Activity (This will assist the student in discovering things on their own).
- The Principle of Laws of Learning (Problems should be assigned based on the learners' age and capabilities).
- The Principle of Logical Thinking (The method employs both deductive and inductive logical thinking procedures).
- The Principle of Purposeful Experience (The students understand what they are doing. They learn to think critically).

Teaching forms in German can be divided into frontal teaching/direct instruction, group work, work in pairs, and individual work (Table 5.2).

Table 5.2

Direct versus indirect instruction

Direct instruction	It can be both direct and indirect instruction	Indirect instruction
Lecture	Concept formation	Hands-on activities
Modeling	Inductive reasoning	Individual projects
Graphic organizers	Deductive reasoning	Cooperative learning (discussions, projects, etc.)
Teacher-led discussion	Problem-based instruction	Group learning (discussions, projects, etc.)
Debriefings	Discovery learning	Peer tutoring

Authors in didactic theory classify them into frontal teaching form/direct instruction and indirect form/ autonomous work of students. The indirect form consists of learning in groups/group work, working in pairs, and individual work.

5.2 Lecture as a teaching method and its effectiveness

Lecture, as a method of teaching by which the instructor gives an oral presentation of facts or principles to learners and the class usually being responsible for note taking, usually implies little or no class participation by such means as questioning or discussion during the class period.

While the lecture primarily consists of one-way communication from the teacher, this does not mean there can be no discussion or dialogue between the lecturer and students. Often such two-way communication is limited to the teacher asking questions to establish that the subject matter has been assimilated. Still, many skilled lecturers can make their lectures more thought-provoking and interactive to make deeper learning possible.

Four main features can be suggested for the process of lecturing

1. Intention: The lecturer's intentions may be considered to provide coverage of a topic, generate understanding, and stimulate interest. Consideration of these lecturing goals and the knowledge of the earlier learning of the students are essential constituents of lecture preparation.

2. Transmission: A lecture sends the learners a message verbally, extra verbally, and nonverbally. The verbal messages may contain definitions, descriptions, examples, explanations, or comments. The 'extra verbal' component is the lecturer's vocal qualities, hesitations, errors, and use of pauses and silence. The 'nonverbal' component includes the teacher's gestures and facial expressions. The students may receive all of these types of messages, and what they perceive as important messages may be noted.

3. Reception of Information: The information, meaning, and attitudes conveyed by the lecturer may or may not be perceived by the students. Attention fluctuates throughout the process of the lecture. Students' attention can be increased if the lecture includes some short activities for students, such as brief small-group discussions or simple problem-solving. Any change of activity may renew attention.

4. Output: Any instructional strategy should lead directly to the objectives and interrelated goals for a course of study. So, the student's response or "output" is essential in the lecturing process and may occur in immediate reactions to the lecture and the lecturer. But, the long-term changes in students are more important than the immediately observable responses to the lecture. A lecture may change a student's perception of a problem or theory, increase a student's insight, and stimulate the student to read, think, and discuss ideas with others.

Historically the lecture can be traced back to the 5th century BC when it was popular with the Greeks. It was widely adopted in the early Christian and Muslim Universities in medieval times when books were scarce. The term lecture originated from the Latin word 'Lecture,' which meant reading aloud. So, the

lecture consisted of an oral reading of a text followed by a commentary. Lecture occurs whenever a teacher is talking and students are listening.

The lecture is still one of the key teaching methods in higher education. However, this method is criticized and considered a passive method with low efficiency within some learning theories. The eighteenth-century lexicographer Samuel Johnson made one of the most direct challenges to the prominence of the lecture as a teaching method.

"Lectures were once useful, but now, when all can read, and books are so numerous, lectures are unnecessary. If your attention fails, and you miss a part of a lecture, it is lost; you cannot go back as you do upon a book … People have nowadays got a strange opinion that everything should be taught by lectures. Now, I cannot see that lectures can do as much good as reading the books from which the lectures are taken. I know nothing that can be best taught by lectures, except where experiments are to be shown. You may teach chemistry by lectures. You might teach making shoes by lectures."[69]

Modern researchers and teachers also see the lecture as an outdated method. As Ch. Crook shows, some state that the lecture keeps communication channels closed, freezes the hierarchy between lecturers and students, and removes any responsibility on the student to respond. Another stresses that lectures lead only to memorizing the information often without thinking about it. D. Bligh summarized a wide range of meta-analyses and studies of the effectiveness of lectures compared with other teaching methods and found consistent results:

• the lecture is as effective as other methods for transmitting information (the result, of course, is that other methods – such as video, reading, independent study, or Wikipedia – are just as effective as lecturing for transmitting information);
• most lectures are not as effective as a discussion for promoting thought;
• lectures are generally ineffective for changing attitudes or values or for inspiring interest in a subject;
• lectures are relatively ineffective for teaching behavioral skills.

"We see evidence… once again to suppose that lectures should not be longer than twenty to thirty minutes – at least without techniques to vary stimulation."[70]

One of the fundamental problems associated with the lecture method is its duration. Proposals to reduce lecture time are based on aspects of attention, which is difficult to maintain with the passive participation of students, and, accordingly, on the reduction of retention of acquired knowledge. However, the conducted studies demonstrate that the specified disadvantages are not mandatory.

Discussions about the effectiveness of the lecture are still going on. Researching the lecture from different points of view reveals the weak sides of

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[69] *Crook Ch. "Locating the university lecture as a contemporary educational practice," Journal of China Computer-Assisted Language Learning, vol.2, no.2, 2022, pp.203-227. URL: https://www.degruyter.com/document/doi/10.1515/jccall-2022-0013/html*
[70] *Bligh D. What's the Use of Lectures? San Francisco: Jossey-Bass. 2000. P. 56.*

the method but also finds subtle sides that cannot be realized by eliminating lectures from the curricula. For example, one of the latest studies noted:

"McLeish (1968) discussed the work of Trenaman, who found that as the length of a lecture increased, the proportion of material remembered by students decreased. In Trenaman's studies, students listened to a 45-min recorded talk and then took a recall test on the material in the lecture. The recall test, given immediately after the lecture, consisted of recognition items, free recall, and true–false items. Trenaman found that students listening to only the first 15 min of a lecture retained approximately 41% of the material, students listening to 30 min retained 25%, and those listening to 40 min retained only 20% of the material.

In what he labeled the Norwich experiment, McLeish (1968) attempted to replicate Trenaman's results with a live lecture. McLeish had participants attend a live lecture for 25, 40, or 50 min. Participants completed a test of retention immediately after the lecture that consisted of multiple-choice, true-false, matching, and paragraph completion items. There were no differences in retention between the groups. Across the groups, individuals retained between 40% and 46% of the material in the lecture. McLeish's results were consistent with Scerbo et al.'s (1992) findings regarding stability of retention."[71]

"As large-scale lectures are destined to be with us for some time, what can students extract from them? Student claims about the efficacy of their various study techniques can be questioned, but the emotional support offered by the informal networks created in lecture theatres is plain to see. And maybe that's enough. While the measurable impact of the lecture may be muted, it provides the space for these informal networks to exist. It would appear that for many of these students, the conversations and clarifications that take place in the breaks and after the lecture are (at least) as important as the content of the lecture itself."[72]

Some researchers believe that lecturing is best used for:
- providing up-to-date material that cannot be found in one source;
- summarizing material found in a variety of sources;
- adapting material to the interests of a particular group;
- initially helping students discover key concepts, principles, or ideas;
- modeling expert thinking.

The Lecture offers several advantages and reasons for its continued use.
- Lecturing is an efficient use of the instructor's time. A good lecture can be presented from one semester to the next, reducing subsequent planning and preparation time to review and update.
- Lecturing is versatile, and it can be used with large or small groups for any curriculum area, lasting from a few minutes to several hours.
- The instructor has complete control of course content. When lecturing, the instructor has complete control over the level of detail and degree of emphasis

[71] *Wilson K., Korn H.J. Attention During Lectures: Beyond Ten Minutes. Teaching of Psychology, 34*(2) P. 86 – 87.

[72] *Loughlin, C., Lindberg-Sand, Å. The use of lectures: effective pedagogy or seeds scattered on the wind? High Education, 2023, 85, 283–299. URL: https://link.springer.com/article/10.1007/s10734-022-00833-9#citeas*

with which course content is covered.
- Lecturing enables coverage of content not available in published form. For example, findings from just-completed or ongoing research projects may be presented to students via lecture.
- The lecture method can be used to supplement or elaborate course content. Content that is particularly important or difficult for students to learn directly through text-, web- or field-based activities can be highlighted during the lecture.
- The lecture method provides flexibility. The instructor can probe students understanding and make on-the-spot adjustments to the lecture if warranted.
- Lectures can be personalized. Instructors can customize lectures to meet students' interests and backgrounds.
- Lectures can be motivating for students. Students can see and hear their instructor's level of enthusiasm for and commitment to the discipline.

> ***Further Reading***: *McKeachie W. and Svinicki M. McKeachie's Teaching Tips: Strategies, Research and Theory for College and University Teachers. Boston, New York: Houghton Mifflin. 2006.*
> *Biggs J. Tan C. Teaching for Quality Learning at University What the Student Does. 4th edition. New York: Open University Press, 2011. P. 146 –148.*

The authors of the authoritative textbook "A Handbook for Teaching and Learning in Higher Education," summarizing theoretical and practical experience, form the characteristics of 'an outstanding lecture.' An outstanding lecture should have the following attributes:
- It is delivered in an informative, interesting, and engaging way.
- The content is well-organized and easy to follow. Students can understand the development of the argument or the logic in ordering the information or ideas.
- Students feel involved. It may be through active participation, the use of relevant examples to which they can relate, and by being made to think about what is being said. The ability to engage students through questioning, no matter what the class size, is an important way of getting students involved.
- Students leave wondering where the time has gone.
- Students leave knowing they have learned something(s) and are often inspired to go off and discover more.

The following suggestions may help to make the lecture a good learning experience for all students:
- Find out as much as possible about the student cohorts who will be attending the lecture, particularly what they may already know about the subject, to profile the range of knowledge and subject disciplines of the students.
- Acknowledge to the students at the start that you know they are a varied group and that the lecture's content, organization, and supporting materials will reflect this.
- Use varied examples, or case studies, that reflect the group's subject disciplines.

- When undertaking class tasks, suggest to the students that they work in their closest disciplinary cohorts.
- When appropriate, ask the students to work on different problems or consider different questions relevant to their knowledge base or subject discipline.
- Make explicit reference to specific additional resources each cohort can access for support after the lecture.

> ***Further Reading***: *Biggs J. Tan C. Teaching for Quality Learning at University What the Student Does. 4th edition. New York: Open University Press, 2011. P. 146 – 148*

Some scholars offer effective tools for self-assessing the criteria for a successful lecture and the ways to improve. For example, M.J. Babic and P.V. Luther developed a checklist for an effective lecture to summarize the principles of learning, memory, and instructional design (see Appendix III to Section 5).

5.2.1 Types of lectures

There are many approaches to classifying lecture types, and they are based on different criteria.

Categorized by content
- Expository lecture/oral essay. The lecturer begins with a primary thesis or assertion and then proceeds to justify it, typically putting the most important information or supporting examples first and moving in descending order of importance.
- Storytelling lecture. The instructor presents concepts and content through a story to illustrate a concept. The lecture proceeds in typical narrative form, with an exposition, rising action, climax, falling action, and resolution. Characters are presented and developed through the presentation of the storyline. The goal is to give critical content in a way that students will remember it.
- Point-by-point lecture. The instructor presents information about a single concept, question, or issue in this lecture type. The organizational structure is typically an outline format, with a hierarchical organization of major and minor points.
- Lecture-demonstration. The content involves a demonstration of a process or activity. The lecture typically proceeds chronologically, with the demonstration presented in a sequence of events that the lecturer highlights and explains.
- Problem-solving lecture. In this type of lecture, a problem serves as the focus. The lecturer outlines the main problem, the key known elements, and the remaining ones to be discovered. During the lecture, the instructor typically works through the problem and demonstrates a solution or various possible solutions.

Categorization by medium

- Naked lecture. Teachers have much to gain by taking technology out of their classrooms, and he argues that teaching without technology, "naked," will improve student learning. Instructors who adopt this approach talk directly to students without the intervening agency of technology; alternately, they use technology outside the classroom and reserve in-class time for direct communication with students.
- Chalk and talk lecture. This approach is so named because of the early uses of lectures in a classroom with a blackboard and chalk. While some professors still use a blackboard, whiteboards, markers, and smart boards supplement the earlier tools. Regardless of the tools used, the key characteristic of this approach is that the instructor lectures while generating notes in a medium that students can see.
- Multimedia lecture. A multimedia lecture, once called the slide lecture because of the slide-talk approach, is one of the most commonly used approaches today. Instructors use audio-visual software packages such as PowerPoint or Prezi to highlight the text's key points. The term "death-by-PowerPoint" is one that teachers should keep in mind, particularly as something to avoid when using this approach.
- Video lecture. This type of lecture is one in which an instructor lectures and is captured on video as a talking head. At times, the video may alternate between showing headshots of the instructor and full-screen visuals of the slides. This lecture type is often used in the service of online and blended learning. More recently, this approach has seen increased usage as part of the flipped classroom strategy

Categorization by teaching methods

- Formal lecture. The lecturer delivers a well-organized, tightly constructed, and highly polished presentation. This type of lecture works well for teaching large groups of students and has been popularized by outlets such as TED Talks and, more recently, massive open online courses. In the formal lecture, students hold questions until the lecture's conclusion.
- Socratic lecture. This type of lecture, which typically follows a reading assignment to give students a baseline of knowledge, is structured around a series of carefully sequenced questions. The instructor asks a single student a question sequence, and the questions require the student to use logic and inference skills.
- Semi-formal lecture. It is the most common type of lecture. Like the formal lecture, the semiformal lecture is less elaborate in form and production. Occasionally, the lecturer entertains students with questions during the presentation of material.
- Lecture-discussion. This type of lecture encourages greater student participation. The instructor presents the talk, but he or she frequently stops to ask students questions or to request that students read their prepared materials.

The direction of interaction can occur in one of three ways:

(1) instructor to class,

(2) instructor to the individual student,

(3) individual student to instructor.

- Interactive lecture. In this version of lecturing, the instructor uses mini-lectures about 20 minutes long, involving students in a range of brief content-related activities. The interaction may occur between the instructor and students or between and among students.

> *Further Reading: Major C. H., Harris M. S., Zakrajsek T. Teaching for learning: 101 intentionally designed educational activities to put students on the path to success. Routledge. 2014*

5.2.2 Structure (introduction, body & conclusion) and activities

Knowing something and knowing how to explain something are different things—a good lecture results from planning, preparation, and hard work. You must invest time and energy into identifying resources, organizing the material, developing examples, and preparing supporting documents for your students. When planning for a lecture, it is essential to consider the selection and arrangement of content and the strategies that can be used to communicate, connect, and reach out to your audience.

Like a good research paper, a good lecture has three key components: an introduction, a body, and a conclusion. While this sounds simple, it is often stunning to see how many lectures are missing one or more of these elements and how often a 'lack of organization' is cited by students as the key feature of an unsuccessful lecture or course.

A good introduction serves to get the listener on your side. The first thing that should be done in the introduction is to gain the listener's attention. For example, you may present a startling statistic, ask for a show of hands on an issue, or start with something humorous. There is nothing wrong with being dramatic as long as you have content. Once attention is gained, you should establish the relevance of what you will say. Tell the audience how they will use the information in the future. At this point, the goals of the lecture should be identified. One helpful way to do this is to say, "At the end of this lecture, you should be able to answer the following questions."

Next, the structure of the lecture can be discussed, and it is often helpful to have the structure detailed on a slide or a handout. It will give the listener a roadmap to follow during the talk.

Finally, the ground rules can be established, such as whether the audience should ask questions anytime or hold questions until the end.

At the very beginning, you should:
- appear enthusiastic and interested yourself;
- be organized, and take control of the lecture room on your arrival;
- know how to use the presentation equipment.

During the first few minutes, the lecturer could:

- go through the learning outcomes for the session, telling them what they should have learned by the end. It can be a bit dry;
- describe a problem or scenario that is of relevance to the topic, and then go on to outline how the lecture will consider this;
- share their passion and enthusiasm for the subject by telling students why they are personally interested in this topic. Where possible, this could be a link to their personal research;
- link the lecture to some current news or activity.

The body of the talk amplifies the three to five main concepts you want to get across. The object of a lecture is not just to 'get through' the material as fast as you can; the goal is to have the listener learn. If you attempt to cover too much, your audience will actually learn and remember less. Numerous studies show that students who listen to low-density lectures score higher on tests than those who listen to high-density talks. Therefore, the audience will learn more when given fewer concepts explained well.

Lectures are the worst way to deliver many facts (use handouts for this purpose), but they are the best way to transmit concepts. It would help if you tried to synthesize the information from various sources, add your experience, and present a series of basic concepts. Each of the three to five central ideas in the body of the talk should contain five essential parts. First, the central concept should be stated in simple terms, and then examples and exceptions should be given. Then the central concept should be restated. A transition should then be made to the next central idea with a short pause to give the listener time to think. Each of the five points of a single concept should take about five to seven minutes.

To keep students interested during the remainder, the lecturer could:
- use relevant and current examples to illustrate the point;
- where possible, draw on the student's experiences;
- use rhetorical questions to encourage students to keep on track;
- change the demands on the student as the lecture progresses;
- vary between note-taking, listening, and active participation (considered later);
- use visual materials or artifacts that are relevant to the topic of the lecture;
- use live links to the web to demonstrate the currency of the presented material.

The lecturer's enthusiasm and interest are important at the start and during the lecture. This factor should not be underestimated concerning the effectiveness of the lecture overall. It should also be remembered that there is a performance aspect to lecturing.

> *Further Reading: A Handbook for Teaching and Learning in Higher Education Enhancing Academic Practice. 3d edition. Ed. Heather Fry. New York, London: Routledge, 2008. P. 60 – 61*

Despite the overall structure, students can lose or miss critical points. Brown, in 1987, suggested several simple ways to get students the clues and signals they need (Table 5.3).

Table 5.3

Emphasizing the structure of lectures using signals and glues

Signposts
These indicate the structure and direction of the lecture: Last week we covered ... and this week I will be developing those ideas further   Today I want to consider …   First, we are going to look at ...   Second, I'll spend some time considering ...
Links
These are phrases or statements that link part of a lecture together, and they often involve the use of rhetorical questions. Having just come to the end of a topic, you could say, for example: So what does that mean in practice? Well, let's go on to have a look at ...   So we can conclude then that ... But what does that really tell us about ...? Well, if we go back to the first item we considered today ...   So, you can see that this is the final step in the process. So what now? If we know that this happens in this way, what are the long-term consequences? Well, we'll now go on to consider those.
Foci
These are statements that give emphasis and which highlight key points.   This is the most crucial step of the process,   There are three absolutely essential points that need to be made.

Adapted from Brown (1987)

It is important to create formal breaks to help students stay better engaged with the material. 'Activity breaks,' as they are often called, do not simply break up the monotony of a lecture; when done effectively, they provide participants with formal opportunities to process, review, and apply the material.

Some suggestions for student activities:

- Students reflect on what they think they have just learned, then, in pairs, tell each other what they saw as the most critical point in the preceding 15 minutes of lecturing.
- Each student writes down a question or a comment sparked by the previous 15 minutes for their neighbor to respond to. They can hand in their question/comments sheet at the end of the session; it will also be helpful feedback to you – and an attendance check.
- You pose questions for them to answer individually or discuss with a neighbor.
- You set a problem based on the content discussed for them to work on, either individually or in discussion with a neighbor.
- Toward the end of the lecture, allow five minutes for each student to tell their neighbor or learning partner what they think was the thrust of the session. It achieves the consolidation by active review and gives them a different

perspective to think about, other than their interpretation of your perspective. Further, they are giving and receiving feedback.

Getting students to review what has been learned at the end of the lecture leads to much better and lasting retention than simply finishing and dismissing the students.

Some standard practices include:

- Asking a question or discussing a problem individually or in small groups.
- Reviewing a film clip or multimedia clip that pertains to the material.
- Working through a case study that is drawn from professional practice.
- Assessing learning at the end of your lecture.

To informally and quickly assess the degree to which your students picked up on the objectives of your lecture, consider the following strategies:

Two-Minute Paper

Ask your students to take two minutes to write everything they have noted or can remember about the lecture's main points. Alternatively, you could ask them to focus on writing about a particularly challenging concept in your lecture. In addition to providing useful information about lectures' effectiveness, this technique increases attention and encourages careful note-taking. If you have a large class, you may want to collect all the papers but only review a small, random sample. As with all listed here, this strategy may be used to provide feedback about your lecture and does not need to be graded.

Short Online or Paper Quizzes

By offering an ungraded quiz at the end of the class, you provide your students with practice retrieving the information and skills shared in the lecture. You may choose to have them complete the quiz individually or collectively.

Muddiest Point

At the end of the lecture, ask your students to write down the strongest point that sticks out in their minds and the point that is the least clear.

Exit Slip

It can be a note they submit to you on their way out that is either very open-ended – comments, questions, concerns – or a specific question about your teaching to which you have the answer. Again, the point is to gather information to improve teaching and learning.

Time for Questions

Plan for time to respond to questions at the end of the lecture. If you are teaching a large class and your schedule allows for it, stay afterward to respond to any questions from students who may be too intimidated to speak up in front of a large group. If you have presented yourself as an approachable person, early arrival may also offer a chance for students to talk with you about their questions and concerns. Questions are a vital part of any lecture or presentation and provide opportunities for the whole audience to clarify, consolidate, and enhance their understanding of the material.

Asking provocative or open-ended questions is a helpful way to engage the audience and gather feedback on student learning. But, it is essential to ask questions that are conversation starters and not conversation stoppers

Some typical conversation stoppers:

- "Are there any questions?" is probably the least provocative question you can ask your audience. Students will not answer this question because they probably would like to move on. In contrast, in other cases, students will be reluctant to pose a question because they do not want to 'bother' you or 'bother' their classmates (by 'interrupting' their instructional time).
- Questions that are too vague or general and lack (or are perceived to lack) a direct connection to what is being discussed.
- Questions that are too detailed or complex and require the students to piece together the notes they have just taken

Some techniques for developing conversation starters:

- Asking the audience to answer a multiple choice question or select the best response from various options.
- Asking the audience to complete a sentence or 'fill in the blank.'
- Asking the audience to apply the new concepts to a case, problem, or example.
- Asking the audience to rephrase a concept or idea in different terms.

The structure of the lecture has its chronology, which should be planned during preparation. For example, A. Long and B. Lock[73] suggested that a 1-hour lecture plan may include the following:

- Introduction and scoping – this sets minds (5 min).
- Ascertain knowledge base – this question engages the mind and memory; this is important in a lecture series to show how this new content relates to the previous lecture (5 min).
- Delivery – just enough new information at just the right speed (15 min).
- Question and discussion – set connections in long-term memory that may be carried out using realistic mock exam single best answer (SBA) questions (10 min).
- Delivery – check volume and speed of delivery (15 min).
- Questions – consolidate connections (5 min).
- Summary and close – pull it together (5 min).

Most lecturers agreed that the department had a mix of styles, from highly structured to more free-flowing approaches to lecturing, and each style had its merits. A highly structured approach was considered well-prepared in advance, with the lecturer covering points systematically on slides with only a limited degree of digression. The advantages of this approach were the logical sequencing of points, which aided comprehension, and the explicit signposting of critical issues so that students could separate the 'wood from the trees.' Moreover, a clear structure helped students see linkages between previous lectures and other parts of the course. Clearly linking the individual learning outcomes of lectures with the broader goals of the module and the course itself was felt to encourage students to construct meaning using a deep rather than a surface approach to learning.

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[73] *Long A, Lock B. Lectures and large groups. In: Swanwick T, ed. Understanding Medical Education: Evidence, Theory, and Practice. Chichester, West Sussex: Wiley Blackwell; 2010:139–150.*

However, some lecturers also emphasized that there was a balance to be had, as too much structure could border on spoon-feeding. A more free-flowing approach encouraged creativity and spontaneity, which helped students think for themselves.

> *Further Reading: Revell A., Wainwright E. What Makes Lectures 'Unmissable'? Insights into Teaching Excellence and Active Learning, Journal of Geography in Higher Education. 2009. 33:2. 209-223 p.*

5.2.3 Lecture tools

Visual tools can enhance lectures; some concepts are more easily conveyed or understood visually. Visual presentation can also break the monotony of a lecture, potentially regaining students' attention. Presentation slide technology, like PowerPoint, is common, although it should be used carefully. For such technology to be beneficial, do not talk while students are reading. Do not fill slides with too much text or unnecessary graphics or animation, which can be distracting and overwhelming. Another reason not to supply too much text is that students learn more when they must conceptualize and write it themselves, a process called 'encoding.'

Audiovisual aids augment your presentation and help facilitate learning by providing the audience with additional support, cues, and examples of what is being discussed. The key with any audiovisual aid drawings, graphics, videos, PowerPoint slides, clips, or even writing on the chalkboard is to keep it simple, clear, relevant, and uncluttered (Table 5.4).

Some suggestions:
- Less is best. Use audiovisual aids to support, summarize, and highlight what you are saying, and resist the temptation to make the aids a verbatim transcript of the discussion.
- Do not distract the audience. Avoid using too many 'bells and whistles,' including unnecessarily dramatic transitions, moving graphics or text, or sounds.
- Focus on the key facts and only include two to three main points in any slide.

> *Further Reading: Heward W. L. Three "low-tech" strategies for increasing the frequency of active student response during group instruction. In R. Gardner III, D. M. Sainato, J. O. Cooper, T. E. Heron, W. L. Heward, J. W. Eshleman, T. A. Grossi (Eds.), Behavior analysis in education: Focus on measurably superior instruction. 1994. P. 283–320.*

Handouts can be an effective teaching tool, whether professionally produced masterpieces or simple, hand-lettered sheets. They are most effective when organized according to your class's planned learning outcomes. The student can see clearly where the information fits in the overall picture. A handout can be of any size, depending on its purpose.

Table 5.4

Strategies for effective use of visuals on slides

Strategy	Example
Use graphs to replace text	Use a pie graph instead of a list to show the most common causes of chest pain
Use photographs as examples	Show examples of physical examination findings (e.g., a rash or swelling of an extremity) or diagnostic testing (e.g., blood smears, culture results, imaging results, or pathology).
Use photographs to highlight a point	Show a photograph of a small girl at a petting zoo with her hand in her mouth to illustrate the infectious risks of petting zoos. This is much more powerful and memorable than just making the statement!
Embed videos	These can be of teaching strategies, echocardiograms, physical examination findings, etc.
Use visuals to organize test	Powerpoint has a SmartArt tab with templates which can help organize text in a way that can enhance your point. You can use venn diagrams, timelines, and other graphics as a way to organize your text and move away from bullet points.
Avoid outdated graphics	Outdated graphics can be found with earlier versions of slide presentation programs. These are distracting in the current era where high-resolution images and graphics are the norm.
Make your own tables	When showing tables from papers, in almost all cases, it is better to remake the table with the data of interest rather than showing the entire table (which will usually project in 6-point font!). Try to avoid ever saying "You probably cannot read this slide," or "the text is probably too small for you to see" or "This is a really busy slide, but..."

"The challenge is creating a slide that contains all of the information you want to deliver but also adheres to the coherence principle. We propose three main ways to accomplish this:

(1) Turn text into visuals. This not only helps to avoid clutter but also improves retention. Mayer's multimedia principle is informed by research showing that people learn better from words and pictures than from words alone. For example, using an instructional strategy of adding visuals to words can improve recall from 10 to 65% at three days after a presentation.

(2) Although the amount of text on slides does not necessarily impact learning outcomes, it does contribute to increased cognitive load. As such, it is helpful to limit the text to key points and then use the notes section to store text that you want to remember to say. In this way, you will have clean slides but still have all of the information in the notes, both for practicing as well as for reference the next time you want to give the lecture.

(3) Finally, you can put extra information into an appendix slide, handout, or syllabus. Handouts and supplementary materials can be particularly helpful tools that allow your learners to revisit material or have an opportunity to thoroughly examine the subject matter at a later date."[74]

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[74] *Babik M.J., Luther P.V. Creating and Presenting an Effective Lecture. JCEHP. Winter. 2020. Volume 40. P. 38.*

Whatever its size, a well-designed handout:

- clarifies the topic being discussed,
- provides an alternative to note-taking when focus on the presentation is desired,
- saves you the trouble of trying to portray time-consuming detail on a chalkboard or whiteboard to illustrate what you are discussing,
- makes errors in note-taking less likely, giving students a reliable reference for learning,
- provides material beyond the lecture,
- provides more up-to-date material than contained in course readings,
- frees up time for other learning activities.

Graphic illustrations may be photos, sketches, diagrams, charts, graphs, flowcharts, or maps. Handouts of these special items are very useful. A sketch previously drawn by someone who understands the material is far more effective and accurate than something drawn quickly in a class by the instructor and copied by the student. Many topics and procedures are very difficult to explain only with words. A clear, well-labeled graphic can replace a great deal of text or talk.

Guided notes (GN) are instructor-prepared handouts that provide all students with background information and standard cues with specific spaces to write key facts, concepts, and/or relationships during the lecture.

GN requires students to actively respond during the lecture, improve the accuracy and efficiency of students' notetaking, and increase students' retention of course content. GN can help organize and enhance lecture content in any discipline or subject area.

Instructors can develop GN for a single lecture, one or more units within a course, or an entire semester-long course.

- GN increases students' active engagement with course content. To complete their GN, students must actively respond to the lecture's content by listening, looking, thinking, and writing.
- Students can more easily identify the most important information. Because GN cues the location and number of key concepts, facts, and/or relationships, students can better determine if they are getting the most important content.
- Students earn higher quiz and exam scores with GN.
- GN can serve as an advance organizer for students. Some students have indicated that they benefit from reviewing the lecture topics before attending class.
- Instructors must prepare the lecture carefully. Constructing GN requires instructors to examine the sequence and organization of lecture content.
- GN helps instructors prioritize and limit lecture content. Many instructors pack too much information into their lectures. While this tendency is understandable – instructors want their students to learn as much as possible – when it comes to how much new lecture content students can learn and retain, less can be more.

Lecturers' ambivalent views on handouts showed concern for achieving a balance between structure and creativity and between note-taking and note-making. While most lecturers tended to give handouts of their slides to communicate the lecture's key points, many were concerned that students might become over-reliant on their handouts for revision instead of making notes of their thoughts and ideas on the subject. This concern was exacerbated by the easy access students had to lecture notes and handout material on the university intranet.

Some lecturers attempted to make handouts more like worksheets by leaving gaps, which kept students on their toes as they had to fill in the missing information themselves. It also meant that students who missed lectures could not just rely on the handouts for their revision. Interestingly, students reported that they liked handouts with gaps because they encouraged them to be more attentive in lectures[75].

A worksheet is anything printed on copier paper and given to students to write on. Presents short, simple directions along with blank space on a line or in a box where responses are entered. Items appear in functional order.

There are plenty of instructional rich things you can do with a worksheet:

- a graphic organizer is a wonderful tool for research, pre-writing, and notetaking,
- as supplements to the textbooks, worksheets can be used to add information for particular classes,
- an excerpt from a primary source can be printed on a worksheet for close study and annotation. Worksheets can be used for analyzing data,
- as scaffolds for notetaking,
- as tools for reflection, or as formative assessments,
- as recording tools alongside more active experiences: lab data sheets and group project planning sheets.

Mass-produced worksheets do not help achieve educational goals. But as written material, worksheets are able to act as agents of teachers to lead students' attention and give students opportunities to work independently so that the students can work at their paces and the teacher can have time to take care of those students who need more help. Much of what we learn comes from reading, so if you do not have good science textbooks, worksheets and handouts can serve the same purpose.

In the worksheets they create, instructors should attend to the amount of text, directions, focus, blank space, font style, font size, and images (Fig. 5.3). Depending on the level of the student, a page filled to the brim with English words can be intimidating and overwhelming. An exception would be a reading class, but even then, students should understand what to do rather quickly, without

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[75] *Revell A., Wainwright E. What Makes Lectures 'Unmissable'? Insights into Teaching Excellence and Active Learning, Journal of Geography in Higher Education. 2009. 33:2. P. 217.*

needing to understand and digest large blocks of text before they can begin their task.
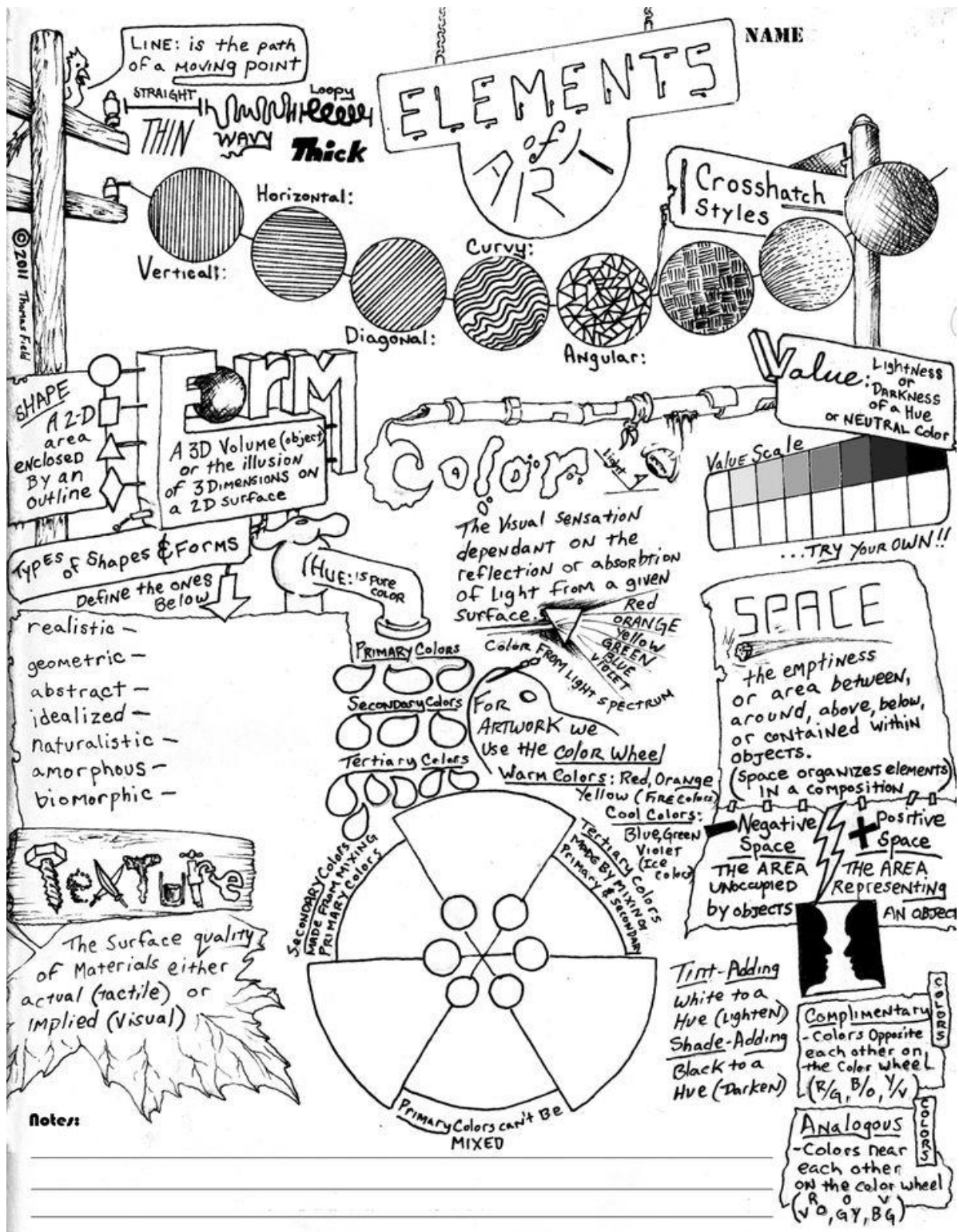

Figure 5.3 Humorous worksheet design

Include directions on every worksheet. It is best if the instructor reads them aloud, repeats them, and rephrases them to the class before they begin the activity. Even with this repetition, students might still not hear or understand the teacher's directions. Also, many English learners are better readers than listeners and would benefit from both modes' directions. Again, keep directions short and simple.

Ideally, there is only one task on each worksheet. More questions and task types will require more explanation from the teacher and create more confusion in the class. English learners are already under a considerable cognitive load trying to understand the language on the page; if its organization is confusing, the learner will likely be lost. If different tasks must be included on the same page, make clear distinctions – visual and verbal – between when one task finishes and the next begins.

Designers use the Latin term 'horror vacui' – the fear of the void – to describe the need to fill a page and leave no blank space. Blank space is a design tool; creating more blank space around a particular object makes it appear more valuable.

Another note that should be obvious: empty space is needed for student answers. Ensure adequate room under questions so students can write their answers. Blank space on the side of the page also allows room for notes or definitions of vocabulary words.

If you struggle with spacing, use a pencil to lightly section off parts of your page for your information categories. Once you have your section titles, fill in the rest of the information along with spaces where the students can write their answers. Once that's completed, scan your page using a scanner or an app on your phone and send it out to students!

> ***Further Reading***: *Campbell C. P. Instructional materials: their preparation and evaluation. Journal of European Industrial Training, 1999. 23(2), 57–107.*

5.2.4 Flipped classroom and lecture method

The inverted or flipped classroom label describes the teaching structure with students watching pre-recorded lessons at home and completing in-class assignments instead of hearing lectures and doing homework at home.

The idea of the flipped classroom owes a great deal to the work of physics professor Eric Mazur, whose Peer Instruction method formulated at Harvard in the 1990s evolved into what is often termed flipped learning. Teachers who implement the flipped classroom model often film their instructional videos, but many also use pre-made videos from online sources. The online lectures should be concise; fifteen to twenty-five minutes is often recommended. And supporting the video lectures will probably be some reading material, a book chapter, or a journal article. Students may watch the lectures a few times to get the most from them. Students for whom English is not their first language may benefit significantly from the ability to watch and re-watch the lectures (and possibly from the captions too if it has been possible to caption them).

> ***Further Reading***: *Robert Farmer the What, the How and the Why of the Flipped Classroom Innovative Practice in Higher Education Farmer Vol.3 (2) April 2018. P 14 – 31.*

Schematically, an approach to the flipped classroom is illustrated in Fig. 5.4.

An Approach to the Flipped Classroom				
What?	Knowledge Transfer		Knowledge Assimilation: Active Engagement and Sense-making	
When?	Before Class		In Class	After Class
Who?	Students working individually on structured tasks	Students working Individually on structured tasks; Students working collaboratively in groups; Students discussing and debating with their peers; Students working with and engaging in dialogues, discussions and activities with their tutor(s)			Students working individually on structured tasks
How?	Listening Reading Thinking Viewing	Discussing Examining Preparing Questioning	Analysing, Applying, Discovering, Discussing, Experimenting, Explaining, Illustrating, Interpreting	Assessing Discussing Summarising Synthesising	Consolidating Evaluating Planning Reflecting

Figure 5.4 An approach to the flipped classroom

Studies have shown that the flipped classroom can provide students more flexibility for self-paced learning, help to promote content retention, and promote students' interest in learning. This model increases interactive communication in class because learners watch lecture videos at home. Preferred flipped learning can be explained by this approach's main aim to provide opportunities for students to communicate and cooperate with their peers and teachers during class time.

"In the flipped classroom, lectures in the form of online videos are viewed outside of class time, creating the opportunity for instructors to provide mentorship and guidance during class hours. Instructors may use the flipped classroom approach because of its potential to increase the depth of engagement without sacrificing the amount of content and efficiency of delivery inherent in the lecture-based approach <…>
Negative attitudes toward flipped classroom have included having to watch long, boring videos, time constraints, and the frustration, disorientation, and confusion of adjusting to a new and unfamiliar approach. However, initial resistance and frustration seem to occur in the first few weeks of a flipped classroom-based course. By the end of the course, many students prefer the flipped classroom over lectures."[76]

A comparison of the procedure of the flipped classroom and the traditional lecture-based approach is illustrated in Fig. 5.5.
The procedure of the flipped classroom[77]:

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[76] *Kay R., MacDonald Th., Di Giuseppe M. A comparison of lecture-based, active, and flipped classroom teaching approaches in higher education Journal of Computing in Higher Education. 2019. 31(3). P. 450 – 451.*

[77] *The example from: Talley P. Ch., Stephen Scherer St. The Enhanced Flipped Classroom: Increasing Academic Performance with Student-recorded Lectures and Practice Testing in a "Flipped" STEM Course. The Journal of Negro Education, Vol. 82, No. 3, The*
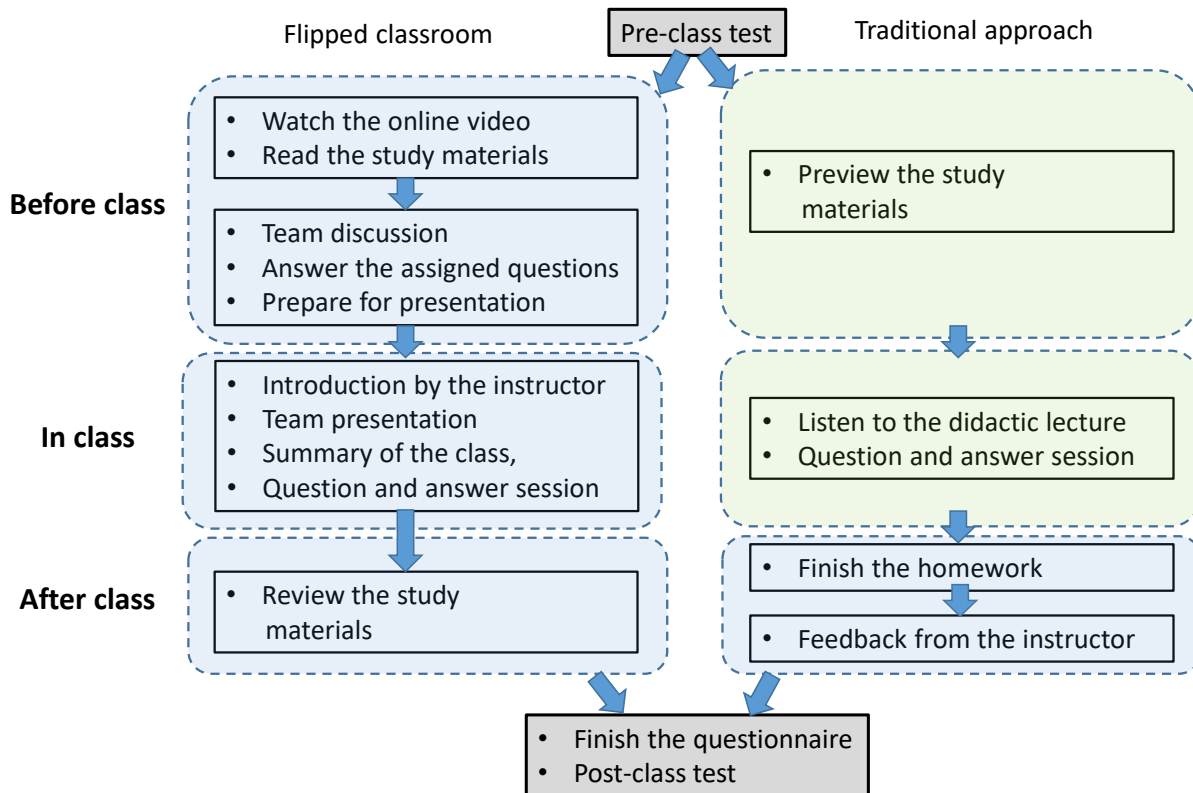
Figure 5.5 The procedure of the flipped classroom vs. the traditional lecture-based approach

1. Online lectures were introduced the previous semester to create the flipped classroom format.
2. The topic of synaptic transmission was introduced in week three of the course, following lectures on gross brain anatomy and neural development. The instructor recorded a 15-minute lecture.
3. The video content focused on illustrating the process of synaptic transmission and used concepts from physiology and cell biology.
4. Twenty-four slides were used to explain the chemical/electrical signal transfer between a network of three neurons.
5. Students viewed the colored illustrations, which included a moving pointer and corresponding audio content.
6. One week after the material had been introduced, students were given an announced practice test, which consisted of a small portion of the process (i.e., neuron morphology).
7. A list of terms that had been previously posted. Students were given ten minutes to draw and label the posted terms on a blank sheet of paper.
8. When the time expired, the correct answers were presented, and students were then instructed to access the course blog, the textbook chapter, which was an e-book, or any other online source to view the corrected items.

9. Students then graded their papers and turned them in to the instructor. After viewing the instructor's online video lecture and participating in several practice test sessions, students were asked to record a video of them teaching the lecture material to an imaginary class.

10. Class time was spent correcting omissions and reviewing common misunderstandings or misconceptions in the student videos. All students who completed the video assignment received maximum credit for it. The additional feature of having students orally deliver the lecture material to the instructor in their own words relied on the ability of students to upload easily and the video recording.

11. The self-explanation learning method employed higher-level thinking skills because students had to explain, interpret, and summarize the material. Higher level thinking becomes more important as students' progress to increasingly more challenging courses, especially in STEM majors.

A group of researchers investigated the effectiveness of flipped learning by studying the performance of 95 students, divided into two groups, one of which studied using the new method and the other according to the traditional lecture-based method. They came to the following conclusions:

First, the flipped classroom approach offers personalized study. Students in the flipped classroom group have more freedom and flexibility in self-paced learning, allowing students to use their time more efficiently.

Second, the flipped classroom approach offers group study. Compared to the traditional lecture-based classroom with only teacher-student interaction, the flipped classroom encourages teacher-student and student-student interaction. Studying as a group may improve individual students' mastery of medical knowledge.

Third, the flipped classroom approach emphasizes the output of knowledge from students. The traditional lecture-based classroom focuses on how much knowledge can be absorbed in a class by the students through reading and listening (input); however, in the flipped classroom, students are encouraged to verbalize what they learn and to exchange ideas through discussion or debate (output). The professor and teaching assistants in the flipped classroom. Compared to the traditional lecture-based classroom, where medical students have only an average attention span of 10–20 minutes at the beginning of the lecture, the flipped classroom approach engages students longer, which may aid in knowledge retention. Consistent with our findings, previous studies have shown that the flipped classroom approach improves students' performance[78].

5.3 Making lectures memorable: A cognitive perspective

The main principle to maximizing the long-term memory of new material is

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[78] *Tang F., Chen Ch, Zhu Y., Zuo Ch., Zhong Y., Wang N., Zhou L., Zou Y., Liang D. Comparison between flipped classroom and lecture-based classroom in ophthalmology clerkship, Medical Education Online. 2017. 22:1. P. 7.*

> "Get the students' attention <…> tell the students what to pay attention to <...> and do not overload the system."[79]

To set the groundwork for constructing a memorable lecture, briefly reviewing the theory behind memory formation, learning, and effective teaching is important. The learning process has three core components: attention, comprehension, and integration (Fig. 5.6).
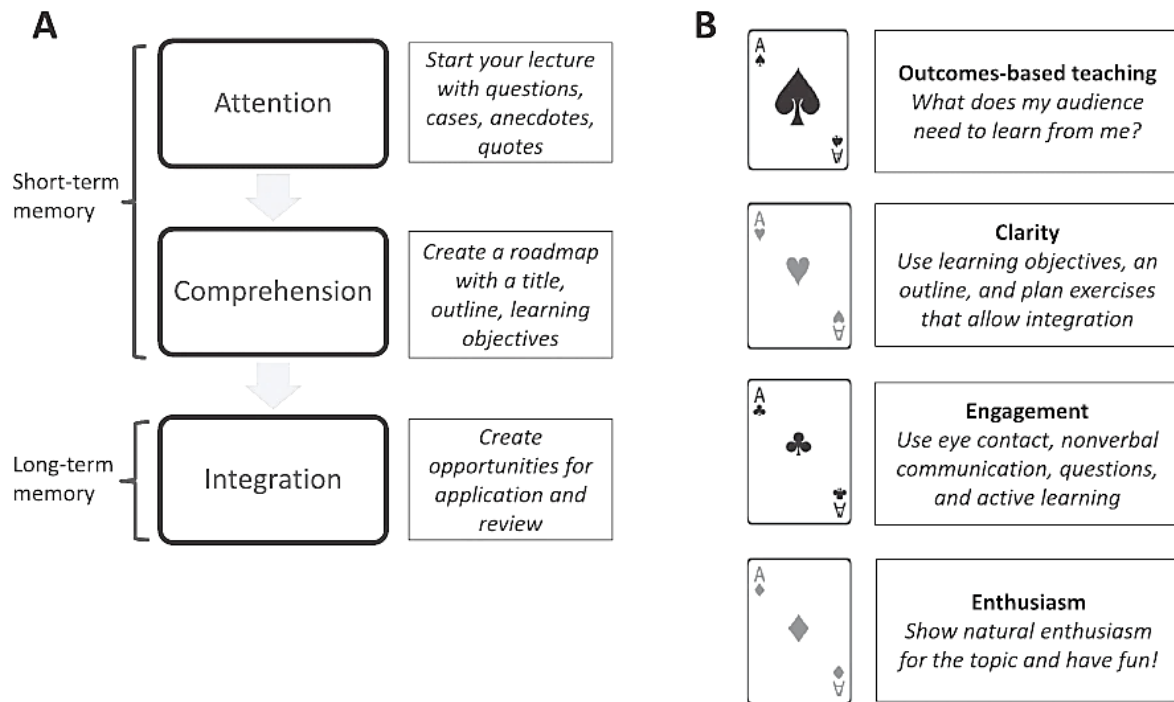

Figure 5.6 Three core components of the learning process[80]

First, to focus the audience's attention, you can start your lecture with questions, case scenarios, personal anecdotes, powerful quotes, or illustrations. Second, you can facilitate comprehension by creating a 'roadmap' to an understanding with thoughtful consideration of a presentation's title, outline, and learning objectives. These first two steps help the learner create short-term memories.

However, to form long-term memories, you must also foster integration by creating opportunities for the audience to relate new information to existing information through application and review. You can ask the audience to apply information from your presentation to a case scenario, solve a problem or dilemma, or have them compare and contrast concepts. Opportunities for review may be challenging if you will not be with the audience after the lecture; however, you can still prime the audience for review by summarizing important points, closing the presentation with instructions on how to apply material from the session, and providing a handout or identifying resources that allow the audience

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[79] *Davis J. R. Better Teaching, More Learning: Strategies for Success in Postsecondary Settings. Phoeniz, AZ: Oryx Press. 1994. P.141.*

[80] *Babik M.J., Luther P.V. Creating and Presenting an Effective Lecture. JCEHP. Winter. 2020. Volume 40. P. 36 – 37.*

members to revisit key concepts from your presentation. The main principles of effective teaching are linked to the above core learning components. These principles are sometimes described as the "four aces," and they are linked to increased retention of information (Fig. 5.6B).

5.3 Learning in small groups

Small group learning can be defined as a group of learners exhibiting three characteristics: active participation, a specific task, and reflection (Table 5.5). The effectiveness of small groups was proven two and a half thousand years ago, when Socrates and Confucius initiated this method, which has survived to this day and continues to develop. However, as the researchers emphasize, these traditions had unfolded in different directions.

"Like Socrates, Confucius held discussions with his students, but these discussions were different in character. Confucius was traditionally regarded as wiser and elevated in comparison to his students. By traditional accounts, he offered declaratory answers to student questions—providing cultural foundation for the tradition of teaching by passive-reception lecturing that would later be cemented by the adoption of Kairov's Pedagogics. Confucius's students thus learned from their master's wisdom, but they may have learned less about how to seek wisdom independently. By contrast, Socrates began from the humble (if questionable) premise that he was ignorant. The questions he asked his students challenged them to discover truth through their own process of reasoning. By engaging their opinions as a basis for discussion and encouraging them to discover meaning for themselves, Socrates implicitly conveyed that their ideas and reasoning abilities were worthy of respect."[81]

Successful small-group teaching and learning do not happen by chance. Planning for effective small-group teaching is as important as planning any other teaching activity. This point sometimes goes unrecognized because learning in small groups can appear initially unstructured. Some lecturers are put off by the seemingly informal, loose, or open-ended nature of small-group learning. Others fear this informality will be a recipe for chaos or the group will develop into a therapy session. All types of teaching must be planned as part of a coherent package, with appropriate use of different methods within each component.

Further Reading: A Handbook for Teaching and Learning in Higher Education Enhancing Academic Practice. 3d edition. Ed. Heather Fry. New York, London: Routledge, 2008. P. 72 – 85.

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[81] *Ryan E., Shuai X., Ye Yu., Ran Yo., Haomei L. When Socrates Meets Confucius: Teaching Creative and Critical Thinking Across Cultures Through Multilevel Socratic Method. 2014. 92 Neb. L. Rev. P. 306*

Table 5.5

The table of the types of small groups[82]

	Buzz Group	Circle of voices	Snowball groups	Learning teams
Time frame	3-10 minutes	10-20 minutes	15-20 minutes	any
Purpose	generate ideas/answers, re-stimulate student interest, gauge student understanding	generate ideas, develop listening skills, have all students participate, and equalize the learning environment	generate well-vetted ideas, narrow a topic, develop decision-making skills	foster relationships among students, increase confidence in participating
Features	These groups involve students engaging in short, informal discussions, often in response to a particular sentence starter or question. At a transitional moment in the class, have students turn to 1-3 neighbors to discuss any difficulties in understanding, answer a prepared query, define or give examples of key concepts, or speculate on what will happen next in the class.	This method involves students taking turns speaking. Students form circles of four or five. Give students a topic, and allow them a few minutes to organize their thoughts. Then the discussion begins, with each student having up to three minutes (or choosing a different length) of uninterrupted time to speak. During this time, no one else is allowed to say anything. After everyone has told once, open the floor within the subgroup for general discussion.	This method involves progressive doubling: students first work alone, then in pairs, then in fours, and so on. After working in fours, students usually come together for a plenary session in which their conclusions or solutions are pooled. Provide a sequence of increasingly complex tasks so students do not become bored with repeated discussions at multiple stages. For example, have students record a few questions about the class topic. In pairs, students try to answer one another's questions. Pairs join together to make fours and identify, depending on the topic, either unanswered questions, areas of controversy, or relevant principles based on their previous discussions.	Students are divided into groups at the beginning of the term. When you want to incorporate small group discussion or teamwork into your class, you direct the students into these term-long learning groups. Groups of four work well because each foursome can be subdivided into pairs, depending on the activity.

5.3.1 Seminar method. Ideas for activities in small seminar classes

A seminar is an advanced group technique usually used in higher education. It is an instructional technique that generates a situation for a group to have a guided interaction on a theme. It refers to a structured group discussion that

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[82] *Based on: Group Work in the Classroom: Types of Small Groups. URL: https://uwaterloo.ca/centre-for-teaching-excellence/catalogs/tip-sheets/group-work-classroom-types-small-groups*

follows a formal lecture or lectures, often in the form of an essay or a paper presentation on a theme. The overall goal of the seminar is to create a space and time for students' engagement on the idea level (the intellect, the intuitive, the emotions), the individual level (unique perceptions), and the social level (community). Intellectually, the seminar serves to help students explore a diversity of perspectives, see the complexity and ambiguity of the content, help them recognize the underlying assumptions of their habitual ideas and behaviors, develop higher-level critical thinking ability, and encourage active listening.

The seminar has no expected formal product. The product is meaning, not an answer or a task accomplished. In fact, more questions may be raised than answered. If there is a product, it is inspired learners: learners develop a habit of inquiry that transforms how they approach issues, knowledge, and others. These are habits of mind and heart, a search for connectedness and relatedness

The original home of the seminar is to be found in the ecclesiastical schools of the Middle Ages. The medieval 'seminaries' were veritable seed plats, institutions in which the youthful would-be religious writer or teacher was taught to unfold the seed of doctrinal disputation, theological acumen, and pulpit eloquence. Like medieval universities, the medieval seminaries were called upon to perform a twofold task. On the one hand, they were supposed to impart to the students a comprehensive knowledge of particular topics and teach them special work methods.

The flexibility of class discussions stems largely from a grounding in the Vygotskyian social learning theory, which emphasizes knowledge and conceptual gain through peer-to-peer dialogue. Vygotsky understood peers to coexist in the 'zone of proximal development,' where knowledge could be shared and misconceptions clarified through dialogue. Moreover, this semi-public dialogue can facilitate better speaking skills and human reasoning. When an instructor effectively facilitates rich discussion during class, their students are more apt to build upon the existing knowledge frameworks they continue to develop and achieve better learning outcomes (*see Chapter 3*).

Basic Principles to be included in the seminar:

The seminar method depends on the linguistic, social, and emotional instances and their maturity level.

The complex and undefined concept or article must be read and discussed for meaningful learning experiences and new concepts.

Group discussion is emphasized. The kernel of the seminar is stressed.

The seminar's value and success depend on the learner's path and learning experiences through the discussion.

The learner can advocate and interact in a group discussion with his experiences and concept derived. Both the group and learner can transform their ideas and derive a new conclusion also be anticipated.

In the lower level of learning experiences, the concepts are explanatory, but in this higher level of the learning experience, the theme or concept is centered and needs more evidence and explanations through the discussion.

The interactions in this method develop observation, questioning, and evaluation skills using their own learning experience.

Advantages and special features of the seminar method:

- The seminar method gives good motivation and learning experience.
- Help to evaluate the learnability of learners.
- Regulate the creation and organization of facts and information.
- Dissemination and retrieval of information are scientifically managed.
- Develop self-reliance and self-confidence.
- It also teaches responsibility and cooperative nature.
- This method is the best for socialization.
- Students interaction is possible in participating and producing the teaching-learning process.
- Traditional monotony is abolished in this method.
- Ensures understandability and enhances the capability of the students learning.
- The seminar is always subject / theme specific, so sufficient knowledge about the subject can be developed.
- The presenter or the reader of the article can get further clarification on his subject.
- Develop questioning skills.
- Data processing and analysis also play a vital role in this method.
- It makes the teaching and learning process lively.
- The student receives good information from his teacher and fellow students.
- A seminar does not end on the premises after the completion of the discussion; the group in smaller groups carries on the discussion in informal settings off campus. It is certainly a strong advantage of using the seminar method.

The following activities need to be done in the preliminary stage of the seminar:

- Selection of the seminar theme and its sub-themes.
- A circular regarding the seminar and its information must be prepared without ambiguity.
- The seminar circular must be circulated well in advance to the people with relevant knowledge about the seminar's theme and who can participate in the seminar.
- The selection of the paper presenter/speakers must be based on the article submitted by them and their professional excellence. The selected paper presenter will be informed of the necessary regulations to be followed by them in the seminar.

Before you explain your approach, introduce the relevant background material. Add brief citations to attribute work done by others appropriately. Ensure the audience understands which of the presented material reacts to your ideas and work and which is based on ideas/work done by others. After introducing the background material, you can explain your approach and how you evaluated it.

Activities involved during the seminar (seminar phase):

- The compendium must be distributed to the participants before the beginning of the seminar.
- The seminar theme and its sub-theme need to be explained.
- Guide the paper presenters for their location and time of the seminar session before the beginning of the seminar.
- At the end of the seminar session, the seminar's Chairman will brief the seminar events. It also clearly defines the seminar conducted and the further steps to be taken in the future.

The essential considerations for planning a seminar discussion are:

- What specifically should the students learn from the topic for that day?
- What can you reasonably accomplish in the time allotted?
- Most importantly, what is the right pattern[83] for the discussion at hand?

For example, if you and your students are discussing a nonfiction work, try the *Arguments: find them first, then evaluate the* pattern. Guide the students to unpack the author's line of argumentation carefully. When they have that reasoning in their grasp, they can evaluate how well the argument illuminates the relevant sphere of reality – some aspect of politics, say, friendship, how we know what we know, or some other important topic.

The seminar discussion really starts when you ask your first question.

- Do not begin with something like, "What did you think of the reading?" That is too unfocused.
- Above all, do not ask a question that distracts the students from the text and kills focus.
- If the text is fictional, do not ask the students about authorial intent, the moral of the story, the takeaway virtue, or an alternative ending—all major distractions.
- Ask questions that lead the students into the text. Ask them to notice concrete details—geography, appearance, or shifts in time.
- Ask 'why' questions.
- Questions to clarify.
- Questions to probe the thoughts, words, and actions of the characters.
- Questions to challenge presuppositions.
- Questions to seek textual evidence.
- Questions that trigger fresh starts altogether—you may need a fresh perspective if you have exhausted a passage or run into a dead end.

Higher-order questions are those that the students cannot answer simply by recollection or reading the information '*verbatim*' from the text. Higher-order questions put advanced cognitive demands on students, encouraging them to think beyond literal questions (Table 5.6).

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[83] *Pattern - the specific strategic approach you are going to adopt for the topic under examination. That there are different strategic patterns may not have occurred to you, but it should make sense*

Higher-order questions promote critical thinking skills because these types of questions expect students to apply, analyze, synthesize, and evaluate information instead of simply recalling facts. For instance:

application questions require students to transfer knowledge learned in one context to another;

analysis questions expect students to break the whole into parts such as analyzing mood, setting, and characters, expressing opinions, making inferences, and drawing conclusions;

synthesis questions have students use old ideas to create new ones using information from a variety of sources; and

evaluation questions require students to make judgments, explain reasons for judgments, compare and contrast information, and develop reasoning using evidence from the text.

Table 5.6

Example of helpful questions for concept development and guided practice

Concept development	Guided practice
In your own words, what is (insert the concept being taught)?	How did you know how to _____?
	How did you know that this was the correct answer?
Which is an example of _____? Why?	
What is the difference between the example and the non-example?	How did you use to ensure that you knew how to find the ____?
What is an example of _____?	How did you know how to interpret the answer?
Give me an example of _____	
Draw an example of ____ .	Which steps were most difficult for you? Why?
Match the examples to the definition of _____	
Which picture/poster shows an example of ___?	

The standout qualities of a great seminar discussion are:
- All the students are participating and working things out together.
- There is a lot of exchange between them.
- The discussion has purpose and direction but is fluid.
- Each student is thinking independently.
- Students persuade each other: Some defend their positions with careful argumentation, while others see things they had not considered before.
- Everyone relies on good evidence.
- The learning is rigorous, and the discussion is lively and fun.
- The students are attaining real understanding.

They are forging a genuine friendship.

Coaching takes place during the seminar. For example, while observing a less-than-productive exchange develop among the students, you might interject by asking them to look at the text they have been discussing from a different angle—using a different question or relying on evidence they have not yet considered. Or, you might help a student rephrase a statement because it was grammatically incorrect, inaccurate, or off-topic. If the students meet a roadblock

and cannot seem to continue the conversation, you can help them regroup by pointing out an important passage or by bringing their attention back to a question that triggered the discussion in the first place.

Coaching might also occur outside of class in a one-on-one meeting with a student. There, you can highlight strengths and areas in need of improvement. Coach your student on how better to prepare for the discussion: markup the text better; jot down some questions or ideas to contribute to the discussion; outline an argument or list out the qualities of a character. In a one-on-one meeting, you can even relate the quality of a student's discussion to another essential skill. For example, let us say a student is fully engaged in a seminar discussion, asking questions without fear of being judged, posing original thoughts on interpretation, arguing with his peers, conceding ground to better arguments, and trying fresh approaches to the text. Yet, on the other hand, his writing is formulaic. One thing you can do is to go over the student's latest essay and point out how he might improve his writing if he took the kind of reasonable risks there that he takes in class discussion.

To preserve the dynamism of seminar discussion, seminar instructors continue to make real-time interaction the centerpiece of their courses. Instructors add significant asynchronous elements to their courses to expand the number of ways that students in different situations can engage with one another and with the instructor. To optimize interaction online, instructors consider ways of reducing seminar size. More extensive seminars might break up into smaller tutorial groups. Instructors supplement their live discussions with asynchronous modes of participation, which offer students multiple ways of engaging with the course. Discussion boards, chats, and between-class projects can strengthen the cohort, encourage individualized or small-group exploration, and make the live discussions more focused and informed.

Post-Seminar Content:

- Transition to Writing: Give a few minutes for everyone to write down things they thought, read, or heard that help them explain further their thinking about Information, Knowledge, Understanding, Wisdom, and Time.
- Writing Task: After reading and discussing "The Goods of Mind," assess a lesson you have recently taught to see where most of your student's learning experiences fall. How might you adjust at least two key components of your plan to further advance in the "scale of values"? Use at least one reference from the text.
- Brainstorm: Talk in pairs about what the writing task is asking you to do and your beginning thoughts about what you will edit or modify about your lesson plan.
- Structure the Writing: Discuss with participants possible designs (or outlines) for their lesson plans. Allow a few minutes for all to create designs or edits for their plans. Have participants draft their improvements and modifications on paper and use them to refine their thinking. Discuss an individual with whom you might be open to sharing this updated lesson plan.

- First Draft: Spend 10-15 minutes putting your thoughts on paper about what edits are actionable and realistic.
- Personal Revision: Have participants modify their lesson plans focusing on the anticipated change in one of the goods of mind. Give time for complete revisions resulting in a new draft ready for class use.
- Post-Teaching Edit: After reflection on the outcome of the lesson, make final adjustments to your lesson plan and prepare the plan to be shared with a teammate or colleague.
- Publish: Share the plan and solicit feedback once the plan is reviewed or used to teach.

Getting a handle on the following student factors and corresponding teacher responsibilities will help you work with the range of performance levels among your students (Table 5.7).

Table 5.7

Influencing student factors and corresponding teacher responsibilities

Student factor	Teacher's responsibility
Students desire to know. Each student wants to participate. This is true, even for students who do not initially participate.	Assume potential for learning in all of your students. Proactively coach them to be discussants.
Every participant can play an important role.	Like a sports coach with a team of players, help each student work in concert with the others.
Each discussant can grow in skill.	Attentively observe the students' work and coach each one to the next level of proficiency.

Evaluation of Seminar:
- The seminar can be evaluated using formal and informal evaluation methods.
- The evaluation must be made to get immediate feedback from the speaker and participants regarding the seminar paper and other details.
- The paper's objectivity and the audience's view must also be evaluated.
- The observation schedule and questionnaire can be used as evaluation tools for the seminar.
- The information obtained through the evaluation tools must be feedback for the paper presenters.
- The evaluation of the overall seminar process can be used for the study and feasibility of forthcoming seminars and their arrangements.

A Socratic seminar is a formal discussion based on a text in which the leader asks open-ended questions, running as it should (Fig. 5.7)

Figure 5.7 Socratic seminar vs. traditional discussion
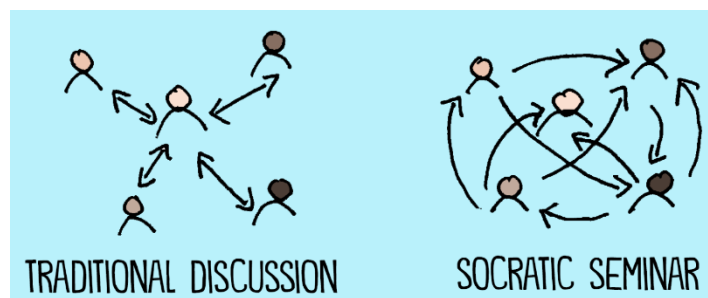
At its best, the Socratic seminar discussion model challenges students to read closely, think and write critically, and articulate their thoughts clearly and respectfully. Socratic seminars acknowledge the highly social nature of learning and align with the work of John Dewey, Lev Vygotsky, and Jean Piaget.

> "A Socratic teacher engages her students in strategic intellectual debate, forcing them to challenge the reasoning behind her purported conclusions, theirs, and the conclusions of other students. Ideally, the method facilitates an interactive classroom in which lively discussions stimulate engagement, participation, and epiphany. Yet cultural norms in Chinese and other Eastern societies occasionally clash with the classroom roles required by the method, which compromises its effectiveness at engaging student participation and stimulating learning. Such norms discourage students from challenging the teacher, engaging in apparent confrontation with other students, taking public risks, volunteering, or even calling attention to themselves or their own ideas."[84]

Ideally, the method teaches students how to expose poor reasoning and prepares them to assemble robust alternatives. In this respect, the method teaches the reductive side of critical thinking and the creative side by encouraging students to draw connections between elements without immediately obvious relationships. Students are asked to experiment continually, applying new theories to old problems and old theories to new problems.

Before the Seminar

- *Prepare students with expectations for participation* (read and discuss this list together, and prompt students to consider their participation style during the seminar.)
- *Provide students with seminar questions in advance* (Having a written response to refer to during the seminar is useful for all students, but especially for students who are introverted or have social anxiety; it serves as a built-in talking point.)
- *Offer a mix of required and optional seminar questions* (Required questions are beneficial because everyone can speak to them during the seminar, while optional questions cater to students' individual interests and build some flexibility into the discussion.)

The responsibilities of a student in a Socratic Seminar are:

- Being prepared by reading my text thoroughly and reflectively and marking key passages in my text.
- Asking questions about what I have read, heard, and seen.
- I am asking for clarification of any passage I have read that I do not understand.
- Being courteous and respectful of my peers.
- Maintaining an open mind to a diversity of opinions.
- Listening attentively and patiently as peers share their ideas.

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[84] *Ryan E., Shuai X., Ye Yu., Ran Yo., Haomei L. When Socrates Meets Confucius: Teaching Creative and Critical Thinking Across Cultures Through Multilevel Socratic Method. 2014. 92 Neb. L. Rev. P.291.*

- Listening critically to others' opinions and taking issue with inaccuracies or illogical reasoning.
- Pausing and thinking before I respond to a facilitator's question or a comment made by a peer.
- Clarifying information and lending support to a peer's argument.
- Commenting on what my peer has said before going on to make my point.
- Making judgments that I can defend with specific textual evidence.
- Explaining to others how I have inferred an idea by exploring the passage led me to this conclusion.
- Locating facts and examples in the text that can be cited as evidence for a particular argument.
- Moving the seminar forward to new concepts.
- Searching for connections between the text and previous readings or prior studies.
- Searching for connections between the reading and the world

During the Seminar

Opening with a round robin (Opening with a round robin question – where going around the circle and each student shares their response – means that every student's voice is at least once. Again, students who are introverts or have social anxiety are never surprised. This strategy works particularly well as a warm-up when the question connects to students' personal experiences or asks them to bring in a piece of outside media).

Facilitate, do not dominate (Move the conversation in a new direction as needed. But rarely participate directly, except to answer the round-robin question for community building).

Common statements or questions used during a Socratic Seminar activity include:
- Where does that idea come from in the text?
- What does this word or phrase mean?
- Can you say that in another way?
- Is this what you mean to say...?
- What do you think the author is trying to say?
- What else could that mean?
- Who was the audience for this text? How does that shape our interpretation of these words?
- Who was the author of this text? What do we know about him/her? How does that shape our understanding of these words?

Criteria you might use to evaluate a Socratic Seminar activity include
- engagement (everyone listening and sharing),
- respect (no interruptions or put-downs),
- meaning-making (students understand the text more deeply at the end of the seminar), and
- use of evidence (comments always refer back to the text).

A Socratic Seminar activity often begins with the discussion leader, a student, or the teacher, asking an open-ended question. A typical opening prompt is: What do you think this text means? Silence is fine. It may take a few minutes for students to warm up. Sometimes teachers organize a Socratic Seminar activity like a Fishbowl activity, with some students participating in the discussion and the rest of the class having specific jobs as observers. At least 15 minutes should be allotted to the activity, and it can often last 30 minutes or more. As students become more familiar with the Socratic Seminar format, they can discuss a text for longer periods without teacher intervention.

After the Seminar

Allow time for reflection. This step encourages students to practice metacognition, evaluating their performance during the seminar. At the end of each seminar, give ten minutes for students to respond to five questions

- What did you find most interesting about today's seminar?
- What did you find most surprising?
- Did anything make you change your mind or think more deeply? What, how, and why/why not?
- What did you contribute to today's seminar? Be specific.
- What might you do differently at our next seminar? Be specific.

Further Reading: Castellanos-Reyes D. Socratic Seminar. In: R. Kimmons, S. Caskurlu (Eds.) The Students' Guide to Learning Design and Research. 2000. EdTech Books. https://edtechbooks.org/studentguide/socratic_seminar

5.3.2 Key characteristics of a symposium

A symposium is similar, in some ways, to a seminar. It takes place in a small group (preferably no more than 25, and ideally less) and is fundamentally about shared, open discussion on a particular topic. Symposia work best when furniture is arranged in a square or circle so that everyone can see everyone else and no single person – whether tutor or student – is in a position to dominate or to hide.

Much beloved by the ancient Greeks, the original symposia involved alcohol, feasting, and music aiding philosophical discussion. Still, in a modern university setting, you should expect the emphasis to be placed firmly on the latter (although light refreshments are sometimes involved). A good symposium will tend to have a relaxed atmosphere to encourage lively debate, knowledge sharing, and opinions.

The key characteristics of a symposium are as follows:
- there is no set running order – you simply join in when you have a point to make or a question to ask, or if you want to steer the conversation in a certain direction,
- everyone must join the discussion at some point – there is no audience in a symposium; only participants,

- there is usually a symposium 'chair' (this is not necessarily the tutor), whose role is to move the conversation on if it stalls, prevent gaps, and ensure that everyone contributes,
- the chair is not supposed to lead or dictate the discussion, but s/he might provide a short summary at the end and/or arrange for a record of the symposium to be written up afterward.

You can prepare for a symposium by:

- thinking about – and researching – the broad subject beforehand,
- identifying a specific issue, idea, figure, or work that you would like to pitch into the discussion at some point,
- preparing something to say about it,
- bringing along something to write with and something to write on.

Do not script what you want to say: aim to extemporize it (i.e., do it 'off-the-cuff') so that you can respond to what other people have said. Use available media if this will help illustrate your contribution, e.g., draw a diagram on the board or visualizer, bring along an image or a scene from a film. To perform well in a symposium, you must be confident in your knowledge of the subject matter.

5.3.3 Procedure of workshop method

The workshop explicitly focuses on the context because the successful implementation of generically described teaching methods in units of heavy learning depends on the context.

A workshop is an assembled group of ten to twenty-five persons who share a common interest or problem. They meet together to improve their individual subject skills through intensive study, research, practice, and discussion.

Teaching is a continuum from conditioning to indoctrination, and training is also inclusive in it. The innovations and practices of education are introduced by organizing a workshop in which persons are trained to use new practices in their teaching-learning process. The workshops are organized to develop the psychomotor aspects of the learner regarding practices of innovations in the education area. Participants must do practical work to produce instructional teaching and testing material.

The term workshop has been borrowed from engineering. In these workshops, people have to do some tasks with their hands to produce something. Question Bank Workshops are organized in education to prepare questions on the subject, and the designers are given knowledge and training for designing questions in the workshop.

Objectives of workshop

The workshop is organized to achieve the following cognitive objectives:

- To identify the educational objectives in the present context.
- To develop an understanding regarding the use of a theme and problem.

The following objectives are achieved by this method under the psychomotor domain:

- To develop the skills to perform a task independently.
- To train the persons to use different approaches to teaching.

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Functions of workshop

The workshop looks at the factors influencing the successful adaptation of teaching techniques to create specific learning arrangements. The 'context' created by the specific learning situation is seen as the defining influence of teaching method selection and adaptation. Workshop participants will use generically described teaching methods for (supposed) application to a specific learning/teaching situation. The workshop will look at the triangle built by the three concepts of teaching method, a unit of learning, and context to determine the relevant elements that influence the (successful) adaptation of teaching methods to a specific context to create a unit of learning that is targeted towards a specific implementation. The workshop aims to work out a practitioner-oriented set of elements that make up the context of teaching methods and the barriers and uncertainties that arise when using generic teaching methods.

1. The workshop method is used to seek, explore and identify the solutions to a problem; to permit the extensive study of a situation, its background, and its social and philosophical implications.

2. It is used for teachers to give awareness and training of new practices and innovation in education.

3. It provides an opportunity to prepare specific professional, vocational, or community service functions. A high degree of individual participation is encouraged and permits group determination of goals and methods.

The procedure of the workshop method

No doubt planning a workshop is a lot of work. But if enough time is spent thinking through the details, everyone will get the total value from the event.

The workshop will mainly incorporate interactive elements. To kick off the workshop, the organizers will shortly outline the strengths and weaknesses of generic teaching method descriptions and show the importance of providing context information to facilitate real implementation. After the introduction, the participants will split into groups and take an example generic teaching method to adapt to a supposed teaching context. While going through this process, the participants will identify and record context elements that they find relevant and questions that arise. Each group will agree with the group members on what context elements represent the core when adapting teaching methods.

The workshop's goal should be central to all planning, and creative exercises will get everyone relaxed and involved. Do not forget to follow up afterward: Although it can be scary to hear what people thought of all the hard work, it is the only way to improve the future event.

The organization of the workshop can be divided into two phases;

The Pre-active phase

Follow these steps to make the workshop a valuable experience:

Step 1: **Define the Goals**

Every workshop must have a goal. Many workshops waste time because no clear goal is kept at the discussion center. Without a clear goal, there is really no point in getting people together.

Step 2: **Decide the Target Group**

Knowing who will participate directly relates to the objective. Make a list of people who needs to be there. Try to be as specific as possible, but leave a few openings for last-minute additions.

The target audience for the workshop includes instructors and instructional designers interested in applying proven teaching methods, learning patterns, or pedagogical scenarios. The target group benefits from this workshop by gaining experience in exemplarily transferring a generic teaching method to a unit of learning and identifying what relevant context elements reinforce this process. The participants' awareness of needed elements is thus sharpened, and the ability to use generic teaching methods in future applications is enhanced. Furthermore, participants will support the scientific understanding of the context of teaching methods by contributing their own teaching and learning design experience. Participants are expected to contribute actively to the workshop. Participants do not have to write an article for this workshop. Workshop participants are expected to contribute actively to the workshop's discussions and tasks.

Step 3: **Select the Right Location**

Think about the logistics and practical details of the workshop to select the location. Make sure that everyone can see the visual aids. If a technology like teleconferencing is used, will the location support it? Also, make sure about the appropriate facilities for breakout sessions. Will everyone be able to reach the venue? Will there be a need to organize accommodation for people coming from a long way away? And what catering facilities does the venue provide?

Step 4: **Prepare an Agenda**

As the primary objective is decided and who will participate is confirmed, develop an outline of how to achieve the workshop's goal.

- **Main points** – Create a list of main points to discuss, and then break down each larger point into details
- **Visual aids** – List the visual aids, if any, to be used for each point. If you need technical support, provide expert help, this helps the people to determine where they need to focus their efforts.
- **Discussions and activities** – List exactly which group discussions and activities will be used at which point in the workshop. How much time will be allowed for each exercise? Make sure the activities are appropriate for the size of the group, and ensure that the venue has the resources (for example, seminar rooms) needed to run sessions.

Step 5: **Develop a Follow-up Plan**

The only way to determine if the workshop succeeded is to have an effective follow-up plan. Create a questionnaire to give to all participants at the end of the event and provide them with plenty of opportunities to share their opinions on how well it went. It is the only way to learn – and improve – for the next time.

It's also important to have a plan to communicate the decisions that were reached during the workshop. Plan to send out a mass email to everyone with the details. Plan to put it on your college internet. People need to know that their hard work resulted in a decision or action, so plan to keep them informed about what happens after the workshop ends.

The Active phase

Generally, workshops are organized for three to ten days. In exceptional cases, the period of the workshop may be extended. It depends on the nature of the task assigned to the workshop participants. It can be organized into three stages:

First Stage.

Presentation of the theme for providing awareness. Resource persons or experts are invited to give awareness and understanding of the topic. Paper reading is done to discuss the different aspects of the theme. The trainees or participants are given opportunities to seek clarification. The experts provide suitable illustrations and steps for classroom teaching or education. In the first stage, the theoretical background is provided to the participants.

Second stage.

Practice the method for its applicability. In the second stage, the group is divided into small groups, e.g., a workshop for lesson planning or writing objectives in behavioral terms or a Question Bank workshop. The groups are formed based on subjects (Language, Science, Math, Social Studies). A resource person or expert is assigned to guide the work. The expert provides guidance and supervises the work of each trainee in his group. Every participant has to work individually and independently. Every trainee has to complete their task within the given period. In the end, they meet in their groups and discuss and present their task to be completed.

Third Stage.

At the round-up of the workshop. A representative of each group will then be asked to present the findings. Following all groups' presentations, workshop participants discuss the findings, conceivably adding or eliminating elements. This first phase will result in an unordered set of context elements accumulated from all workshop groups and unresolved questions.

In the second stage, the participants must elaborate a meaningful ordering scheme for the thus far collected context elements. It is achieved by illustrating an example for each context element derived from teaching practice. The groups then prioritize the context elements, assigning, for instance, first and second priorities based on teaching requirements. The groups will also choose one of the unresolved questions, which they will discuss further. This discussion either provides a solution to the question or a more detailed description of what makes up the problem. The outcomes of this group work are again presented to the workshop audience. Comparative discussion can take place to arrive at a final result for the context elements of teaching methods.

The round-up will be a reflective discussion with all workshop participants. The experiences of using teaching methods are put into personal perspective, e.g., what value participants see in the use of teaching methods or what elements regarding the context cause uncertainties with participants.

Evaluate the material prepared by the participants as a follow-up. These groups meet at one place and present their reports of work done in the second stage. The participants are given opportunities to comment and provide

suggestions on different aspects of the reports; Formalities are observed at the end of the workshop.

Follow up.

A follow-up is an important part of a good workshop. An objective follow-up ascertains the effectiveness of a workshop. The trainees are asked to continue their tasks and examine their workability and usability in their institutions. Participants will take away from the workshop a set of structured teaching methods for their teaching and the ability to adapt a teaching method to their teaching context. It includes a refined understanding and awareness of the elements that play a defining role when performing this task.

The workshop will provide a set of practitioner-defined context elements for generic teaching methods that are prioritized and illustrated in examples. Last but not least, problems of generic teaching method use are collected. These inputs will be used to refine further the research on optimizing the provision and use of teaching methods.

The participants are invited to meet again and present their institution's feedback. The participants are invited to meet again and present their experiences regarding the applicability of the topic or new practices. They may give some practical suggestions in this context. A report on the workshop is prepared.

Suggested Areas of Education for Workshop Method:

- A new format of lesson planning.
- Writing objectives in behavioral terms.
- Preparing objective-type tests which are objective centered.
- Action research projects for classroom problems.
- Preparing instructional material or teaching model.
- Workshop on Micro teaching.
- Workshop on Interaction analysis technique.
- Workshop on test construction.
- Workshop on preparing research synopsis or proposals.
- Workshop on nonformal education.
- Workshop on designing courses for teacher education.

Roles in Workshop Method

Role of Organizer of the Workshop Technique. The organizer prepares the program and schedule, and he has to arrange boarding and lodging facilities for participants and experts.

Role of Convener in First Stage. In the workshop's first stage, the experts discuss the theoretical aspects of the workshop's theme. Therefore, a convener familiar with the theme or workshop is nominated or invited. He has to conduct a workshop at this stage and observe the workshop's formalities and keynotes.

Role of Experts or Resource Persons. Resource persons play an important role in organizing a workshop providing theoretical and practical aspects of the theme. They guide participants at every stage and train them to perform the task effectively

Role of Participants or Trainees. The participants should be keen or interested in the theme of the workshop. In the first stage, they have to acquire an

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understanding of the theme. In the second stage, they must practice and perform the task with great interest and seek expert guidance. They should try to carry the concept to their classroom to evaluate its workability in current situations. The effectiveness of any workshop technique depends upon the involvement of the participants in the task.

The Overall Workshop Tips are:

Getting everyone involved is the key to a successful workshop. If one stands up and talks for three hours, he is just giving a lecture – not facilitating a workshop. Everyone needs to participate

Many people are nervous about speaking up in an unfamiliar group. Plan group exercises; keep the size of each group small so people are more comfortable talking and interacting.

Determine how to record the ideas from each group.

Remember; to spend as much time as possible creating fun and interest in group exercises. These will likely keep everyone interested and participating.

Start the meeting with a few icebreakers to get everyone relaxed and comfortable.

If the workshop aims to address a difficult or sensitive topic, it is especially important to get the group comfortable before starting. One way is to tell a story loosely related to the topic before discussing the difficult issue. Sometimes, not everyone has to stay for the entire workshop… Identify which sections the busiest participants need to attend, and suggest in advance when they might want to arrive and leave. They will appreciate this consideration.

Where possible, avoid holding the workshop after lunch, between 2:00 and 3:00 in the afternoon. For many people, this is the slowest, most unproductive time of day. The group will probably be more energetic if they schedule the morning or late afternoon event. (If the workshop is in the early afternoon, ensure plenty of strong coffee is available).[85]

5.4 Self-assessment questions

1. What are the principles of the heuristic method of teaching?
2. What are the differences between the form/direct instruction and indirect form/autonomous work of students?

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[85] *According to:*

Tiberius R, Silver I. Guidelines for conducting workshops and seminars that actively engage participants. University of Toronto, Department of Psychiatry, 2001.

Maheshwari V.K. Workshop — an Instructional Method. URL:httpp://www.vkmaheshwari.com/WP/?p=385

Planning a Workshop. O1ganizing and Planning a Successful Event. URL:https://www.studocu.com/en-us/document/new-jersey-university/pathophysiology/ workshops-and-seminars/22309969

A Guide for Presenting an Effective Workshop at the Graduate Student University-Teaching Conference. URL: https://opened.uoguelph.ca/student-resources/resources/A-Guide-for-Presenting-an-Effective-Workshop-at-the-Graduate-Student-University-Teaching-Conference_2018.pdf

3. What are the main vectors of discussions around the effectiveness of the lecture as a teaching method?
4. Identify the advantages and disadvantages of the lecture as a method
5. What tools increase the effectiveness of the lecture?
6. What functions does the worksheet perform during the lecture?
7. What student interactive activities can be added to the lecture?
8. What are the goals of the flipped classroom strategy?
9. What is the difference between the flipped classroom procedure and the traditional lecture-based approach?
10. Identify the ways to maximize long-term memory in learning new material. Provide examples.
11. What techniques support the dynamics of the seminar?
12. What teaching goals does the Socratic seminar implement?
13. Determine the stages of conducting a Socratic seminar.
14. What is the difference between a seminar and a symposium?
15. What advantages and disadvantages of the workshop method can you distinguish?

5.5 Practice exercises

5.5.1 Seminar organizer

Pre-Seminar Content

Inspectional Read: Ask participants to scan the document and discuss what they anticipate in the reading. Briefly discuss the title. Number the paragraphs (1-11). Read the whole text aloud and slowly.

Vocabulary: Highlight words, phrases, and sentences of import and interest. Use context clues to clarify the meaning of unfamiliar words. Create a list of unfamiliar words

Analytical Read: Read this text a second time and take detailed notes on your reactions to the points made. Underline any phrases that stand out to you. Put question marks by points that either you do not understand or do not agree with.

Pre-Seminar Process:
- Define and State the purpose of the seminar. The seminar's main purpose is to arrive at a fuller understanding of the textual ideas and values of ourselves and each other.
- Describe the responsibilities of the facilitator and participants.

Have participants set a Personal Goal?
- To refer to the text
- To ask a question
- To speak out of uncertainty
- To build on others' comments

Agree on a Group Goal. Post-Seminar Process:
- Have participants do a written self-assessment of their personal goals.
- Do a group assessment of the social and intellectual goals of the seminar.

After the Seminar

Allow time for reflection. This step encourages students to practice metacognition, evaluating their performance during the seminar. At the end of each seminar, give ten minutes for students to respond to five questions.

- What did you find most interesting about today's seminar?
- What did you find most surprising?
- Did anything make you change your mind or think more deeply? What, how, and why/why not?
- What did you contribute to today's seminar? Be specific.
- What might you do differently at our next seminar? Be specific.

Preliminary stage
- Seminar theme and its sub-themes
- The goal of the seminar.
- Background information.
- Guide the paper presenters for their time and requirements of seminar session.
- Supplementary tools (worksheet, texts, glossary etc.)

Seminar phase
- What is your first question?
- What are your good questions for the discussion?
- What activities will you add?

Post-seminar phase
- The type of assignment (time of performing).
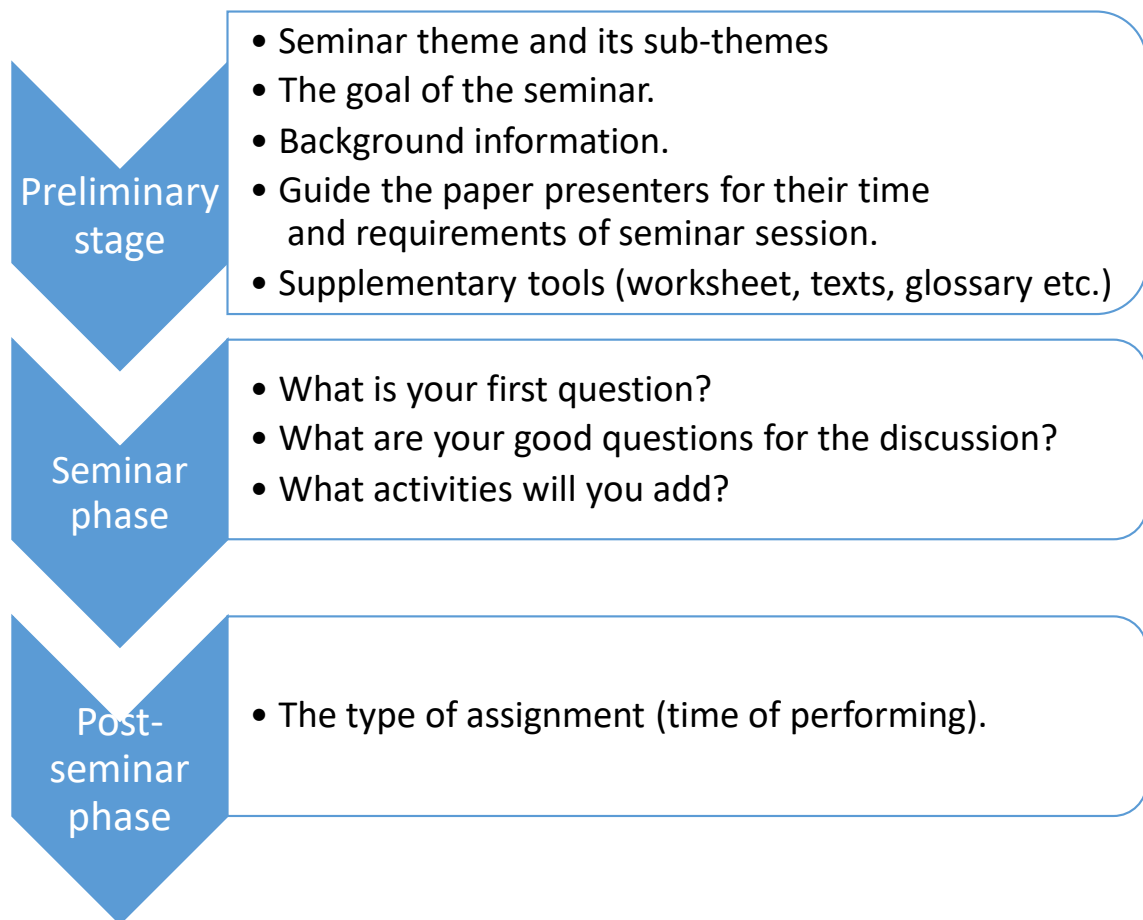
Figure 5.8 Seminar organizer

5.5.2 Lecture planning and organizer for interactive teaching and learning

Structure the content and the key terms

Lectures across different categories work together. Thus, an instructor may give a semiformal, problem-solving, chalk, and talk lecture, while another may offer a lecture-discussion, point-by-point, multimedia lecture.

Define the type of your lecture.

Add some activities for the lecture.

Design the lecture organizer.

Overview
- What is the purpose of your lecture?
- What are 3-5 main points you want to make in your lecture?
- What is the background of your audience?

Introduction
- How will you gain their attention?
- How will you establish relevance to the learner?
- What are the goals of your lecture?
- What is the structure of your lecture?
- What ground rules will you establish?

Body
- 3-5 main points for each
- State main point in simple terms
- Give examples or illustrations
- Give major exceptions
- Restate main point in different words – make a transition to next main point.

Conclusion
- How will you summarize the main points?
- What questions will you ask learners?
- How will you encourage learners to ask questions?

Visual aids
- What main points or concepts could be made more understandable by a visual aid?
- What types of visual aids could you use to illustrate the above main points or concepts?

Learner involvement
- Write at least 5 fact-based questions to include in the body of your lecture.
- Write 1-2 problem-solving questions or case studies to include in the body or conclusion of your lecture.
- Describe 2 strategies (other than questions) you can use during your lecture to involve learners.

Figure 5.9 Lecture organizer

5.5.3 Effective lecture handouts

Guidelines for Constructing and Using Guided Notes

- Examine existing lecture outlines (or create them as necessary) to identify the most important course content students must learn and retain via lecture. Student learning is enhanced by lectures with fewer points supported by additional examples and opportunities for students to respond to questions or scenarios.
- Delete the key facts, concepts, and relationships from the lecture outline, leaving the remaining information to provide structure and context for students' note-taking.
- Insert formatting cues such as asterisks, lines, and bullets to show students where, when, and how many facts or concepts to write.
- Use PowerPoint slides or overhead transparencies to project key content. Visually projecting the key facts, definitions, concepts, relationships, etc., that students must write in their GN helps ensure that all students access the most critical content and improves the pace of the lecture.
- Leave ample space for students to write. Providing about three to four times the space needed to type the content will generally leave enough room for students' handwriting.
- Do not require students to write too much. Using GN should not unduly slow down the pace of the lecture. Two studies found that students? Exam scores for lectures taught with GN that could be completed with single words and short phrases were as high as their test scores for lectures taught with GN that required more extensive writing to complete.
- Enhance GN with supporting information, resources, and additional response opportunities. Consider inserting diagrams, illustrations, photos, highlighted statements, or particularly important concepts.

DESIGN OF HANDOUTS

Selection:

1. Select materials that are appropriate to the content of the lecture.
2. Use materials that enhance the speaker's presentation and/or if the speaker makes specific reference to them.
3. Make sure the material is not out-of-date.

B. Designing Handouts

1. Outline important points to be covered. Carefully structure the outline in terms of main topics and sub-topics. Organize contents carefully and use a logical sequence.
2. Avoid lengthy written explanations - the handout is a guide
3. The most useful handouts have partial information (an outline with key tables and figures) and space for taking notes (encourage note-taking)
4. Use more than one handout in preference to a lengthy one if there is a logical way of dividing the content

While you design your handouts, use the following checklist to ensure they are effective.

Content features:
- Checked the learning outcomes to establish what was needed.
- Checked that the information is not readily available elsewhere.
- Applied for permission to reproduce copyrighted material.
- Organized the information in a logical order for learning.
- Clearly stated the topic and purpose of each handout.
- Make it clear whether students are to put their names on the handouts or if they are to return them.
- Included instructions for any test questions or procedures.
- Included all necessary steps in procedures and instructions.
- Included safety cautions for all dangerous or difficult procedural steps.

Stylistic features:
- Used simple, clear language throughout.
- Explained any trade or technical terms.
- Subdivided long handouts with headings to help guide the student.
- Left plenty of white space so the type is not overwhelming to read.
- Left plenty of white space where students are to write on the handout.
- Included an overview before each set of procedures.
- Written procedural steps in order that they will be performed.
- Placed safety cautions immediately before the action(s) they refer to.
- Divided long, complex procedures into groupings of between 5 and 9 steps.

Graphic features:
- Chosen graphics that illustrate the topic clearly and add to the text.
- Labeled all important parts of each graphic.
- Used graphics to explain complicated procedural steps.
- Placed graphics close to the written material they illustrate.
    See the example (Appendix 1 to Chapter 5).

5.5.4 Creating worksheets for visual thinkers

- Information found in long blocks of text can get easily lost for visual learners. Use drawings to break up blocks of text and encourage students to recap what they learned. It will make the information easier to digest for your students
- if your worksheet has three important takeaways, you can draw a star, arrow, or key (as in 'key concept') by each one to give your student a visual cue.
- If you're introducing a new idea, you could draw a lightbulb, or if you're asking them to ruminate on a question, you could draw a question mark in a thought bubble.
- In addition to creating visual breaks within the page, you can engage students by creating a post-lesson visual review page. All you need is a sheet of paper, a phone or scanner, and your drawing tools!

    Start by noting the information you think is important within the original piece. Sort that information into categories. In the example below, our categories are "What Is It?", "When To Use It," "Tips," "Checklist," and a final section for the exercise. Label those sections with a bold marker. Use a highlighter or another light color behind the bold letters to make them stand out even more.

General Tips

- Try to stick to A4 (8 x 11) size paper. If you must enlarge a sheet to A3, make the page smaller by cutting the margins.
- Keep it clutter-free. Printing lots of text or busy backgrounds can be very distracting.
- Use a sans serif font where letters are clearly separated from each other. Arial is a good example and makes it bold and even clearer.
- Put adequate spaces between sections to clarify where one part ends and the other begins. Put suitable spaces between text and diagrams as well.
- Bold, sharp print provides good contrast. When enlarging print copies, try to achieve clear, non-blurry copies.
- Using bold-lined paper with varying amounts of space between the lines may be helpful for handwritten tasks.
- The student may prefer to use pencils and pens with larger points and darker lead and ink.

When approaching a worksheet, it may be helpful to use the tool below to write down the following steps:

- Title of worksheet or activity.
- Learning objective: Define what the child needs to know. What is the outcome or concept being taught?
- Which parts of the task must the child complete to achieve the desired outcome? Is there any possible reduction in the task size?
- How will access to each task be enabled for the individual? List each task and describe how access will be provided.

Appendices to Chapter 5

Appendix I. Lecture Handout

Teaching Plan of 《Digital Image Processing》

Basic teaching unit design			
Lecture section	Channel and mask of digital image	**Teaching time**	2 class hours
instructional objective	1. Knowledge and skills: Know and master the basic concept of channels, learn to view channels, understand channel classification, and master the relationship between channels and colors, channels and selected areas. 2. Process and method: Use task driven method, brainstorming method, case analysis and other methods to correctly understand the concept of channel and guide students to think. 3. Emotional attitude and values: After learning this course, be able to independently think about other ways to use the channel and apply it to valuable works.		
Teaching methods and means	Classroom teaching, comparison and case analysis		
Keys	Correctly understand the basic concept of channel and the relationship between channel and color.		
Difficulties	How to transform the channel into a selection area and case making		
Classroom teaching design	## 1 Scenario import Taking the upcoming May Day as the introduction of the course, highlight the theme of "the most glorious working people", guide students to realize that labor is the most glorious, the most noble, the greatest, and the most beautiful, and present a bunch of beautiful yellow flowers to the beautiful working people. 		

2 New Course Professor

(1) Know the channel and check the channel

a. Open the ps software, find the window channel, and check the content contained in the channel.

b. After checking the channels in RGB image mode, a question is randomly asked:

Is the default number of channels for the image 4 correct?

The answer is no, because our commonly used image mode is CMYK mode. In this mode, there are five channels in total, namely composite channel and four primary color channels (cyan, magenta, yellow and black); In RGB mode, there are 4 channels, respectively composite channel and three primary color channels (red, green and blue)

c. Classification of incoming channels: **composite channel, primary color channel, alpha channel, spot color channel;**
Learn to create new alpha channel and spot color channel

(2) Channels and Colors

Ask the question: What is the relationship between the black, white and gray reflected in the primary color channel and the red, green and blue primary colors in RGB?

Open the ps software and try to draw a white circle in the red channel, a white circle in the green channel, and a white circle in the blue channel. The final picture is the RGB primary color effect.

RGB   CMYK
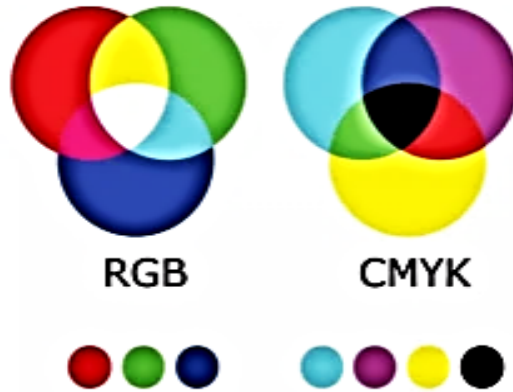
Conclusion: In the primary color channel, black represents that there is no primary color, which is 0; White represents the primary color with the highest purity, which is 255;

Open the ps software to test the effect of intermediate gray on color.

Conclusion: The brighter the primary color channel, the higher the color saturation of the primary color.

Case test: The text in the poster design of "Never Forget the Original Heart" has different effects in the red, green and blue channels, and the text color of "Never Forget the Original Heart" is analyzed.

The answer is yellow.

(3) Channels and constituencies

Observe the red sphere with reduced opacity on the screen, enter the red channel to view it, convert it into a selection area, return to the layer panel, and fill it with color.
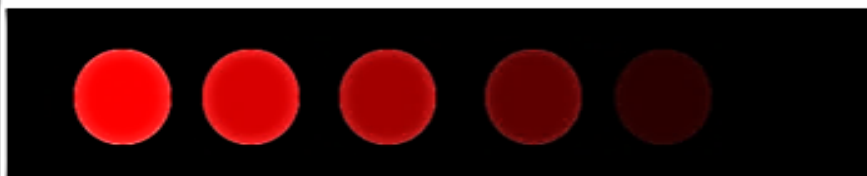
Appendix II Worksheet

Example 1. History of Industrial Design. Art and Craft Movement (1860-1910)

1.Background.

2. Influencing factors

a.The holding of the London World's Fair (promoting British design reform)

b.Further establishment of the patent system

3. Representative person

①.John Ruskin

His main ideological claims.

Reflection and Analysis ❓❓

Why advocate a return to the Middle Ages?

The **flaws** in John Ruskin's claims.

②William Morris

His main ideological claims.

Reflection and Analysis ❓❓

What are the characteristics of the following works by Morris.

4.Differences between British and American Arts and Crafts movements.

5. The significance of the Arts and Crafts Movement to modern design

Example 2. The order of Motion Design

Simiao Wu 2210ZW019

1. History and Theory of Order

The orderliness of design refers to the standardization, serialization and orderliness among the relevant elements in the design.

Representative:

- E. H. Gombrich
- Gustav Klimt

2. Background motion design case

```
Abstract
background ──┬── Basic dynamic material ──┬── Circle
motion      │   creation                  ├── Rectangle
design case │                             └── Triangle
            │
            ├── Animation forms of ───────┬── Translate
            │   element materials         ├── Rotation
            │                             └── Size
            │
            ├── Orderly dynamic material ─┬── Quantity
            │   simple arrangement        ├── Spatial arrangement
            │                             └── Time setting
            │
            ├── Orderly layer management
            │
            ├── Motion design element ────┬── Scripts
            │   iteration                 ├── Plug-ins
            │                             ├── Morphological substitution
            └── Composition               ├── Animation reconstruction
                                          ├── 3D
                                          └── Textures
```


3. Script application

- Find scripts, projects, and other useful items on the Adobe Add ons website.
- Dan Ebberts provides script tutorials and practical scripts in the scripts section of his MotionScript website.
- The AE Enhancers forum provides sample scripts and useful information about scripts in After Effects.

4. Task

Create Motion Design effect or Motion background of logo with orderly dynamic effect, 5-10S.

Appendix III Effective Lecture Checklist

	SUCCESSES	AREAS FOR IMPROVEMENT
PREPARATION		
Outcomes-based Teaching		
☐ I based my presentation on key questions		
☐ I planned activities to foster integration (application, review)		
Clarity		
☐ I organized the presentation into a logical outline		
☐ I based content on 3-5 specific, measurable learning objectives		
Engagement		
☐ I planned to have a conversation with my learners		
Enthusiasm		
☐ I reflected on ways to demonstrate enthusiasm		
PRESENTATION		
Slides		
☐ I included an appropriate number of slides (≤1 per min)		
☐ I organized my slides		
☐ I used visuals (pictures, graphs, tables)		
☐ I used a font that was minimum 24 point, Arial or Calibri type		
☐ I used a simple template with contrasting colors		
Techniques to Create Long-term Memories		
☐ Focus Attention: I began with a technique to focus attention		
☐ Comprehension: I explained the framework or "big picture"		
☐ Integration: I used pauses effectively for review, integration		
☐ Integration: I used activities for learners to apply information		
Active Learning		
☐ I created a safe learning environment		
☐ I used at least one active learning technique every 15-20 min		
Public Speaking		
☐ I conveyed confidence and enthusiasm		
☐ I knew the content well (did not just read my slides)		
☐ I engaged my audience		
☐ I ended on time		

CHAPTER 6. ASSESSMENT OF LEARNING AND TEACHING

6.1 Assessment as the crucial components of instruction

The root of the word 'assessment' is from the Latin 'assidere,' which means 'to sit beside another.' However, along with such a word, the concept of evaluation is often used. These words can be understood as synonymous but differ from the educational perspective.

The main point of difference is that assessment is focused on efficiency, and evaluation is based on values (Fig. 6.1).

Assessment and evaluation
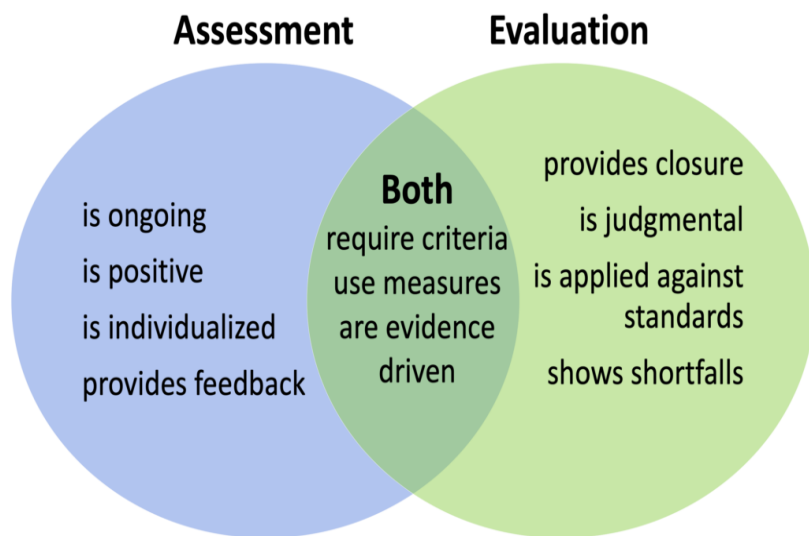
Figure 6.1 The difference between assessment and evaluation

Assessment and accountability do not mean the same thing but are often used interchangeably. Direct performance indicators may be used for assessment, and indirect performance indicators for accountability.

The assessment has a long history. Early records of the Chinese Imperial examination system date 2,500 to 3,000 years ago. That system was used to identify and reward talent wherever it could be found in the sprawling empire of China. Rather than rely solely on recommendations, bribery, or nepotism, it was designed to meritocratically locate students with high levels of literacy and memory competencies to operate the Emperor's bureaucracy of command and control of a massive population. Standardized tasks (e.g., completing an essay according to Confucian principles) were implemented under invigilated conditions to ensure performance comparability.

European educational assessment grew on the base of remains of the Roman Empire, such as schools of grammarians and rhetoricians. At the same time, schools were formed in various cathedrals, monasteries (especially the Benedictine monasteries), and episcopal schools throughout Europe. Under Charlemagne, church priests were required to master Latin to understand scripture correctly, leading to more advanced religious and academic training. As European society developed in the early Renaissance, schools were opened under the authority of a bishop or cathedral officer or even from secular guilds to those deemed sufficiently competent to teach. European universities from the 1100s

adopted many clerical practices of reading important texts and scholars evaluating the quality of learning by student performance in verbal disputes, debates, and arguments relative to the judgment of higher-ranked experts.

As the 20th century progressed, the concepts of validity grew increasingly expansive. The validation methods have become increasingly complex and multi-faceted to ensure scores' validity and interpretation.

> **Further Reading:** *Brown GTL The past, present and future of educational assessment: A transdisciplinary perspective. Front. Educ. 2022. Vol.7 URL: https://www.frontiersin.org/articles/10.3389/feduc.2022.1060633/full*

The primary purpose of assessment is to promote learning. The assessment provides evidence of how learners progress according to defined standards throughout learning and achievement at the end of the learning period. Assessment is one of the most controversial issues in higher education today. Assessment design is concerned with philosophy, disciplinarity, models of assessment, and what we know about ways students learn. In other words, it is an assessment to influence learning. Assessment as feedback is focused more on practices to improve student learning.

"Assessment may be defined as 'any method used to better understand the current knowledge that a student possesses.' This implies that assessment can be as simple as a teacher's subjective judgment based on a single observation of student performance or as complex as a five-hour standardized test. The idea of current knowledge implies that what a student knows is always changing and that we can make judgments about student achievement through comparisons over a period of time. Assessment may affect decisions about grades, advancement, placement, instructional needs, and curriculum."[86]

The practice for the assessment of students determines four main purposes:

1. Pedagogy: promoting student learning by providing the student with feedback, normally to help improve his or her performance (but also to determine what and how students learn).

2. Measurement: evaluating student knowledge, understanding, abilities, or skills.

3. Standardization: providing a mark or grade establishes a student's performance. The mark or grade may also be used to make progress decisions.

4. Certification: enabling the public (including employers) and higher education providers to know that an individual has attained an appropriate level of achievement that reflects the academic standards set by the awarding institution.

The Committee on the Foundations of Assessment report, which summarized the various experience and multiple problems of the assessment, contains conceptual assessment formula that draws on the advances of cognitive learning theory. Three foundational elements, comprising what is referred to as

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[86] *Dietel R.J., Herman J.L., Knuth R.A. What does research say about assessment? NCREL 1991. Oak Brook.URL : http://www.ncrel.org/sdrs/areas/stw_esys/4assess.htm*

the 'assessment triangle,' underlie all assessments. These three elements – cognition, observation, and interpretation – must be explicitly connected and designed as a coordinated whole. If not, the meaningfulness of inferences drawn from the assessment will be compromised.

> *Further Reading: Pellegrino J. W., Chudowsky N., Glaser R. (Eds.). Knowing What Students Know: The science and design of educational assessments. 2001. Washington, DC: National Academy Press. P. 44 – 51.*

The assessment's role and methods are not invariable educational activity tools. Modern studies testify to the dynamism of approaches to assessment, which is determined by the development of learning theories. In particular, there is a shift from traditional approaches based on behaviorist theories to approaches based on cognitive, constructivist theory (*see Chapter 3)*. The understanding of the interaction between assessment and the learning process is changing. Accordingly, evaluation methods and their purpose are being transformed. Checking the level of memorization of a part of the material is considered ineffective in constructivist theory.

> "Cognitive psychology suggests that learning is not linear, but that it proceeds in many directions at once and at an uneven pace. Conceptual learning is not something to be delayed until a particular age or until all the basic facts have been mastered. <…> Learning isolated facts and skills is more difficult without meaningful ways to organize the information and make it easy to remember. Also, applying those skills later to solve real-world problems becomes a separate and more difficult task. Because some students have had such trouble mastering decontextualized 'basics,' they are rarely given the opportunity to use and develop higher-order thinking skills.
>
> Recent studies of the integration of learning and motivation also have highlighted the importance of affective and metacognitive skills in learning. Acquisition of knowledge skills is not sufficient to make one into a competent thinker or problem solver. People also need to acquire the disposition to use the skills and strategies, as well as the knowledge of when and how to apply them."[87]

Under new approaches, students take more responsibility for their knowledge. It means the teacher's role in assessment is to motivate and improve the learning process. This goal is achieved by motivating students to solve problems without feeling 'punished' by a low score.

> "We [teacher educators and practitioners] have not only to make assessment more informative, more insightfully tied to learning steps, but at the same time, we must change the social meaning of evaluation."[88]

It is now widely accepted that assessment tends to shape much of the learning that students do, so if we want to change the way our students learn and the content

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[87] *Dietel R.J., Herman J.L., Knuth R.A. What does research say about assessment? NCREL 1991. Oak Brook.URL : http://www.ncrel.org/sdrs/areas/stw_esys/4assess.htm*

[88] *Shepard L. The role of assessment in a learning culture. Educational Researcher. 2000. 29(7), 4- 14. P. 10.*

of what they learn, the most effective way is to change the way we assess them. The researchers argue persuasively for a paradigm shift in assessment practices. One of the powerful points they make is that despite the advent of technology, most education systems still rely on an out-of-date information transmission model, which means that the assessments do not address the needs of learners in our modern, complex, and globalized societies.

Two key characteristics of any form of assessment are validity and reliability. Reliability refers to whether an assessment instrument gives the same results each time it is used in the same setting with the same subjects. Reliability essentially means *consistent* or *dependable* results. However, clarity of the criteria can also pose threats.

> "The search for perfect reliability leads toward tests whose completion and marking allow for no possible margin of error and end up measuring nothing worth knowing. Pursuing perfect reliability leads to meaningless assessment."[89]

Reliability is a part of the assessment of validity. Validity is not a property of the tool itself but rather of the interpretation or specific purpose of the assessment tool with particular settings and learners.

> "The crucial relationship is, therefore, between the task outcome (typically the observed behavior) and the inferences that are made on the basis of the task outcome. Validity is, therefore, not a property of tests, nor even of test outcomes, but a property of the inferences made on the basis of these outcomes."[90]

Validity can be divided into 3 points:

1) Surface validity, which is surface credibility or public acceptance;

2) Content validity, which is content validity measurement tools (including materials, topics), and the subject is representative or the content of the selected sample is sufficient;

3) Relevance validity. The test of relevance and independence are quite reliable measurement tools.

According to its function, validity can be divided into concurrency, prediction, and construct validity.[91]

> *Further Reading: Sullivan M.G. A Primer on the Validity of Assessment Instruments. Journal of Graduate Medical Education. 2011. Jun; 3(2). P. 119–120. URL: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3184912/*

Quality Assessment for the 21st century suggests that the frameworks for assessing students' learning are undergoing a fundamental transformation. Three

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[89] *Eraut, M., Steadman, S., Trill, J., & Parkes, J. The assessment of NVQs. Research Report. University of Sussex Institute of Education. 1996. No. 4. P. 5.*

[90] *Wiliam D. An Overview of the Relationship between Assessment and the Curriculum. In: Curriculum and Assessment Ed. D. Scott. Westport, Connecticut and London. Greenwood Publishing Group, Inc. 2001. P 169.*

[91] *According to: Hughes A. Testing for Language Teachers. Cambridge University Press, 1989.*

developments underpin this transformation:
- new thinking,
- new metrics,
- new technologies.

New thinking relates to how assessment monitors learning. The fundamental purpose of assessment is: 'to establish and understand where learners are in an aspect of their learning at the time of assessment.' Assessment clarifies what the learner knows, understands, or can do and highlights what is needed to progress the learner to the required standard of achievement at the end of the year or band of development.

New metrics represent the assessment of a broader range of skills and attributes than those addressed by most current assessment practices. New technologies have the potential to transform assessment practices through more personalized, interactive, and intelligent forms of evidence gathering, as well as by providing more immediate, high-quality feedback to learners. For example, real-time interactions in online learning environments[92].

What students and teachers think and believe about assessment is crucial for the efficiency of the teaching and learning process and a shared understanding of the purposes of assessment in meeting learning and teaching goals. A broad comparative study of evaluation among teachers and students raises an essential correlation problem in realizing assessment among them, and the conclusion is not unambiguous.

Some researchers consider that while students have a clear conception that assessment has a fundamental purpose – the certification of student learning, teachers' conceptions of assessment are not very clear but show a strong tendency toward the purpose of improving teaching and learning. Teachers and students are directly involved in the same pedagogical process (assessment). Thus, some authors believe that the disparity between teachers' and students' conceptions of assessment may be caused by inconsistencies between teachers' conceptions and assessment practices, with students' conceptions primarily relating to their teachers' assessment practices. So, the question of how teachers and students conceive assessment is still topical[93].

The approaches to assessment in higher education are also an actual problem because they should reflect a wide range of competencies and skills of the student and his further potential for studying or employment. The professional requirements are constantly changing, but the evaluation system remains traditional. Criticism and suggestions for overcoming reform barriers are heard in various studies.

For example, H. Coates notes that the assessment of student learning does

[92] *Masters G. Reforming educational assessment: Imperatives, principles and challenges. Australian Education Review, 57. Melbourne: Australian Council for Education Research. 2013.*

[93] *Monteiro V., Mata L., Santos N. N. Assessment Conceptions and Practices: Perspectives of Primary School Teachers and Students. Frontiers in Education. 2021. №6. URL: https://www.frontiersin.org/articles/10.3389/feduc.2021.631185/full*

not change given its low priority to institutions. From many perspectives, the current system seems 'good enough.' Besides pressure from accreditation or employers, there can appear to be little impetus to change. Traditional higher education structures can hamper progress, creating confusion about who should own change. Individual faculty focus on assessing particular subjects, departments focus on majors, and students and institutions focus on qualifications. Fragmentation of curriculum and cohorts can further hinder the formation of coherent assessment schemes[94].

6.2 The term "high-quality learning outcomes"

The term 'high-quality learning outcomes' is used, which can be defined as involving 'an understanding that can be drawn upon in other and new contexts.' It is commonly recognized as a deep approach to learning, where the intention is to understand through an active constructivist engagement with knowledge, as opposed to a surface approach to learning, where the intention is to reproduce through a passive incremental view of knowledge *(see Chapter 1)*.

When lecturers can develop a module or course, they start with the content. The teaching metaphor revolves around 'covering' the subject area rather than facilitating students' learning. A growing body of research shows that students tend to adopt a deep approach to learning while their lecturers adopt a more student-focused approach. In other words, when designing a module, we need to think about what we want the students to learn rather than what we teach.

The key principle is to design an assessment before designing the module's content as part of an integrated assessment system, which serves the purposes of both assessing for learning and assessing learning. The main aim of such a system is to ensure that both students and lecturers are informed about how they (the students) are progressing, enabling more flexible and planned teaching.

Any learning occurs in a system where if you change one element of the system, all the others must necessarily change to effect the desired learning. In poorly integrated systems, it tends to be only the ablest students who can engage in learning at a deep level. In well-integrated systems, all students can achieve the desired learning outcomes, although this is not to say that all students will achieve them, as there is much individual variation.

Put very simply; the main principle is that there is a consistency between the three related components of curriculum design:

1. What do you want your students to learn (i.e., what learning outcomes will they achieve?);

2. What teaching methods will you use to enable them to achieve these learning outcomes?

3. What assessment tasks and criteria will you use to show that students have achieved the intended learning outcomes?

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[94] *Coats H. Assessment of Learning Outcomes. In: The European Higher Education Area. Between Critical Reflections and Future Policies. Ed. A. Curaj, L. Matei, R. Pricopie, J. Salmi, P. Scott. Berlin. Springer. 2015. P. 399 – 415.*

4. How will you arrive at an overall grade/mark?

6.3 Function of assessment: Assessment of learning. Assessment for learning. Assessment as learning

There are three interrelated functions of assessment (Table 6.1). Each type of assessment, systematically implemented, contributes to an overall picture of an individual student's achievement.

Assessment of Learning:

- Its purpose is summative, intended to certify learning and report to parents and students about students' progress, usually by signaling students' relative position compared to other students.
- Assessment of classroom learning is typically done at the end of something (e.g., a unit, course, grade, key stage, a program) and takes the form of tests or exams that include questions drawn from the material studied during that time.
- In Assessment of Learning, the results are expressed symbolically, generally as marks across several content areas.

Assessment for Learning:

- Offers an alternative perspective to traditional assessment.
- It shifts the emphasis from summative to formative assessment, from making judgments to creating descriptions.
- Teachers collect a wide range of data to modify the learning work for their students.
- Marking is not designed to make comparative judgments among the students but to highlight their strengths and weaknesses and provide them with feedback to further their learning.

Assessment as Learning:

- Reinforce and extend the role of formative assessment for learning by emphasizing the role of the student, not only as a contributor to the assessment and learning process but also as the critical connector between them.
- As active, engaged, and critical assessors, students can make sense of information, relate it to prior knowledge, and master the skills involved.
- It is the regulatory process in metacognition. It occurs when students personally monitor what they are learning and use the feedback from this monitoring to make adjustments, adaptations, and even major changes in their understanding.
- Assessment as Learning is the ultimate goal, where students are their own best assessors[95].

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[95] *Earl L. Assessment as Learning: Using Classroom Assessment to Maximise Student Learning. Thousand Oaks, CA, Corwin Press. 2003.*

Table 6.1

Three interrelated functions of assessment

Approach	Purpose	Reference Points	Key Assessor
Assessment *of* Learning	Judgments about placement, promotion, credentials, etc.	Other students	Teacher
Assessment *for* Learning	Information for teachers' instructional decisions	External standards or expectations	Teacher
Assessment *as* Learning	Self-monitoring and self-correction or adjustment	Personal goals and external standards	Student

6.4 The types of assessment

According to the "Glossary of Education Reform," the education system has various assessment forms. In particular, it is proposed to differentiate screening assessments and pre-assessments. However, the main types that determine different stages of the educational process are:
- placement assessment to determine students' performance at the beginning of a new course;
- formative assessment to monitor students' progress while on a course,
- diagnostic assessment to determine problems persistently occurring in the process of learning to solve them efficiently;
- summative assessment to define if the goals set at the beginning of the course have been achieved[96]

Placement assessments are used to 'place' students into a course, course level, or academic program. For example, an assessment may determine whether a student is ready for Algebra I or a higher-level algebra course, such as an honors-level course. For this reason, placement assessments are administered before a course or program begins. The basic intent is to match students with appropriate learning experiences that address their distinct learning needs[97].

Summative assessment is defined as that which contributes to a grade and overall calculation of the degree classification. In contrast, formative assessment is defined as that which enables students to see how well they are progressing and gives them feedback (Table 6.2).

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[96] *Linn R., Gronlund N. Measurement and assessment in teaching. Merrill, WI: Merrill Publishing Associates, 2000. P. 41 – 42.*

[97] *The Glossary of Education Reform. URL: https://www.edglossary.org/*

Table 6.2

Formative vs. Summative Assessment[98]

FORMATIVE
- Occurs during the learning process
- Allows teachers and students to pivot their strategies mid-stream.
- Identifies areas for improvement.
- Gives opportunities for students to implement feedback.

SUMMATIVE
- Occurs at the end of the learning process
- Provides a final evaluation of knowledge and skills.
- High-stakes testing that often involves ranking of students.
- Provides students with a grade

Summative assessment can have a formative component; indeed, that might be more desirable than much common assessment practice when the assessment (either coursework or exam) comes at the end of the course. Formative assessments are commonly said to be for learning because educators use the results to modify and improve teaching techniques during an instructional period. Summative assessments are for learning because they evaluate academic achievement after an instructional period. Or, as assessment expert Paul Black put it:

> "When the cook tastes the soup, that's formative assessment. When the customer tastes the soup, that's summative assessment."[99]

Since the late 1980s, the distinction between summative and formative has transmogrified from timing to one of type. Formative assessments began to be only those not formal tests but rather informal classroom interactions.

This perspective was extended by the UK Assessment Reform Group, which promulgated basic principles of formative assessment worldwide (Fig. 6.2).

The difference between formative and summative

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98 *75 Formative Assessment Examples. URL: https://helpfulprofessor.com/formative-assessment-examples*

99 *Quoted in Scriven, Michael. "Beyond Formative and Summative Evaluation." In M.W. McLaughlin and ED.C. Phillips, eds., Evaluation and Education: A Quarter Century. Chicago: University of Chicago Press, 1991: p. 169. Reported in Patton, Michael Quinn, Utilization-Focused Evaluation: The New Century Text. Edition 3. Thousand Oaks, CA: Sage, 1997: p. 69.*
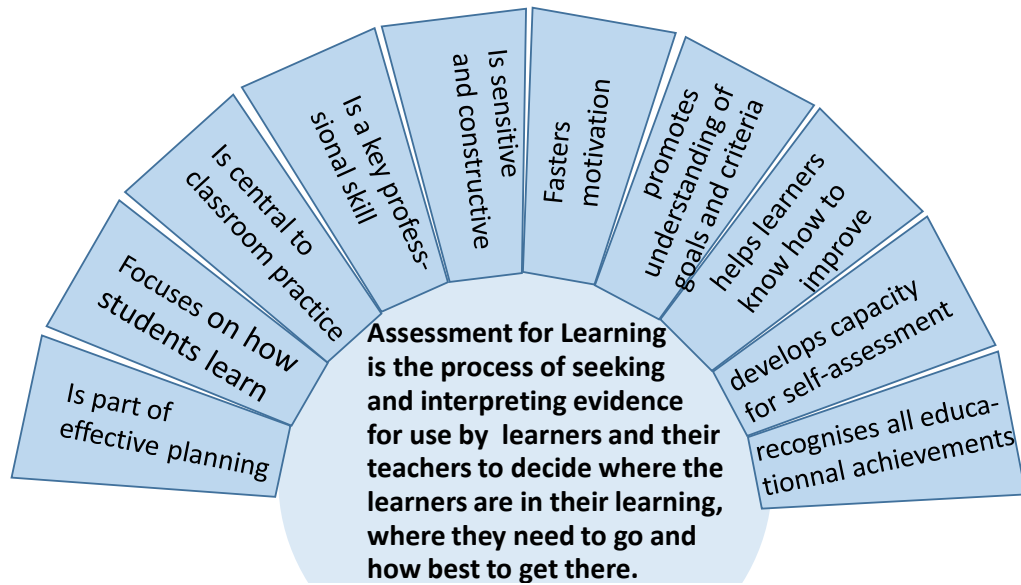
Figure 6.2 Research-based principles of assessment for learning to guide classroom practice assessment for learning[100]

Those classroom assessment practices focused much more on what could be seen as classroom teaching practices.

Instead of testing, teachers interacted with students on-the-fly, in-the-moment of the classroom, through questions and feedback to help students move towards the intended learning outcomes established at the beginning of lessons or courses[101].

Teaching in education: Formative assessment

6.4.1 Formative vs. summative vs. diagnostic assessment

Formative assessment is a range of formal and informal procedures to develop writing skills and students' potential as learners. It may have different forms, such as teacher, peer, self-assessment, or a combination of them, and uses various techniques like classroom observation, portfolios, questionnaires, interviews, etc. It assesses cognitive processes and concerns learners' feelings, behaviors, interests, and attitudes. It is process-focused and for developmental purposes, not for comparison or selection. It pays more attention to the change in

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[100] *Assessment Reform Group. Assessment for learning: 10 principles Research-based Principles to Guide Classroom Practice. Cambridge: Assessment Reform Group. 2002. URL: https://www.hkeaa.edu.hk/doclibrary/sba/hkdse/eng_dvd/doc/afl_principles.pdf*

[101] *Brown GTL. The past, present and future of educational assessment: A transdisciplinary perspective. Front. Educ. 2022. Vol.7. URL: https://www.frontiersin.org/articles/10.3389/feduc.2022.1060633/full*

individual learners, respects learner differences, and gives full play to learner potential.[102]

There are four core elements of formative assessment:
1) identifying the 'gap,'
2) feedback,
3) student involvement,
4) learning progressions.

Identifying the gap. In a seminal paper in 1989, Royce Sadler established the essential purpose of formative assessment to determine the gap between a student's current status in learning and some desired educational goal. He stressed that this gap would vary from student to student and spelled out the consequence for pedagogy. Educational psychologists call this 'just right gap' the zone of proximal development *(see Chapter 3)*. The teacher's task is to identify and build on immature but maturing structures and, through collaboration and guidance, to facilitate cognitive growth.

Feedback. Formative assessment is designed to provide feedback at multiple levels. First, it gives feedback to the teacher about current levels of student understanding, which also informs what the next steps in learning should be.

Student involvement. Improving learning through formative assessment also depends on the active involvement of students in their assessment. In formative assessment, students learn the skills of self- and peer assessment. In doing so, they are using metacognitive processes. They reflect on their learning, monitoring what they know and understand and determining when they need more information. They also develop self-regulation strategies and can adapt their learning tactics to meet their learning needs. Students must also collaborate with their teachers to determine the criteria for success for each step along the learning progression.

Learning progressions. If formative assessment is to guide teachers and students, it must be linked to a learning progression. The learning progression should clearly articulate the subgoals that constitute progress toward the ultimate goal. Most state standards do not provide a clear progression for understanding where students are relative to desired goals. In fact, many state standards do not even provide a clear picture of what learning is expected. Developing learning progress toward standards is a critical element of formative assessment. Learning progressions provide the big picture of what is to be learned. They help teachers locate students' current learning status on the continuum along which students are expected to progress.

> **Further Reading:** *Heritag M. Formative assessment: What do teachers need to know and do? Kappan. Connecting education, policy, and practice. URL: https://kappanonline.org/formative-assessment-heritage/*

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[102] *Wei L. (2010). Formative assessment: Opportunities and challenges. Journal of Language Teaching and Research, 2010. 1(6), P. 838.*

6.4.2 Cognitive diagnostic assessment

Cognitive diagnostic assessment (CDA) refers to a set of cognitively grounded diagnostic procedures attempting to pinpoint students' strengths and weaknesses in their knowledge structures and processing skills (referred to as attributes) in the target domain. In contrast to standardized testing, which measures the educational level of students on a broad scale and reports the measurement results in a summative manner, CDA is rooted in the cognitive psychology of problem-solving. The notion of diagnosis can be traced back to the 1950s. Based on it, CDA emerged and was discussed extensively in education, psychometrics, and applied linguistics, including books and special journal issues.

The integrative framework of diagnosis consists of four major components (Fig. 6.3), including
- designing and conducting diagnostic assessments,
- providing diagnostic feedback to stakeholders,
- implementing remedial instruction and learning,
- validating the integrative system of diagnosis.
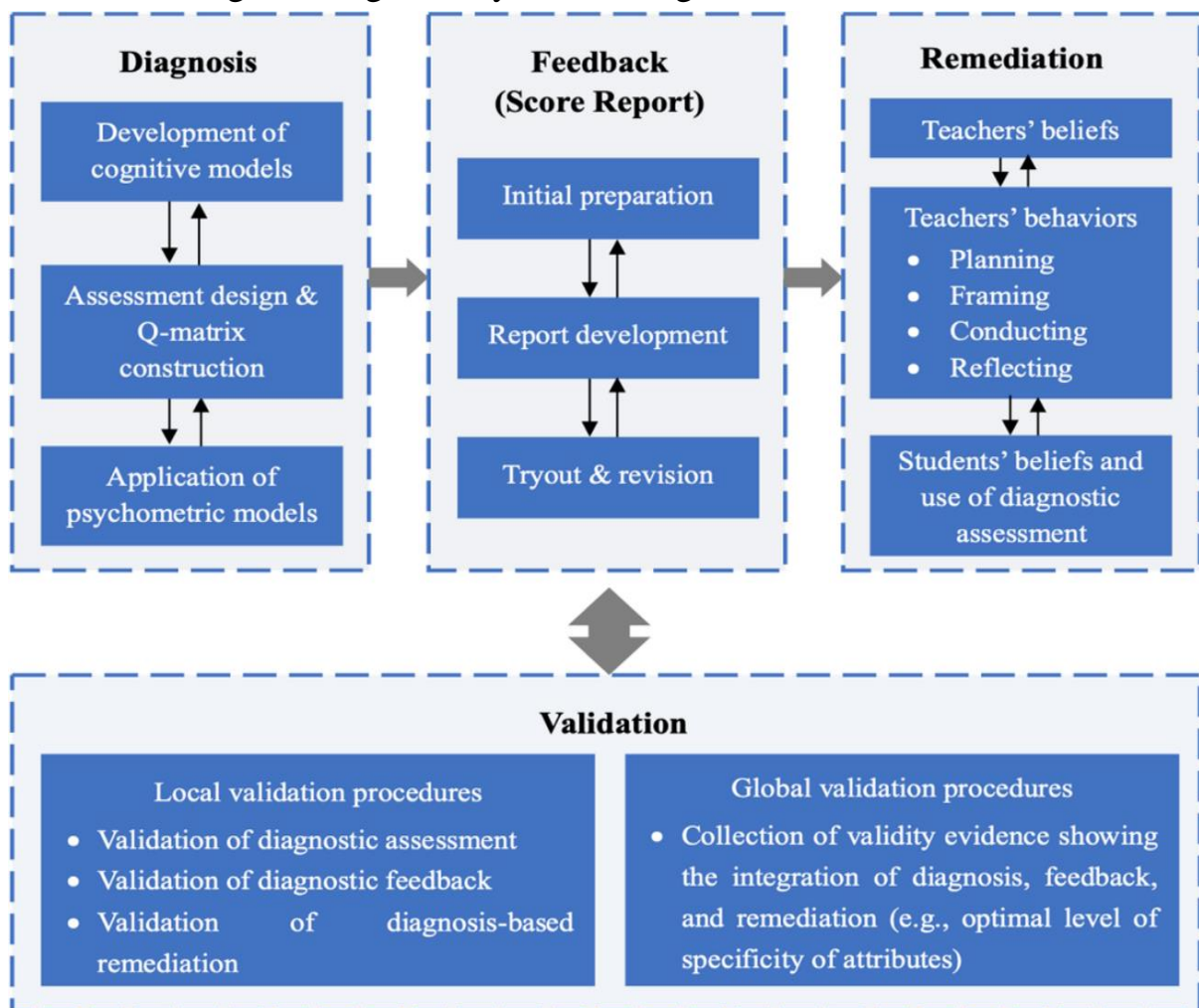
Figure 6.3 Integrative framework of diagnosis

Diagnosis is the first component of the framework. The purpose of diagnosis is to pinpoint individual students' strengths and, more importantly, weaknesses in the attributes that the student has not yet fully mastered. The validation procedure

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is pivotal if the cognitive model involves the hierarchical relationship in which psychological ordering is assumed among the attributes. The results of validation and, when necessary, subsequent revisions of the hierarchy would result in a more accurate and valid cognitive model for assessment development and analysis. Teachers must integrate diagnostic assessment results into the curriculum to create meaningful content and concrete pedagogy. Validity evidence can be collected via surveys to assess and score report users in the feedback phase. It will justify the interpretability of the diagnostic score report; that is, the actual interpretations made and uses enacted by users are aligned with the interpretations and use of the score report intended by developers. Similarly, the effectiveness of remedial teaching and learning could be evaluated through interviews, observations, and experimental studies in real classrooms.[103]

6.5 Traditional assessment tools. Difference between assessment and testing

Traditional assessment refers to formal tests that check students' ability to recollect and reproduce the content studied during a course. Traditional assessment is often equated with testing, and they overlap to some extent but are different concepts (Table 6.3).

Table 6.3

A comparative table of the assessment and testing

Assessment	Testing
Multiple ways and methods	Formal, standardized
Any method used to better understand the current knowledge that a student possesses	Single-occasion, unidimensional, timed exercise, usually in the multiple-choice or short-answer form.
A procedure instead of a product. Assessment is used during and after the instruction has taken place	A 'product' that measures a particular behavior or set of objectives

The characteristics of the traditional assessment:
- use in a summative way,
- refers to the conventional methods of testing, which usually produces written document such as quizzes or exams,
- mostly standardized,
- focus on the learner's ability to memorize and recall,
- mostly one-shot, speed-based, and norm-referenced,
- focused on learners giving the expected correct answer,
- the focus is directed on the product of the assessment rather than the learning process,
- objective tasks, such as multiple-choice questions, are easy and quick to correct and tend to give more weight to reliability.

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[103] *Fan, T., Song, J., Guan, Z. Integrating diagnostic assessment into curriculum: A theoretical framework and teaching practices. Language Testing in Asia, 2021.11(1). P.1 – 23.*

6.5.1 Multiple-choice tests

In recent years, more and more attention has been paid to standardized test control of knowledge. It is due to many social, substantive, and technological factors. More and more programs are appearing on the ICT market, designed to facilitate the preparation of test tasks and tests that meet modern requirements.

Properly designed tests have many advantages. These are:

1) diagnostic value and economy of study time, which is spent on checking and evaluating the knowledge and skills of a large number of students;
2) the objectivity of information about the quality of educational achievements;
3) the technology of the educational process, related to the possibility of automating the routine processes of preparation of control tasks;
4) semantic advantage, which is a better understanding of the essence of tasks that do not contain unnecessary words and signs.

Test control has several disadvantages, most of which can be eliminated by using different types of tasks in the tests, which allows you to check different levels of knowledge acquisition by students and reduce the probability of guessing. There are few books containing developed versions of such tasks. Therefore, most teachers have to create sets of tasks independently. The programs used for taking tests in the computer version have a special name - "test shells" and are classified by functionality. Teachers often use complexes containing several special wizard subprograms for compiling a database of questions, performing test generation operations, analyzing and saving assessment results, etc.

Creation of tasks for computer testing

The test is a system of succinctly and accurately formulated standardized tasks to which concise and accurate answers must be given within a limited time and evaluated according to the point system. The concepts of "test" and "test task" are often used synonymously in the literature, and the word "test" is used with narrow and broad meanings. The choice of structure for organizing and presenting the content of the task (test form) depends on the purpose of testing, technical capabilities, and the level of professional training of the teacher.

Special attention is paid to the composition of test tasks when developing tests. A composition combines elements that express the content and form of each task in harmonious integrity. The following are the main elements of the composition of test tasks: instructions; task content; answers to tasks; place for a grade given for a correctly completed task. The compositional structures of test tasks are distinguished depending on the used form of information presentation.

In assimilating the material, the student successively reaches four levels, each of which means obtaining a certain quality of knowledge. Without mastering the previous level by the student, the next cannot be achieved.

The first level of assimilation means that the student acquires knowledge with the help of which he can recognize this or that phenomenon among similar ones. The main feature of this level is that its achievement requires a mandatory reliance on a specific phenomenon, information about which was provided during the training process.

The second level of assimilation corresponds to knowledge with the help of which the student can reproduce the learned information from memory without support.

The third one means that the student can solve typical problems using the methods learned in the learning process.

The fourth is the level of transformation or creativity, when the student can creatively use the acquired knowledge in new, atypical situations, creating original methods and approaches to implement his skills.

Tests developed taking into account the levels of learning allow us to assess the quality of studying the material. For example, to assess the first level of learning, you should use tasks that require students to perform actions aimed at recognition: recognition, classification of objects, phenomena, and concepts. These are tests with the answers "Yes" - "No" (alternative) and sample tests.

It is better to use addition and substitution tests, i.e., comprehension and reproduction tasks, to check the second level. The wording of tasks can be as follows: a) "complete the text..."; b) "write the calculation formula..." etc.

An important point for the teacher is the correct assessment of the difficulty of the test. A task or test for simple reproduction can be very difficult due to an incorrectly posed question, many elementary operations, or an incorrectly determined test time. On the other hand, a test requiring data interpretation may be simple if the principles or solution methods are well known.

Technologies and algorithms for composing test tasks of various types have been developed. When developing tasks independently, the following principles must be followed:

- didactic significance, which means compliance with educational standards of the content of specialist training;
- validity – control and assessment of what students have learned;
- reproducibility – reproduction of results during repeated testing at this stage of training;
- representativeness – completeness of presentation of material from the subject;
- reliability – ease and simplicity of use, availability of clear instructions for conducting and evaluating test results;
- standardizing the form – giving a certain form to tests and test tasks;
- multifaceted – multivariate presentation of information in tasks.

Test tasks must meet certain requirements:

- sameness for all subjects;
- compliance of the instructions with form and content;
- brevity and clarity of wording (as clear and short as possible);
- correct arrangement of elements;
- the uniformity of the rules for evaluating subjects for the adopted form.

The approach to taking tests in the computer version is similar. Thanks to "test shells," almost all types of test tasks can be implemented quite simply, but the most used are four types of compositional structures:

- with selective answers (one or more are correct);

- addition tasks;
- to establish a sequence (or ranking);
- to establish conformity.

Software products have special tools that automate this process to create tasks of each type.

Below is a description of the teacher's sequence of actions when composing test tasks of various types.

Multiple-choice tests contain ready-made answers from which students must choose the correct ones. There should be at least four answers.

The algorithm for compiling sample tests includes the following elements:

1. Instructions for students are general and standard for everyone, written once for the entire test. Tasks should be formulated in a uniform style.
2. The task's content is formulated as clearly as possible. A careful selection of words and symbols ensures the brevity of the task. The content can be transmitted using a facet - replacement options for tasks of equivalent complexity. The principle of facet allows you to compose several variants of the same task simultaneously, and the number of variants is limited only by the capabilities of the programs.
3. The answers to the tasks and the content should be short and informative, referring to the same knowledge system. They can be placed at the end of the task and in the middle of the text. Incorrect answers are selected as plausible, they are called distractors, and their purpose is to draw the attention of the ignorant and divert it from the correct answer.
4. Evaluation. A certain number of points evaluate a correct answer, an incorrect one - "0".

When using "test envelopes" to compose sample tasks, providing for the distribution of points is necessary, which considers the answer's completeness. For example, the presence of two or more correct answers is indicated during editing. Accordingly, the point that can be obtained for the answer is divided into several parts.

The matching test contains tasks represented by two columns that are informationally closely related to each other. Their main purpose is to establish the correspondence of one set's content to another's objects. Tests allow you to check associative knowledge about the essence and properties of real objects (depending on the field of knowledge - elements, substances, reactions, processes, phenomena, etc.).

When developing tasks of this type, the same general rules are followed when creating tasks for a sample. In addition, the following should be taken into account: the second column of data should have 2-3 more options than the first; choices should not be too easy or absurd; one column should consist of keywords, concepts, essential features, and the second - of relevant formulas, schemes, equations, statements; there must be at least two questions in the first set; comparative data of two sets must be placed on the same page (two windows can be open on the screen at the same time).

In the form of matching tasks, grouping test tasks can be given - tasks in the form of a list of objects that must be sorted according to specified characteristics. When performing tasks of this type in the printed version, students must distribute the names in the table's columns and select objects belonging to the same class.

The sequence establishment test is a system of test tasks used to establish the correct sequence of mental operations, practical calculations, and actions. In tests of this type, a sequence can be implemented: events in the history of the development of science; stages of technological processes; formulation of definitions of terms; changes of any features of objects; mental actions when performing cognitive tasks.

Multifunctional "test shells" include a special tool for creating sequencing tasks, thanks to which a drop-down list appears in the finished test to select the correct order of objects.

Tasks with a list of objects that must be arranged in order of growth (or change) of any significant feature are called ranking tasks. For them, the names of the objects must be in the same order, and there should be no more than ten of them. Such tasks can be considered a variant of sequencing tests, so the same tools are used to create both question types in the test shells.

Addition tests are sentence tasks with a keyword omitted, marked somehow (often with a free text entry box). Test tasks of this type, formulated in the form of sentences-assertions, can turn into correct or incorrect statements, depending on the correctness of the answer.

The main requirements for addition test tasks: the content of the tasks must be understandable to everyone without exception; the answer suitable for the blank space must be essential and unambiguous, as well as extremely short (one or two words, a number, a formula); for correct understanding, it is better to put the element to be added at the end of the task.

The technology of developing tests for additions:

1. First, a correct and concise question is formulated.

2. A complete, accurate, and short answer to the question is recorded.

3. Its key element (word, number, formula) is excluded from the answer, which the student must supplement during testing.

When using computer programs to develop test tasks for addition, it is necessary to consider whether the program has a stylistic analysis of the given answer (or whether it is possible to enter a sufficient number of possible options). If there is no such analysis, giving the addition task in the computer version is not recommended, as there will be a high probability of incorrect evaluation of the answers.

An alternative test task is a statement, the correctness or incorrectness of which must be determined. Correct and incorrect sentence-assertions are formulated unambiguously, succinctly, and arranged chaotically in the task. Students can answer questions of this type: verbally - "correct," "incorrect," "yes," "no"; graphically or symbolically - "+," "-," etc. In the computer version, tasks of this type are implemented as sample tests.

Most often, with the help of "test shells," combined tests are compiled, which contain tasks of various compositional structures, which allows the implementation of several instructions.

The ability to independently develop new test tasks allows the teacher to form similar creative skills in students. Independent preparation of test tasks of various types is a very useful and interesting exercise for them. When developing the tests, students are forced to work through the relevant educational material a second time, and when preparing the answer options, they have to predict the wrong ones. In the future, they are more likely to avoid mistakes.

General characteristics of the functions of programs for the development of test tasks

Authors of literature containing ready-made sets of test tasks use mainly questions of one type - with selective answers. Such tests have drawbacks. Most of them can be eliminated if tasks of various compositional structures (for establishing sequence or correspondence, ranking, addition, etc.) are used, which makes it possible to reveal the level of knowledge acquisition by students and reduce the probability of guessing.

There are special packages of computer programs to facilitate the preparation of tests. They are called "test shells" and are classified by functionality. Some are freely distributed (Freeware) and can be obtained from the Internet. On the websites of software development companies, it is possible to "download" previous versions of popular skins for free.

6.5.2 Fill-in-the-blank assessment and short-answer tests

Fill-in-the-blank is especially useful in assessing mastery of factual information when a specific word or phrase is important to know. They preclude the guessing possible on limited-choice items since they require a definite response rather than simply recognizing the correct answer. Because only a short answer is required, their use on a test can enable a wide content sampling. A completion item requires the student to answer a question or to finish an incomplete statement by filling in a blank with the correct word or phrase.

Some good examples of questions are shown in Table 6.4.

Some tips for fill-in-the-blank assessment:

- When possible, provide explicit directions regarding what variation will be accepted in the answers.
- Give much more credit for completions than for true-false or matching items.
- Avoid using a long quote with multiple blanks to complete.
- When working with definitions, supply the term, not the definition, to better judge student knowledge.
- For numbers, indicate the degree of precision/units expected.
- Facilitate scoring by having the students write their responses on lines arranged in a column to the left of the items.

Table 6.4

Some good examples of fill-in-the-blank assessment

1	**Omit only significant words from the statement.**
	Undesirable:
	    Every atom has a center _____ called a nucleus.
	Desirable:
	    Every atom has a central core called a(n)

2	**Do not omit so many words from the statement that the intended meaning is lost.**
	Undesirable:
	    The_____ were to Egypt as the _____were to Persia and as _____ were to the early tribes of Israel.
	Desirable.
	    The Pharaohs were to Egypt as the were to Persia and as were to the early tribes of Israel.

3	Avoid obvious clues to the correct response.
	Undesirable
	    Most United States libraries are organized according to the
	    decimal system.
	Desirable.
	    Which organizational system is used by most of the United States libraries?

4	**Be sure there is only one correct response.**
	Undesirable
	    Trees which shed their leaves annually are.
	Desirable.
	    Trees which shed their leaves annually are called.

It is difficult to write complete items with only one correct answer. List the correct answer and other acceptable alternatives when preparing a scoring key. Be consistent in using the key; it would not be fair to accept an answer as right on one paper and not accept it on others.

In short-answer tests, items are written either as a direct question requiring the learner to fill in a word or phrase or as statements in which a space has been left blank for a brief written answer. Furthermore, the questions need to be precise. Otherwise, the items open to interpretation allow learners to fill in the blanks with any possible information.

Short answer questions may require one sentence or even a paragraph to answer the question fully. Short answer questions are appropriate in measuring a

student's understanding of principles or the ability to solve problems or apply principles. Short answer questions go beyond simple recall or recognition, and they require students to consider various factors and arrive at solutions, whether they deal with mathematical or other situations.

Open-response questions, like short investigations, present students with a stimulus and ask them to respond. Responses include a brief written or oral answer, a mathematical solution, a diagram, a chart, or a graph. The questions must have only one accurate answer. And the answer should be present in the learning materials.

The basic aim of this format is to encourage learners to apply the knowledge they have already learned. So, they must access the source materials before being asked to answer the question.

Tips to Transform Traditional Training Materials into eLearning

> **Further Reading:** *Clay B. Is This a Is This a Is This a Trick Question? Question? Question? A Short Guide to Writing Effective Test Questions. Kansas Curriculum Center, 2001. 69 p.*

6.5.3 Essay as an assessment tool

An essay is a form of art in which the original way, with artistic means based on acquired knowledge and skills and personal opinion, sets out some arguments on an issue. The essay is a type of reasoning. In essence, it is a product of proof thinking – arguments support any opinion and set up and justify certain opinions (Table 6.5).

Table 6.5

An example of essay question development

	Intended Learning Outcome: Create a hypothesis concerning how a particular may effect the quality of education for students
Problem Situation →	A national service entitled "Pick a Prof" makes teacher evaluation data public. "Pick a Prof" gives students the ability to take control of their education by using grade histories, student reviews and course schedules to choose a course and professor of their liking. Currently, professionals are uncertain about the effect of this service on the quality of education for students.
Essay Questions →	Create a hypothesis about the effect the service may have on the quality of education for students using the service. Support your hypothesis with reasons and examples.

In searching for argumentation, the associative principle is the leading factor. A thought brings another one spontaneously, which is related in some lines. Therefore, a statement of the essay is characterized by an individual look at the problem, argument heterogeneity, and originality

- flexible and assess the higher-order learning skills,
- help to assess the level of critical thinking,
- allow applying concepts to the student's experience,
- learned in the classroom to their personal experiences,
- they are not very practical because it is very difficult and time-consuming to score the essays,

 subjectivity might be an issue in scoring.

The technology of the process:

Step one: determine what educational goals of the scientific discipline we want to test and evaluate through an essay question.

Second step: outlining which competence we want to verify and the conceptual area which is subject to assessment and that ensures the achievement of those objectives.

Third step: we formulate an essay question to meet the expected objectives.

Fourth step: Prepare a planning scheme for assessing the performance of two major centers: evaluation of job content and structure of work (formal-linguistic and technical criteria).

Fifth step: Prepare instruction to students (overall plan the students should use; the form where the student must submit their answers (in the form of corresponding text); general criteria that will be used in evaluating responses; terms of volume, duration).[104]

Essay questions differ from these constructed response items because they require more systematic and in-depth thinking.

An essay question should meet the following criteria:

1. Requires examinees to compose rather than select their response.

2. Elicits student responses that must consist of more than one sentence.

3. Allows different or original responses or patterns of responses.

4. Requires subjective judgment by a competent specialist to judge the accuracy and quality of responses.

Assessment process of the essay (grading).[105]

The following grade descriptions are commonly used for marking essays at the university level.

A Grade. An A grade is reserved for an outstanding essay that provides genuine insight and a persuasive argument. While complete originality is not required, the writer's thesis should be complex, nuanced, and compelling. In

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[104] *According to: Yotovska K., Asenova A. The essay as a tool for motivation and assessment of students (future teachers in biology). Bulgarian Journal of Agricultural Science 2013. 2, 19. P. 293–296.*

[105] *https://natureofwriting.com/courses/essay-writing/lessons/grading-and-feedback/topic/understanding-your-grade/*

addition, the essay structure is coherent and logical, the evidence is well-integrated, the analysis is detailed, and the writer can deal fairly with possible objections and other points of view. Essays that deserve an A grade require little correction in terms of spelling and grammar, though there is no expectation that the writing is flawless.

B Grade. A B grade is given for a strong essay with a clear structure and an effective argument. This type of essay requires more polish and editing, but it has an interesting thesis backed by sufficient evidence. A B essay may be a bit rough around the edges (both in terms of content and style), but it accomplishes the main objectives of the assignment.

C Grade. A C grade does not stand for crappy; it stands for competent. A C signifies that your writing meets all the basic requirements. Your work has structure, a decent argument, and adequate proof. In short, your work has potential. More work and editing can turn your competent paper into something good. To improve, you will likely also need to fix many writing errors. If you struggle with persistent errors such as comma splices or apostrophe problems, your instructor may not give you anything higher than a C until you deal with the issue.

D Grade. A D grade is given to deficient essays that provide barely enough content to merit a passing grade. Such essays also contain many writing errors and tend to lack at least one of the basic aspects of an essay (a thesis, a coherent argument, sufficient evidence, and good paragraph structure). A D essay often reveals some misunderstanding of the topic or assignment and requires major revision.

F Grade.

A failing grade is given to essays that are so illogical, poorly organized, and underdeveloped that the instructor cannot find any justification for passing the assignment.

An F suggests that the writing is riddled with errors and that the argument is inadequate or incorrect. Note also that essays that are heavily plagiarized will automatically receive an F.

Explanation of the essay assessment process

> *Further Reading: Reiner M.Ch., Bothell W.T., Sudweeks R. R., Wood B. Preparing Effective Essay Questions A Self-directed Workbook for Educators. New Forums Press, 2002. 50 p.*

6.6 The term "assessment cycle"

Assessment does not occur only at the end of units or courses; assessment should occur regularly throughout the course to adjust teaching and learning. The following diagram (Fig. 6.4) exemplifies how assessment might arise at several levels.
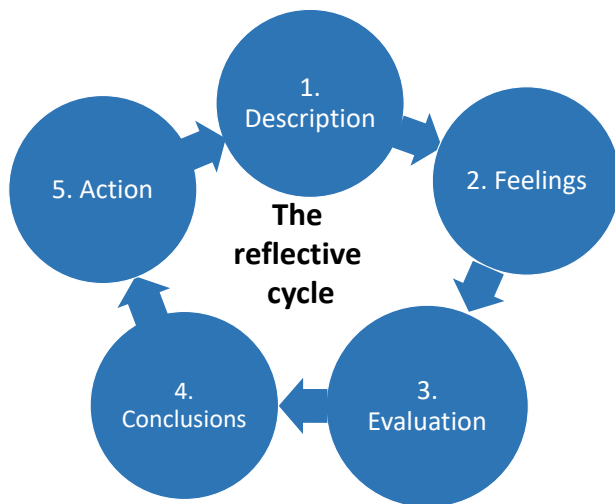
Figure 6.4 The reflective cycle   Figure 6.5 Assessment cycle
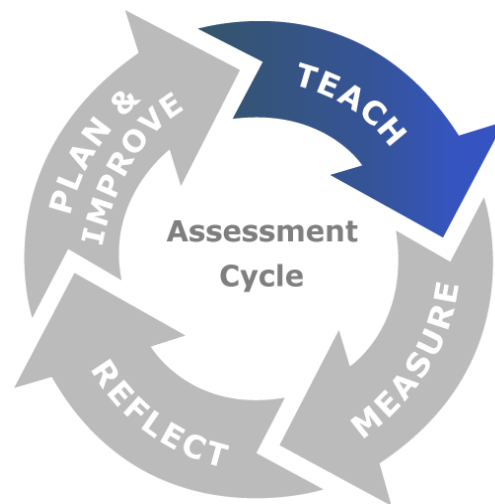
Using Gibbs's reflective cycle as the foundation, the assessment cycle at this stage of development specifies that once learners receive written feedback, they should reflect on it, develop action points and continue the cyclic flow of feedback-reflection-learning for their product. This process should be iterative and should be regularly reinforced for maximum learning.

Assessment is frequently described as a four-step process (Fig. 6.5). Learning outcomes or objectives are developed first. Second, assessment tools are created to measure how well the student has learned. The third step is the actual teaching and learning process, during and after which assessment tools can be administered. The fourth step is collecting data from the assessment tools, studying the data, and using the results to improve future teaching and learning. It means assessment data are used to make informed decisions about how to improve learning in the future—that is, the next time the same module or course is offered, which completes the cycle.

This cycle might occur:

- During a single lesson, when students tell an instructor that they are having difficulty with a topic.
- At the unit level, where a quiz or exam might inform whether additional material must be included in the next unit.
- At the course level, where a final exam might indicate which units will need more instructional time the next time the course is taught.

In many of the above instances, learning outcomes may not change, but assessment results will instead directly influence further instruction. For example, during a lecture, a quick formative assessment such as a poll may clarify that instruction was unclear and that further examples are needed.

6.6.1 Performance assessment

Performance assessment is a product- and behavior-based measurement based on settings designed to emulate real-life contexts or conditions in which specific knowledge or skills are applied.

Performance assessments serve different purposes.[106] They may be formative, used to help teachers know where students are in their learning, or summative, used at the end of a unit or course to report on student learning. A final reason that the term eludes common definition is that educators have used the same term to refer to both on-demand and extended-time administration windows. On-demand means students are assessed in controlled situations (typically classrooms) on the same day throughout a school. Students must complete the assessments in one sitting. Extended time means that assessments are given to students in weeks or months, depending on what best fits the teacher's or school's curriculum. As a result, they are given in less controlled and secure situations; some teachers may provide the assessment a month earlier than other teachers within the same school. An extended-time performance assessment in science: A small group of students is directed to observe a set of materials to understand gravity's effect on a ball on a ramp. Students work together to create observations. They then work individually to answer questions, such as predicting future events or analyzing data from past events.

Further Reading: Tung R. Including Performance Assessments in Accountability Systems: A Review of Scale up Efforts. Boston, MA: Center for Collaborative Education. Retrieved fromhttp://cce.org/files/PAScaleUp_fullreport2010.pdf

Multiple researchers have found that well-constructed performance assessments can better measure higher-order thinking skills while accommodating a wider variety of learning styles than standardized tests. Performance assessments enabled teachers to differentiate instruction better based on how individual students learn best.

There are three critical cornerstones as essential for successful performance assessment scale-up initiatives:

• robust, sustained professional development to build teacher capacity to create high-quality, curriculum-embedded performance assessments;

• technical quality to ensure that performance tasks are valid and student work is scored reliably;

• political leadership and policy support that enables performance assessment initiatives to be successful and sustaining[107].

There are five main points in performance assessment:

1. It is focused on complex learning,
2. engages higher-order thinking and problem-solving skills,
3. stimulates a wide range of active responses,
4. involves challenging tasks that require multiple steps,

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[106] *The definition is according to: American Educational Research Association, American Psychological Association, & National Council on Measurement in Education. Standards for Educational and Psychological Testing. Washington, DC, 1999.*

[107] *French D. The Future Is Performance Assessment In: Performance Assessment: Fostering the Learning of Teachers and Students 2017, № 46. P. 6 – 14.*

5. requires significant commitments of student time and effort[108]

6.6.2 Portfolio assessment

Portfolio learning is a method of encouraging adult and reflective learning for professionals. Derived from the graphic arts, it is based on developing a collection of evidence that learning has taken place. The system works well when it operates through the interaction of a learner and mentor, using the material as a catalyst to guide further learning. It is essential that the portfolio does not become a mere collection of events seen or experienced but contains critical reflections on these and the learning that has been made from them[109].

The purposes and content of portfolios are illustrated in Fig. 6.6.
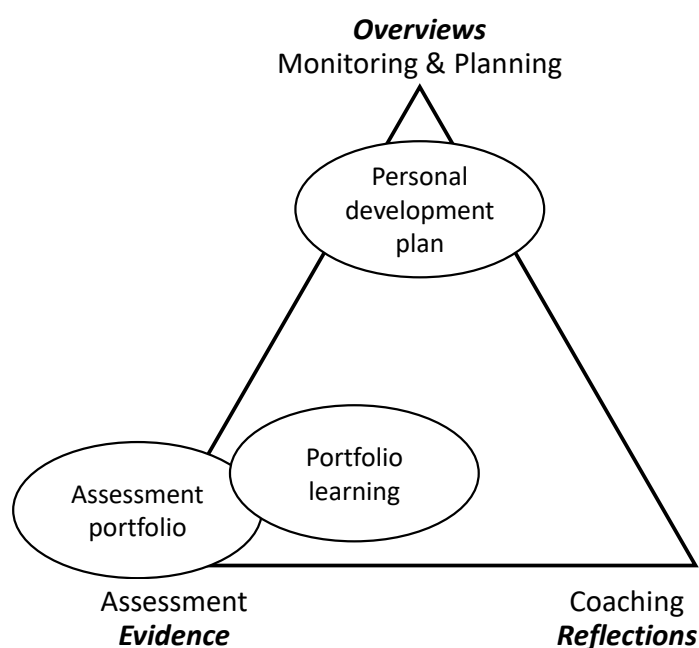
Figure 6.6 Purposes and content of portfolios [110]

> **Further Reading:** *Van Tartwijk J & Driessen EW (2009). Portfolios for assessment and learning. AMEE Guide No.45. Medical Teacher, 2009, 31(9). P. 790-801.*

A portfolio can be used to achieve more than one goal. When a portfolio is to serve a combination of goals, its position in the triangle will shift towards the center because its strengths have to be distributed more evenly over evidence, overviews, and reflections. In practice, most portfolios are not situated in one of the corners of the triangle.

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[108] *Gashoot M., Eve B., Mohamed T. Implementing Technology for Teaching: The Use of a Mobile/Tablet Approach for Enhancing Students' Learning (Design Interaction) Technology-Enhanced Learning (TEL). Journal of Education. 2021. 203(1). URL: https://journals.sagepub.com/doi/10.1177/00220574211016397?icid=int.sj-full-text.similar-articles.8*

[109] *Snadden D., Thomas M. L. The use of portfolio learning in medical education. Medical Teacher, 1998. 20: P. 192*

[110] *Van Tartwijk J, Driessen EW, Stokking K, van der Vleuten CPM. 2007. Factors influencing the successful introduction of portfolios. Qualin Higher Educ 13: 69–79.*

A student portfolio is a compilation of academic work and other forms of educational evidence assembled for

1. Evaluating coursework quality, learning progress, and academic achievement;

2. Determining whether students have met learning standards or other academic requirements for courses, grade-level promotion, and graduation;

3. Helping students reflect on their academic goals and progress as learners;

4. Creating a lasting archive of academic work products, accomplishments, and other documentation.

Portfolios come in many forms, from notebooks filled with documents, notes, and graphics to online digital archives and student-created websites. They may be used at the elementary, middle, and high school levels. Portfolios can be a physical collection of student work that includes written assignments, journal entries, completed tests, artwork, lab reports, physical projects (such as dioramas or models), and other material evidence of learning progress and academic accomplishment. They may include awards, honors, certifications, recommendations, written evaluations by teachers or peers, and student self-reflection. Portfolios may also be digital archives, presentations, blogs, or websites. They may feature the same materials as physical portfolios. Still, they may also include content such as student-created videos, multimedia presentations, spreadsheets, websites, photographs, or other digital learning artifacts[111].

Table 6.6

The comparative table of the tradition and portfolio assessment

Traditional assessment	Portfolio assessment
focus on the learner's ability to memorize and recall	assess higher-order thinking skills, allow learners to express their knowledge of the material in their ways using various bits of intelligence
one-shot	longitudinal and continuous
primarily summative evaluation	provides information for both formative and summative evaluation.
objective, reliable, and valid	have some concerns with the subjectivity

The assessment portfolio is prepared by a student either at the faculty's direction or as an individual student project. It may also contain reports of grades, evaluations, and examinations. It is usually held together in some appropriate binder or a computer-based form so that it can be circulated easily to defined faculty for the specific purpose of assessment.

The researchers describe portfolio assessment as a process of different progressive stages:

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[111] *The Glossary of Education Reform. URL: https://www.edglossary.org/*

1. Collection of artifacts and materials. This stage can also include a needs analysis or project proposal.
2. Selection – collected materials are reviewed and evaluated for inclusion in the portfolio. It can involve different evaluation methods, including pre-set criteria and parameters, tutor feedback, and peer evaluation. This and the next stage are sometimes documented by including first drafts, feedback, and a revised draft.
3. Reflection and projection – this stage consists of reflecting on the 'why' of which particular items should be included (rather than the 'what' of the selection stage), the comparison of materials with others, evaluation criteria or performance indicators, and the active interaction with instruction, tutors or peers in discussing meaning, concepts and good practice.
4. Connection of the portfolio to students' needs and/or the outside world adds value, such as employability and transferable skills, and enhances students' motivation by making the portfolio relevant to them. It may include a presentation to audiences such as the class, the educational community, or employers[112].

6.7 Assessment methods

6.7.1 Marking and grading as an assessment procedure

By 'marking,' we mean quantifying learning performances by transforming them into units (a word, an idea, a point) or allocating ratings or 'marks' on a subjective (if not arbitrary) basis. Marking is an assessment procedure that comes directly from quantitative assumptions and is so widespread as to be universal. For marking to be acceptable, we have seen that one mark must be 'worth' the same as any other so that they can be added and averaged, and a grade is awarded on the number of marks accumulated. Two most peculiar phenomena are associated with marking:

1. Half the total number of marks available is almost universally accepted as the pass mark.

2. It does not matter what is correct as long as there are enough of them.[113]

Grading is the process by which a teacher assesses student learning through classroom tests and assignments, the context in which good teachers establish that process, and the dialogue surrounding grades and defining their meaning to various audiences. Grading refers to evaluating student achievement on a larger scale, either for a single major piece of work or an entire course, subject, unit, or module within a degree program. Scores or marks often serve as the raw material for grade determinations, especially when aggregated, and the result is converted into a different symbolic representation of overall achievement (Table 6.7).

- Grading is a socially constructed and context-dependent process.

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[112] *Guard N., Richter U., Waller Sh. Portfolio assessments In: Learning from Languages. Ed. M. Fray. Preston: TransLang/University of Central Lancashire. URL: https://web-archive.southampton.ac.uk/www.llas.ac.uk/resources/gpg/1441.html*

[113] *Biggs J., Tang K. Teaching for Quality Learning at University. What the Student Does. 3d edition. Open University Press, 2007. P.174. – 177.*

• The role of grades can change over time, and they have different meanings for different groups.

•The grading process has four major roles – evaluation, communication, motivation, and organization.

• There is no absolutely objective evaluation.

• The teacher must develop and render an informed and professional judgment within the context of the institution, students, and their future employees.

> "Effective grading practices begin when the teacher says to herself: 'By the end of the course, I want my students to be able to. . . '. Concrete verbs such as define, argue, solve, and create are more helpful for course planning than vague verbs such as know or understand or passive verbs such as be exposed to"[114]

Table 6.7

Examples of grading[115]

Grade	Interpretation
A	The work is of very high quality throughout; there is clear evidence of mastery over the subject matter; the material is organised logically; the articulation between various parts is smooth and mutually supportive and the whole work is presented nearly faultlessly.
B	The work addresses the specified issue; it shows a sound level of critical thinking and discrimination; the development provides adequate supporting arguments with reasons and uses factual data correctly; the work is focussed but lacks the originality and creativity that would lift it to **A** level; and the work is substantially free of errors in grammar, punctuation and spelling.
C	The work contains mostly relevant material with some that is marginal; the level of organisation could be improved, with many potential connections between content parts not made; the general approach is reproductive with not a great deal of evidence of creative thought or synthesis; the technical production is reasonably competent, but a lack of clarity in expression sometimes produces ambiguity.

E. Walvoord and V. Anderson suggest some tools for effective practice of grading:
• Appreciate the complexity of grading, and use it as a tool for learning,
• Substitute judgment for objectivity,
• Distribute time effectively,
• Be open to change,
• Listen and observe,
• Communicate and collaborate with students,
• Integrate grading with other key processes,

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[114] *Walvoord E.B., Anderson J. V. Effective Grading: A Tool for Learning and Assessment. San Francisco: Jossey-Bass, 1998. P. 18.*

[115] *The example of grading from: Sadler D.R. Interpretations of criteria-based assessment and grading in higher education Assessment and Evaluation in High Education. 2005. Vol. 30. URL: https://www.tandfonline.com/doi/abs/10.1080/0260293042000264262*

- Seize the teachable moment,
- Make student learning the primary goal,
- Be a teacher first, a gatekeeper last,
- Encourage learning-centered motivation,
- Emphasize student involvement,

it is advisable to give answers to the following questions while developing a personal grading philosophy:
- What meaning should each grade symbol carry?
- What should 'failure' mean?
- What elements of performance should be incorporated into a grade?
- How should grades in a class be distributed?
- What should the components be like/include which go into a final grade?
- How should components of the grade be combined?
- What method should be used to assign final grades?

Should borderline cases be reviewed?

Mark-based approaches require assessors to assign numerical marks to candidates' work, assisted by a mark scheme. Grade-based approaches avoid marks altogether and require assessors to assign grades by evaluating candidates' work against grading criteria. However, mark-based and grade-based assessments found in practice differ across various characteristics.

The key advantage of a mark-based approach is that it can capture more information about candidate performance, recording the extent to which a candidate achieved something, not just that it was (or was not) achieved. A common disadvantage of mark-based approaches is that it can be difficult to differentiate between multiple points on a rating scale, even for experienced assessors. It increases task demand and may lead to the underuse of certain marks, negatively affecting reliability.

Within the mark-based assessment, two main aggregation methods are possible. Either mark can be added together or mapped onto a different numerical scale and then added. Within the grade-based assessment, many forms of aggregation are possible. One approach is to convert grades into points and then calculate a total score or average (Table 6.8).

> **Further Reading:** *Biggs J., Tang K. Teaching for Quality Learning at University. What the Student Does. 3d edition. Open University Press, 2007. 357 p.*

6.7.2 Holistic and analytic assessment

Analytic marking of essays or assignments is a common practice. The essay is reduced to independent components, such as content, style, referencing, argument, originality, format, and so on, each rated separately. The final performance is then assessed as the sum of the separate ratings. It is very helpful as a formative assessment; it gives students feedback on how well they are doing

on each important aspect of the essay, but the value of the essay is how well it makes the case or addresses the question as a whole.

"Effective grading practices begin when the teacher says to herself: 'By the end of the course, I want my students to be able to. . . '. Concrete verbs such as define, argue, solve, and create are more helpful for course planning than vague verbs such as know or understand or passive verbs such as be exposed to"

Table 6.8

A comparative table of mark-based and grade-based assessment[116]

	Advantages	Disadvantages
Mark-based assessment	Detailed criteria in a level-based grid guide distinguishing better responses from poorer responses, supporting validity and marker agreement Assessors able to recognize different levels of achievement at the same criteria Aggregation via the addition of marks supports the reliability of overall results High levels of compensation may be perceived as fairer to students	Detailed descriptive criteria vulnerable to variable interpretation High level of marking task demand due to the amount of information given to assessors, likely to weaken marker agreement and also acceptability
Grade-based assessments	The brevity of assessment criteria is likely to result in lower marking task demand, which may result in higher marker agreement and help acceptability A separate (binary) decision for each criterion is unambiguous Points-based aggregation of units uses all information captured at the unit level	Grading criteria provide assessors with less information on how to distinguish between responses Forces assessors to make binary decisions about performance for each criterion Concisely written criteria still open to variable interpretation Hurdle aggregation within units can be seen as against the aim of rewarding success

In making holistic assessments, the details are not ignored. The question is whether the specifics are tuned to create an overall structure or impact, like the bricks of a building or the characters in a novel.

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[116] *On the basis of Williamson J. Characteristics, uses and rationales of mark-based and grade-based assessment. Research Matters: A Cambridge Assessment publication. 2018. URL: http://www.cambridgeassessment.org.uk/research-matters/*

Table 6.9

Figure A1: Holistic level-based mark scheme – a hypothetical example[117]

Level	Marks	Description
3	15-20	Accurate and detailed knowledge of …. is demonstrated. The response is highly focused. Evaluation/discussion is effective and logically developed
2	8-14	Generally accurate knowledge of … is demonstrated, with some omissions. The response is usually focused on the question. Some effective evaluation/discussion is present.
1	1-7	Limited knowledge of … is demonstrated. The response relates to the topic but addresses the question only to a limited extent. The response is mainly descriptive, and the evaluation/discussion is limited or absent.
	0	No relevant content

Table 6.10

Figure A2: Analytic levels-based marl scheme – adapted from the holistic example in Figure A1[118]

Level	Strand 1		Strand 2		Strand 3	
	Marks	Description	Marks	Description	Marks	Description
3	6-8	Accurate and detailed knowledge of … is demonstrated	5-6	The response is highly focused on the question	5-6	Evaluation/discussion is effective and logically developed
2	3-5	Generally accurate knowledge of … is demonstrated, with some omissions	3-4	The response is usually focused on the question.	3-4	Some effective evaluation/discussion is present.
1	1-2	Limited knowledge of … is demonstrated	1-2	The response relates to the topic but addresses the question only to a limited extent.	1-2	The response is mainly descriptive. Evaluation/discussion is limited or absent.
0	0	No relevant content	0	No relevant content	0	No relevant content

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[117] *The examples from: Williamson J. Characteristics, uses and rationales of mark-based and grade-based assessment. Research Matters: A Cambridge Assessment publication. 2018. URL: http://www.cambridgeassessment.org.uk/research-matters/*

[118] *The examples from: Williamson J. Characteristics, uses and rationales of mark-based and grade-based assessment. Research Matters: A Cambridge Assessment publication. 2018. URL: http://www.cambridgeassessment.org.uk/research-matters/*

6.7.3 A rubric as a scoring tool (analytic, holistic, & developmental rubrics, checklists)

A rubric is a scoring tool that identifies the various criteria relevant to an assignment or learning outcome. It then explicitly states the possible levels of achievement along a continuum (poor to excellent or novice to expert).

- It can assess almost any student's work, whether essays, final projects, oral presentations, or theatrical performances.
- It can be used when an assignment is given to communicate expectations to students, when student work is evaluated for fair and efficient grading, and to assess a program by determining the extent to which students achieve departmental learning outcomes.
- A rubric is a formative tool intended to offer insight into the relative strengths and weaknesses of learning as evaluated against a set of criteria

Analytic Rubrics. An analytic rubric resembles a grid with criteria for a student product listed in the leftmost column and with levels of performance listed across the top row, often using numbers or/and descriptive tags (Table 6.11). The cells within the center of the rubric may be left blank or may contain descriptions of what the specific criteria look like for each level of performance

Table 6.11

Examples of analytic rubrics

Needs Improvement (1)	Developing (2)	Sufficient (3)	Above Average (4)	
Clarity (Thesis supported by relevant information and ideas.)	The purpose of the student work is not well-defined. Central ideas are not focused to support the thesis. Thoughts appear disconnected.	The central purpose of the student work is identified. Ideas are generally focused in a way that supports the thesis.	The central purpose of the student work is clear and ideas are almost always focused in a way that supports the thesis. Relevant details illustrate the author's ideas.	The central purpose of the student work is clear and supporting ideas always are always well-focused. Details are relevant, enrich the work.
Organization (Sequencing of elements/ideas)	Information and ideas are poorly sequenced (the author jumps around). The audience has difficulty following the thread of thought.	Information and ideas are presented in an order that the audience can follow with minimum difficulty.	Information and ideas are presented in a logical sequence which is followed by the reader with little or no difficulty.	Information and ideas are presented in a logical sequence which flows naturally and is engaging to the audience.

Holistic Rubrics. A holistic rubric consists of a single scale with all criteria to be included in the evaluation being considered together (e.g., clarity, organization, and mechanics). With a holistic rubric, the rater assigns a single score (usually on a 1 to 4 or 1 to 6 point scale) based on an overall judgment of the student's work. The rater matches an entire student's work to a single description on the scale.

Articulating thoughts through written communication— final paper/project.

- Above average: The audience can easily identify the focus of the work and is engaged by its clear focus and relevant details. Information is presented logically and naturally, and there are no more than two mechanical errors or misspelled words to distract the reader.

- Sufficient: The audience can easily identify the focus of the student's work which is supported by relevant ideas and supporting details. Information is presented in a logical manner that is easily followed. There is minimal interruption to work due to misspellings and/or mechanical errors.

- Developing: The audience can identify the central purpose of the student's work without little difficulty, and supporting ideas are present and clear. The information is presented orderly and can be followed with little difficulty. There are some misspellings and/or mechanical errors, but they do not seriously distract from the work.

- Needs Improvement: The audience cannot clearly or easily identify the central ideas or purpose of the student's work. Information is presented disorganizedly, causing the audience difficulty following the author's ideas. Many misspellings and/or mechanical errors negatively affect the audience's ability to read the work.

Developmental Rubrics. Developmental rubrics (Table 6.12) are a subset of analytic trait rubrics. The main distinction between developmental rubrics and other analytic trait rubrics is that the purpose of developmental rubrics is not to evaluate an end product or performance. Instead, developmental rubrics are designed to answer the question, "To what extent are students who engage in our programs/services developing this skill/ability/value/etc.?"

Determine the skills and abilities students should demonstrate to achieve the learning outcome(s). These skills and abilities are the various criteria. Each criterion should focus on a different skill identified by a phrase or brief statement, and each criterion should be measurable by examining student work. The criteria become the leftmost column of the grid.

The next step is to determine the levels of achievement possible given the expectations of what students are to be able to demonstrate. The levels can be numerical categories but more frequently are descriptions, sometimes with an associated number. At this stage, the number of columns is determined. The levels of achievement are listed across the top row.

The next step in creating an analytic rubric is to develop descriptions for the criteria along each level of achievement. While sometimes this step is skipped, this is not recommended as the descriptions are valuable for helping to increase

reliability among multiple raters and even for a single rater as it assesses the work of different students.

Table 6.12

Examples of developmental rubrics

Domain	Initial Level of Development (1)	Intermediate Level of Development (2)	Mature Level of Development (3)
Cognitive	Assumes knowledge is certain and categorizes knowledge claims as right or wrong; is naive about different cultural practices and values; resists challenges to one's own beliefs and views differing cultural perspectives as wrong	Evolving awareness and acceptance of uncertainty and multiple perspectives; ability to shift from accepting authority's knowledge claims to personal processes for adopting knowledge claims	Ability to consciously shift perspectives and behaviors into an alternative cultural worldview and to use multiple cultural frames
Intrapersonal	Lack of awareness of one's own values and intersection of social (racial, class, ethnicity, sexual orientation) identity; lack of understanding of other cultures; externally defined identity yields externally defined beliefs that regulate interpretation of experiences and guide choices;	Evolving sense of identity as distinct from external others' perceptions; tension between external and internal definitions prompts self-exploration of values, racial identity, beliefs; immersion in own culture; recognizes legitimacy of other cultures	Capacity to create an internal self that openly engages challenges to one's views and beliefs and that considers social identities in a global and national context; integrates aspects of self into one's identity

One way to begin writing the descriptions is to write a short paragraph or even just a sentence or two for one criterion's highest level of ability. Next, circle the words that can indicate various levels of performance. These words will be changed as you write descriptions for the remaining performance levels.

The following are concepts that convey various levels of performance:

- Presence to absence,
- Complete to incomplete
- Many to some to none,
- Major to minor,
- Consistent to inconsistent,
- Frequency: always to usually to sometimes to rarely.[119]

Designing Rubrics Workshop

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[119] *King, P.M., Baxter Magolda, M.B. A developmental model of intercultural maturity, Journal of College Student Development, 2005. 46(2). P. 571–592.*

Checklists are valuable evaluation devices when carefully developed, validated, and applied. A sound evaluation checklist clarifies the criteria that should be considered when evaluating something in a particular area; aids the evaluator in not forgetting important criteria; and enhances the assessment's objectivity, credibility, and reproducibility. Moreover, such a checklist is useful in planning an enterprise, monitoring and guiding its operation, and assessing its outcomes. In the evaluation vernacular, checklists are useful for both formative and summative evaluations

Checklists

Checklists are a distinct type of rubric – where only two performance levels are possible (Table 6.13). Checklists tend to point longer than other types of rubrics since each aspect of performance you seek in students' work/performance becomes its criterion essentially. When using a checklist, every decision is binary (yes/no, present/absent/, pass/fail, etc.). Most rubrics can be converted rather directly into a checklist.

Table 6.13

Examples of checklists

Criterion	Excellent	Good	Adequate	Poor
Site Visits Notes	Every site visit includes good and thoughtful notes about that site	Every site has notes, but one or two days are not good/thoughtful notes OR one day of notes is missing	Every site has notes, but three of four days are not good/ thoughtful notes OR two days of notes are missing	Not every day has good/ thoughtful notes OR more than two days of notes are missing
Class Question	Not every day has good/ thoughtful notes OR more than two days of notes are missing	Is missing answers to no more than 8 questions across the site visits	Is missing answers to no more than 12 questions across the site visits	Is missing answers to more than half of the questions across the site visits

Further Reading: Stufflebeam L. D. Guidelines for Developing Evaluation Checklists: The Checklists Development Checklist (CDC) https://wmich.edu/sites/default/files/attachments/u350/2014/guidelines_cdc.pdf

6.8 Forms of evaluation (low-stakes and high-stakes assessment)

| Low-stakes assignments | Rubrics | High-stakes assignments |

Forms of evaluation are shown in Fig. 6.7.
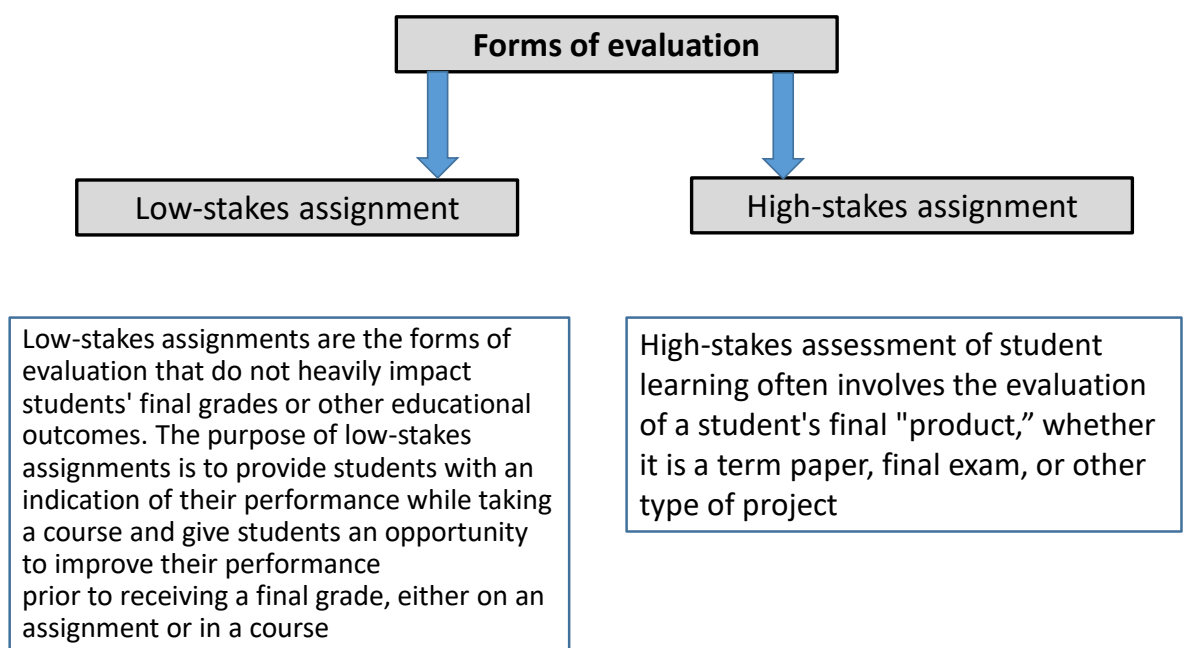
Figure 6.7 Forms of evaluation

Criteria for assignments:

- Clearly link each assignment to the course goals and learning objectives.
- Aim the assignment just slightly above students' current expertise.
- Break large, high-stakes assignments into multiple, low-stakes assignments.
- Identify resources required for the assignment and make them readily available.
- Design assignments around real-world issues and events to engage and motivate students.
- Provide grading guidelines for the assignment through rubrics and examples of acceptable and unacceptable work.
- Provide supporting structures – templates, peer review, examples, multiple drafts, guidelines for library research, etc.

- Revise assignments for next term based on student performance and feedback. Does each assignment develop student expertise in line with course learning goals?

Consider how you can create assignments that deter plagiarism. Remember to include plagiarism, re-write, and late work policies in your syllabus.

The benefits of low-stakes assignments are:

- To give students a realistic idea of their performance early in the term, enabling them to seek appropriate resources as needed
- to open up lines of communication between students and their instructors and may increase students' willingness to ask for help
- to provide feedback for instructors on how well students are absorbing information and progressing in their skill development
- to allow instructors to direct students to resources if they need further assistance or support
- to allow students to be active participants in the evaluation of their learning
- to increase the likelihood that students will attend class and be active and engaged.

Examples of low-stakes assignments:

Components of a larger project

When assigning students writing or research project, break down the elements of the project and use one or more as a low-stakes assignment. Require students to submit their works-in-progress to receive early written feedback and a small grade, which could consist simply of a check or check-minus. Anyone (or more) of the following elements could be collected and used as a low-stakes assignment:

- Prospectus or proposal
- Abstract
- Thesis statement
- Outline
- Annotated bibliography
- Specific sections of the final project (e.g., introduction, methods, lit. review)
- Early-stage drafts of a paper

Early drafts and peer review

Midway through a writing project, have students bring a full or partial draft of their paper to class and then exchange feedback with a peer. Students will receive valuable feedback that they can use to revise their work.

Mid-project/quarter conferences

Ask students to meet with you for conferences around midterm or during the planning stages of a major course project. If the class is too large for you to meet with each student individually, assign students to meet with you in groups or one-on-one with their TA. The conference time might be dedicated to discussing the students' progress toward course goals or providing feedback on a particular project.

To maximize your conference time, ask students to complete and bring a self-assessment form or project proposal. Alternatively, ask students to write down one question about the course, the content covered in class, or an assignment they are currently working on. Having a document to reference will keep the conversation on track and help put you and your students at ease.

Group work planning and reflection

When students work in groups, they must submit a statement outlining each group member's responsibilities and/or a timeline that measures their progress. Periodically throughout the group project, ask students to submit short reflections detailing their progress and any areas where they need support.

Characteristics of high-stakes assessment:
- Encourages synthesis across an entire course or discipline.
- Requires creation of discipline-specific products (research papers, presentations).
- It is often summative, requiring a demonstration of the degree to which students have learned key course concepts and skills.
- Usually represents a larger percentage of the course grade.[120]

6.9 Contextualized as opposed to decontextualized assessment tasks

Authentic or performance assessment raises the issue of contextualized as opposed to decontextualized assessment tasks.

1. Performance assessments include the practicum and case-based and work-based assessment, which are suitable for assessing functioning knowledge in its appropriate context.

2. Decontextualized assessments include written exams and term papers suitable for assessing declarative knowledge. They do not necessarily have a direct connection to a 'real-life' context.

The problem of contextualization of assessment is one of the controversial ones. Issues of contextualization are considered at different levels, highlighting the threats and positive effects of including 'real life' situations in exam tasks

The reasons given for learning in context fall into three broad categories:

1. There is the notion that contexts provide a concrete, familiar experience that makes learning more accessible for students;

2. Context is perceived to motivate students with the use of scenarios that add life to the curriculum;

3. Using everyday contexts will enable the transfer of learning from the classroom to the students' outside world.

Researches also point to shortcomings and possible negative outcomes:

1. The students cannot quite transfer their learning in school to 'real world' situations as they still face problems answering questions of the same demand and content but are either "abstract" or set in context.

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[120] *Teaching Guides In: Center for Teaching and Learning of DePaul University. URL: https://resources.depaul.edu/teaching-commons/teaching-guides/Pages/default.aspx*

2. The problem with the educational approach of embedding examination items in contexts is that it contributes to differential validity and introduces unfairness into tests. The combination of relatively open-ended items with 'real' contexts produces a particular set of threats to valid assessment, especially if no account is to be taken of them in the assessor's view of the task and the marking of responses[121].

6.10 Direct vs. indirect assessment of student learning

Direct – the assessment is based on analyzing student behaviors or products in which they demonstrate how well they have mastered learning outcomes.

Indirect – the assessment analyzes reported perceptions about student mastery of learning outcomes[122].

Direct evidence of student learning is tangible, visible, and measurable and tends to be more compelling evidence of exactly what students have and have not learned. Indirect evidence tends to comprise proxy signs that students are probably learning. An example of indirect evidence is a survey asking students to self-report what they have learned. Students are probably learning what they report to have known, but it is not as compelling as a faculty member looking at students' work (Table 6.14).

Table 6.14

Difference between direct and indirect assessment[123]

Direct	Indirect
Pass rates on licensure/certification examinations (summative)	Course grades (summative)
Portfolios and capstone projects (summative)	Admission, retention, and transfer rates (institutional)
Case studies (formative or summative)	Surveys, focus groups, and interviews (institutional)
Oral examination (formative or summative)	Honors and awards (summative)

[121] *Elwood J. Examination Techniques: Issues of Validity and Effects on Pupils' Performance. In: Curriculum and Assessment Ed. D. Scott. Westport, Connecticut and London. Greenwood Publishing Group, Inc. 2001. P. 83 – 105.*

[122] *Allen MJ: Strategies for direct and indirect assessment of student learning, in Proceedings of the SACS-COC Summer Institute. Decatur, GA, Southern Association of Colleges and Schools, Commission on Colleges, 2008*

[123] *According to: Curry RA, Gonzalez-DeJesus NT. A Literature Review of Assessment: What New Sonographic Faculty Should Know. Journal of Diagnostic Medical Sonography. 2010; 26(2):97 – 105.*

- **Direct Evidence**: Students have completed some work or product that demonstrates they have achieved the learning outcome. Examples: project, paper, performance
- **Indirect Evidence**: A proxy measure was used, such as participation in a learning activity, students' opinions about what was learned, student satisfaction, etc. Examples: teaching evaluations, surveys asking students how much they think they learned, and course grades.

Direct assessment is the most effective form when measuring a single learning outcome, objective, or goal. This type of assessment gives you the clearest, most compelling, and actionable information when determining, for example, how well your students are developing their writing skills and abilities to reflect critically or integrate theory into practice.

When should the indirect assessment be used?

- As a complement to direct assessment methods, indirect assessment is often an extremely useful tool in combination with a direct assessment to offer a more comprehensive view of student learning. Direct assessment may tell you what students learned and how well they learned. Still, indirect assessment can give you information about how a student feels about what they know – for example, does that student feel confident in his or her ability to apply the knowledge in the future?
- In program or curriculum review, the indirect assessment provides valuable insight and feedback on students' views of their learning, how programs and services are administered, etc.
- Peer review of student work. Although peer review is an indirect assessment, it is often a useful teaching and learning tool.

6.11 Types of feedback. The processes of "good feedback practice"

Originally, feedback was used to describe an arrangement in electrical circuits whereby the information about the level of an 'output' signal (specifically the gap between the actual level of the output signal and some defined 'reference' level) was fed back into one of the system's inputs. Where the effect of this was to reduce the gap, it was called negative feedback, and where the effect of the feedback was to increase the gap, it was called 'positive feedback.'

In applying this model to the behavioral sciences, we can identify four elements making up the feedback system:
- data on the actual level of some measurable attribute;
- data on the reference level of that attribute;
- a mechanism for comparing the two levels, and generating information about the gap between the two levels;
- a mechanism by which the information can be used to alter the gap.[124]

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[124] *Black P., Wiliam D. 'Assessment and Classroom Learning', Assessment in Education: Principles, Policy and Practice, 1998. 5:1. P. 47 – 48.*

> "Feedback is a process whereby learners obtain information about their work in order to appreciate the similarities and differences between the appropriate standards for any given work, and the qualities of the work itself, in order to generate improvement."[125]

Types of feedback

• **Informal feedback.** Informal feedback can occur at any time as it emerges spontaneously in the moment or during the action. Therefore, informal feedback requires building rapport with students to effectively encourage, coach, or guide them in daily management and decision-making for learning. It might occur in the classroom, over the phone, in an online forum, or virtual classroom.

• **Formal feedback.** Formal feedback is planned and systematically scheduled into the process. Usually associated with assessment tasks, formal feedback includes marking criteria, competencies, or achievement of standards and is recorded for both the student and organization as evidence.

• **Formative feedback.** The goal of formative assessment is to *monitor student learning* to provide ongoing feedback that instructors can use to improve their teaching and students to improve their learning. Therefore, formative feedback is best given early in the course and before summative assessments. Formative feedback helps students improve and prevent them from repeating the same mistakes. Sometimes, feedback is required before students can progress or feel capable of advancing to the next assessment stage.

• **Summative feedback.** The summative assessment aims to *evaluate student learning* at the end of an instructional unit by comparing it against some standard or benchmark. Therefore, summative feedback consists of detailed comments on specific aspects of their work, clearly explaining how the mark was derived from the criteria provided and additional constructive comments on how the work could be improved.

• **Student peer feedback.** There is no longer a need for teachers to be the only experts in a course. With basic instruction and ongoing support, students can learn to give quality feedback, which peers highly value. Providing students with regular opportunities to give and receive peer feedback enriches their learning experiences and develops their professional skill set.

• **Student self-feedback.** It is the ultimate goal of feedback for learning. During the provision of feedback, teachers have the opportunity not only to provide direction for the students but to teach them, through explicit modeling and instruction, the skills of self-assessment and goal setting, leading them to become more independent. To help students reach autonomy, teachers can do the following: explicitly identify, share, and clarify learning goals and success criteria; model the application of criteria using samples; provide guided opportunities for self-feedback; teach students how to use feedback to determine the next steps and set goals; and allow time for self-feedback/reflection.

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[125] *The definition from: Feedback in Higher and Professional Education. Understanding it and doing it well. Ed.D. Boud, E. Molloy. London, New York. Routledge. 2013. P. 6.*

Feedback processes are difficult to carry out effectively in mass higher education. A significant challenge emanates from generally limited student engagement with feedback. A related barrier is modest student feedback literacy: the capacities and dispositions to use feedback productively. For students to engage actively with feedback, they need agency in line with social constructivist approaches to learning. Social constructivist feedback research and practice take the perspective that shared and individual interpretations are developed through dialogue, sense-making, and co-construction. Feedback predominantly in the form of teacher transmission of information to students is insufficient to promote complex learning.

D.R. Sadler builds on this thinking by identifying three conditions for effective feedback:
- learners need to possess a concept of the standard being aimed for;
- compare the current level of performance with the standard;
- engage in appropriate action, which leads to some closure of the gap between the two.

When information is passed to a learner who lacks the opportunity or knowledge to act, the control loop cannot be closed, and dangling data – i.e., unclosed loops – result[126].

Student response to feedback is influenced by the level at which the feedback operates:
- task-level feedback denotes how well tasks are performed;
- process level feedback focuses on how to perform tasks;
- feedback at the self-regulation level focuses on learners' self-monitoring of their actions;
- personal feedback at the self-level evaluates the learner and frequently involves praise.

D. Carless proposes a model of long-term student engagement with feedback (Fig. 6.8). Inputs from teachers, peers, or learners themselves and processes of student sense-making are shown on the left-hand side of the figure. They are factors influencing different outcomes represented in the central core of the figure. The arrow from single to double-loop feedback processes suggests a possible interplay between the two. Unresolved learning puzzles are represented as a separate element at the bottom of the figure. Single-loop feedback processes arise in terms of short-term problem-solving or troubleshooting. Double-loop feedback processes result from learners re-examining the bases of actions and modifying learning strategies over the medium or longer term.[127]

Therefore, feedback is a significant component of students' educational process and self-improvement, as well as an urgent scientific problem, the

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[126] *Sadler D. R. Formative Assessment and the Design of Instructional Systems. Instructional Science. 1989. 18 (2): 119–44.*

[127] *Carless D. Feedback loops and the longer-term: towards feedback spirals, Assessment & Evaluation in Higher Education. 2019. 44:5, P. 705-714.*

research of which is aimed at finding feedback patterns and ways of improving the effectiveness of teachers' activities for its strengthening.
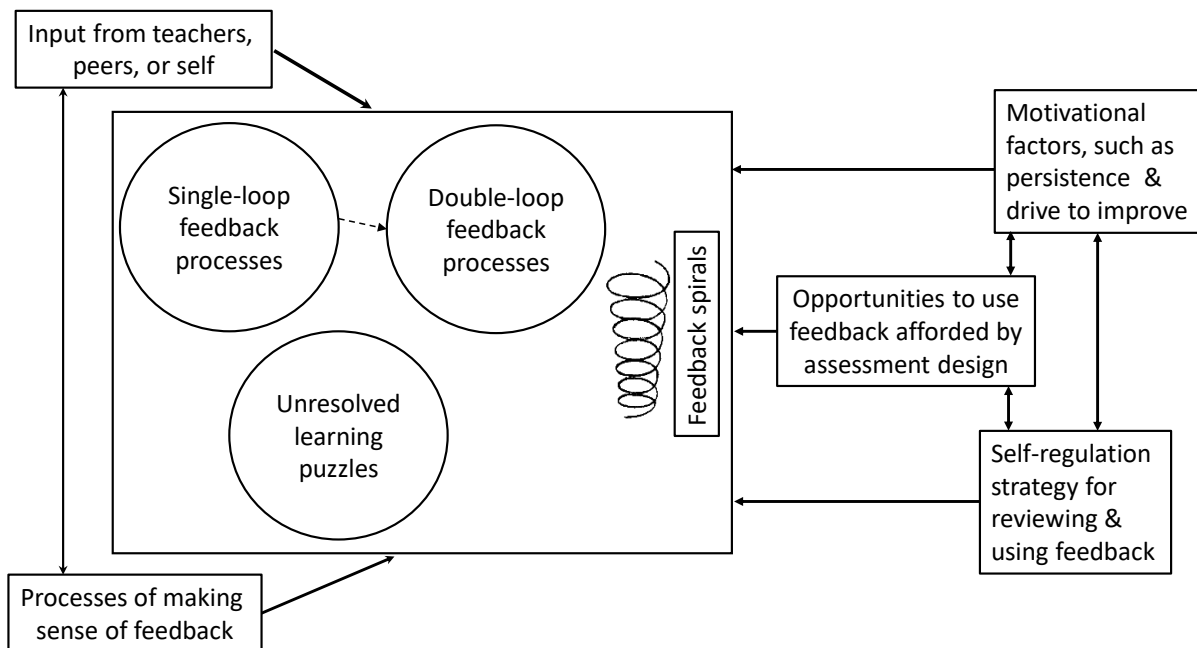
Figure 6.8 D. Carless' model of long-term student engagement with feedback

Summarizing these searches, the researchers singled out several features of 'good feedback practice':

- helps clarify what good performance is (goals, criteria, expected standards);
- facilitates the development of self-assessment (reflection) in learning;
- delivers high-quality information to students about their learning;
- encourages teacher and peer dialogue around learning;
- encourages positive motivational beliefs and self-esteem;
- provides opportunities to close the gap between current and desired performance;
- provides information to teachers that can be used to help shape teaching.

> ***Further Reading:*** *Nicol J. D., Macfarlane-Dick D. Formative assessment and self-regulated learning: a model and seven principles of good feedback practice, Studies in Higher Education, 2006. 31:2. P. 199 –218*

6.12 Characteristics of effective teaching: challenges and polemics

The understanding of teacher effectiveness intersects with the concept of professionalism *(see Chapter 2)*. These are close and interrelated concepts, but they are different. The teacher and students interpret the relationship between professionalism, which includes teacher knowledge and behavior, and effectiveness differently. For example, as J. Robert state, the student essays pointed to several personality traits prevalent among their favorite and most memorable teachers. Such teachers

- came to class prepared,
- maintained positive attitudes about teaching and students,
- held high expectations for all students,
- showed creativity in teaching the class,
- treated and graded students fairly,
- displayed a personal, approachable touch with students,
- cultivated a sense of belonging in the classroom,
- dealt with student problems compassionately,
- had a sense of humor and did not take everything seriously,
- respected students and did not deliberately embarrass them,
- were forgiving and did not hold grudges,
- admitted mistakes.[128]

Many studies of student perception of teacher effectiveness are considered such surveys as a necessary part of the development of quality teaching at the university, including its various offline and online formats.[129]

In his book "Understanding teaching excellence in higher education: towards a critical approach," Alan Skelton argues that teaching effectiveness is a contested, value-laden concept (Fig. 6.9). He points out that "students, teachers, politicians, and employers may all have different understandings of teaching excellence at any given moment in time within a particular system of higher education," and that while "policies which seek to promote teaching excellence may claim to be neutral and value-free, they intentionally or unintentionally connect with particular values and interests."[130]

The authors of "A Practical Guide to Evaluating Teacher Effectiveness" think in the same direction:[131] there are several problems with defining teacher effectiveness:

- Teachers are not exclusively responsible for students' learning.
- Consensus should drive research, not measurement innovations. The development of new instruments and technologies can influence trends in measurement.
- Test scores are limited in the information they can provide.
- Learning is more than average achievement gains.

The fact that the criteria for evaluating the quality of teacher practice are variable indicates that the understanding of effectiveness depends on many factors

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[128] *Robert J. Walker Twelve Characteristics of an Effective Teacher A Longitudinal, Qualitative, Quasi-Research Study of In-service and Pre-service Teachers' Opinions. Educational HORIZONS 2008. P. 61 – 68.*

[129] *See: Delaney J.G., Johnson A.N., Johnson T.D., Treslan D.L. Students' Perceptions of Effective Teaching in Higher Education. St John's, NL: Distance Education and Learning Technologies. 2010.*

[130] *Skelton A. Understanding teaching excellence in higher education: towards a critical approach. London; New York: Routledge, 2005. P. 11.*

[131] *Little O., Goe L., Bell C. A Practical Guide to Evaluating Teacher Effectiveness. 2009. 36 p.*

of the development of culture and society. For example, in the 1950s and early 60s, much research focused on teachers' personal characteristics; in the 1970s and early 80s, research focused on what teachers did and how their behavior impacted student learning. This tradition was soon followed by concern for teacher beliefs, and over time concern shifted from who teachers were to how they behaved and what they believed. Then much research interest moved to students – what they saw, felt, and did. Research then turned to an emphasis on how teachers teach different subject matter and to teachers' knowledge of how to teach subject matter. And most recently, research has moved beyond teachers and students to focus on the learning environment.[132]
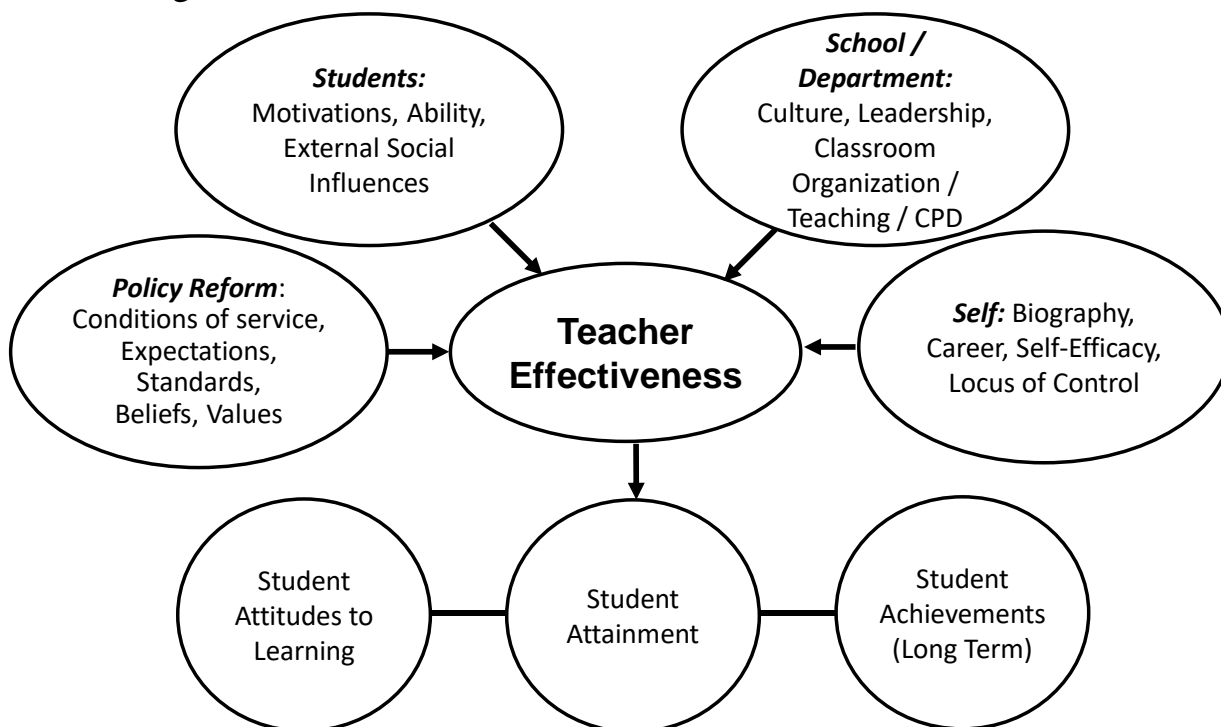
Figure 6.9 Hypothesized initial model of factors contributing to variations in teacher effectiveness. CPD = continuing professional development[133]

At the end of the 20th century, the concept of 'good' teaching practice was actively used as a synonym for effectiveness.

The definition of 'good teaching' also applies to higher education, and reflections on the principles of good educational practice are followed in the 21st century. It can be inferred from the most prominent themes identified in the literature that good teaching begins with enthusiasm and passion for teaching, which motivate students to engage in learning actively. Good teaching is learner-focused and helps learners understand that knowledge is socially constructed and dynamic.

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[132] *Good T.L., Wiley C.R.H., Florez I.R. Effective Teaching: an Emerging Synthesis. In: Saha L.J., Dworkin A.G. (eds.) International Handbook of Research on Teachers and Teaching. 2009. Springer, Boston, MA. Springer International Handbooks of Education, vol 21.*

[133] *According to: Day Ch., Sammons P., Gu Q. Combining Qualitative and Quantitative Methodologies in Research on Teachers' Lives, Work, and Effectiveness: From Integration to Synergy. Educational Researcher, Aug. - Sep., 2008, Vol. 37, No 6, 330-342.*

A good teacher. <… > knows the kind of teacher he or she would like to be, employs classroom behaviors consistent with this view, and is proficient in the behaviors he or she chooses to use <...> Without direction in the form of purposes or beliefs, teacher behaviors lack consistency, and a clear style of teaching does not emerge <...> The teacher behaviors must be performed expertly, however, or else having a purpose and striving for consistency are useless.[134]

Moreover, it helps students to shift their conceptual understanding through approaches that promote deep learning. In particular, such approaches are designed to hone critical thinking, reflection, and problem-solving skills through experientially-based, participative activities. Good teaching involves continual reflection on teaching processes and commitment to fostering independent and lifelong learning skills. In more practical terms, good teaching entails a commitment to providing constructive feedback to students and a soundly designed, relevant curriculum that aligns learning outcomes with teaching methods and assessments.[135]

The situation with education during the pandemic forced us to update this concept again and contrast it with the notion of teaching success. 'Good' teaching pursues morally and rationally sound instructional practices. 'Successful' teaching, on the other hand, is teaching that produces the desired learning.[136]

Teacher effectiveness in higher education can be viewed from three different but interrelated perspectives: measuring inputs, processes, and outputs. Input refers to what a faculty member brings to their position. It is generally measured and includes the teacher's background, beliefs, expectations, experience, pedagogical and content knowledge, certification and licensure, and educational environment.

These measures are sometimes defined in the literature as "teacher quality." Processes, on the other hand, refer to the interaction between teachers and students, and it may include a teacher's professional activities within the larger University community. Outcomes are the results of instructional processes, such as the impact on student achievement, graduation rates, student behavior, engagement, attitudes, and social-emotional well-being. Other outcomes may include contributions to the University or community by taking on leadership roles or training other faculty.[137]

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[134] *Zahorik J. Good teaching and supervision. Journal of Curriculum and Supervision. 1992. 1(4). P. 400.*

[135] *Duarte F. P. Conceptions of Good Teaching by Good Teachers: Case Studies from an Australian University. Journal of University Teaching & Learning Practice. 2013. 10 (1). URL: https://ro.uow.edu.au/cgi/viewcontent.cgi?article=1276&context=jutlp*

[136] *Cuban L. Remote Delivery of Instruction–Covid-19 and Re-opening Schools. URL: https://larrycuban.wordpress.com/2020/08/05/remote-delivery-of-instruction-covid-19-and-re-opening-schools/*

[137] *Mastrokoukou S., Kaliris A., Donche V., Chauliac M., Karagiannopoulou E., Christodoulides P., Longobardi C. Rediscovering Teaching in University: A Scoping Review of*

J. Ko, P. Sammons, and L. Bakkum in "Effective Teaching Education Development" define educational effectiveness as a term developed to provide a more contained definition than notions of 'good' or 'quality' education. Teacher effectiveness is generally referred to in terms of the focus on student outcomes and the teacher behaviors and classroom processes that promote better student outcomes.

However, some authors view teacher effectiveness in a broader sense. They adopt criteria that seek to encompass the duties considered part of the wider role of teachers in the 21st century because the role of a teacher is rarely restricted to instruction only. In many countries, a teacher's work has extended beyond the instructional or pedagogical role in the classroom. Accordingly, efficiency needs to be evaluated based on objective criteria. So, the authors reflect on the interrelated challenges and several relevant questions about the teacher's effectiveness:

The Perspective challenge

Who is best placed to judge teacher effectiveness? How do they define what constitutes effective teaching?

The Characterization challenge

What makes a teacher highly effective? What do they do to make their teaching effective? What does their teaching look like? How can we characterize effective teaching? How can we measure its relative effects?

The Measurement challenge

How can we measure effective teaching? What instruments do we use? What sources of evidence should we look at? What evidence should we give more weight to?

The Theorization challenge

How can we organize research evidence on effective teaching in a holistic fashion? How do the models explain the contingencies of effective teaching? How do the models address the problem of differential teacher effectiveness and its consequences?[138]

Despite the disagreements and many problematic issues, researchers are trying to answer the question of determining the characteristics of teaching effectiveness. One such attempt presents a five-point definition of teacher effectiveness developed through an analysis of research, policy, and standards that addressed teacher effectiveness. After the definition had been developed, the authors consulted several experts and strengthened the definition based on their feedback. The five-point definition of teacher effectiveness consists of the following:

Teacher Effectiveness in Higher Education. Frontiers in education. Systematic Review. 2022. Vol. 7. URL: https://www.frontiersin.org/articles/10.3389/feduc.2022.861458/full

[138] *Ko J., Sammons P., Bakkum L. Effective teaching. Education Development Trust. 2016. P. 9.*

- Effective teachers have high expectations for all students and help students learn, as measured by value-added or other test-based growth measures or alternative measures.
- Effective teachers contribute to positive academic, attitudinal, and social outcomes for students, such as regular attendance, on-time promotion to the next grade, on-time graduation, self-efficacy, and cooperative behavior.
- Effective teachers use diverse resources to plan and structure engaging learning opportunities; monitor student progress, adapt instruction as needed; and evaluate learning using multiple sources of evidence.
- Effective teachers contribute to developing classrooms and schools that value diversity and civic-mindedness.
- Effective teachers collaborate with other teachers, administrators, parents, and education professionals to ensure student success, particularly the success of students with special needs and those at high risk for failure.[139]

6.13 Existing evaluation systems of teacher's effectiveness

There are three elements to consider when evaluating teaching effectiveness within a particular context:
- Criteria – attributes of effective teaching.
- Evidence – documentation of teaching considered in the review process.
- Standards – expectations of quality and quantity.

Standards articulate expectations of quality or quantity for each evaluation criterion. As with criteria and sources of evidence, the corresponding standards should fit the context in which teaching is evaluated. For instance, a teaching award for graduate teaching assistants might articulate high standards for student learning results yet reflect lower expectations for departmental and institutional leadership around teaching.

Quantitative and qualitative approaches to measuring teacher effectiveness are distinguished. The value-added model is a qualitative method. Here is a table describing this method (Table 6.15).

The basic format of the traditional 'teacher effectiveness' study is a so-called product-process design, similar to that used in most school effectiveness research. Typically, outcomes are measured, and a classroom observation instrument or questionnaire is used to measure teacher factors such as classroom behaviors or pedagogical content knowledge and how that might affect these outcomes. The aim is then to see which behaviors, beliefs, or other teacher factors (if any) are associated with more positive outcomes. This model, while shown to be empirically supported, does, of course, have its limitations. In particular, it does not sufficiently consider that teachers' roles are broader than their classroom practice and includes management roles, roles, relationships with parents and community, and classroom practice.

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[139] *Goe L. (2007). The link between teacher quality and student outcomes: A research synthesis. Washington, DC: National Comprehensive Center for Teacher Quality. https://eric.ed.gov/?id=ED521219*

Table 6.15

Value-added model

Description	Research	Strengths	Cautions
Statistical models used to determine teachers' contributions to students' test score gains. May also be used as a research tool (e.g., determining the distribution of "effective" teachers by student or school characteristics).	Little is known about the validity of value-added scores for identifying effective teaching, though research using value-added models suggests that teachers differ markedly in their contributions to students' test score gains. However, correlating value-added scores with teacher qualifications, characteristics, or practices has yielded mixed results and few significant findings. Teachers vary in effectiveness, but research has not determined why.	• Provides a way to evaluate teachers on their contribution to student learning, which most measures do not. • Requires no classroom visits because inked student/teacher data can be analyzed at a distance • Entails little burden at the classroom or school level because most data are already collected for NCLB purposes. • May be useful for identifying outstanding teachers whose classrooms can serve as "learning labs" as well as struggling teachers in need of support.	• Models are not able to sort out teacher effects from classroom effects. • Vertical test alignment is assumed (I.e., tests are measuring essentially the same thing from grade to grade). • Value-added scores are not useful for formative purposes because teachers learn nothing about how their practices contributed to (or impeded) student learning. • Value-added measures are controversial because they measure only teachers' contributions to student achievement gains on standardized tests.

> **Further Reading:** *Little O., Goe L., Bell C. A Practical Guide to Evaluating Teacher Effectiveness 2009. 36 p.*

Teacher effectiveness is whether to use classroom observation, survey style research, qualitative methods such as interviews, or a combination of methods. Classroom observations can be more objective due to the outsider's perspective when studying behaviors. A further advantage is that outside observers are likely to have observed a range of classrooms and teachers and should be well-versed in the theories underlying teacher effectiveness research. They should be better able to judge a teacher's behavior than others. Disadvantages are first that all classroom observations are, by definition, snapshots, and even successive observations of a teacher will only ever supply a collection of snapshots rather than a full picture of said teacher's behavior over the year.

When using questionnaires to ask teachers about their teaching, one is confronted with several problems concerning reliability. Using qualitative, explorative methods in developing survey instruments, such as focus groups or open-ended interviews, can help alleviate this problem. In many cases, such

qualitative methods can also be suited to discovering inner states, traits, and beliefs, allowing in-depth probing and understanding to develop.

Interviews with teachers allow the researcher to probe the teacher in-depth on his/her teaching and thus allow more detailed findings to emerge than questionnaires. Still, they suffer from lower reliability, relying on teachers' 'there and then' memory and, if not standardized, from lack of comparability. It makes them more difficult to quantify. In-depth interviews also make a great demand on teacher time. They can be threatening to teachers and are as expensive as classroom observation but allow the interviewer to be reactive and probe. Therefore, they will likely lead to a deeper understanding of the meaning and reasons for teachers engaging in classroom practice. They can often lead to a deeper understanding of underlying teacher beliefs and thought structures.

A useful strategy could be identifying more and less effective teachers using outcome data and combining quantitative classroom observation with in-depth interviews of selected teachers and/or in-depth qualitative observations of particular classroom interactions.[140]

The teaching portfolio is a qualitative evaluation method, and it helps to measure the aspects of teaching activities that are not observable in the classroom. Even though the portfolio is difficult to standardize, it is an effective tool for reflection and improvement of the teacher.

Self-reflection is an important component of a teacher's development and the evaluation of one's work. Educational institutions offer teachers various self-evaluation systems. For example, The *Learning and Teaching Centre* (Canada) develops instructional materials for self-evaluation[141], including checklists for different essential aspects of teaching activity, such as:

- Organization of subject matter and course,
- Communication,
- Knowledge of the subject matter,
- Enthusiasm for the subject and teaching,
- Attitude toward students,
- Fairness in testing and grading,
- Flexibility in approaches to teaching,
- Appropriateness of student learning outcomes.

When choosing methods to assess the effectiveness of teaching, use the following guidelines:

- Do not allow any self-assessment to become a burden and a chore.
- Choose techniques that will benefit yourself and your students.
- Plan how to introduce the technique to students.

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[140] *Muijs D. Measuring Teacher Effectiveness: Some Methodological Reflections, Educational Research and Evaluation: An International Journal on Theory and Practice. 2006. 12:1, 53 – 74.*

[141] *Your Own Teacher Effectiveness. Instructional Job Aid. Learning and Teaching Centre. British Columbia Institute of Technology Burnaby, British Columbia, Canada. 2003. URL: https://inside.lanecc.edu/sites/default/files/fpd/htteachassess.pdf*

- Estimate and plan for how much class time it will take.
- Do not use these techniques too often—if the students find them predictable and monotonous, the information will not be as useful.
- Brief written exercises are good for encouraging shy students to express their thoughts.
- Anonymity encourages students to be frank without the possibility of penalty.
- Remember that assessment and analysis probably take twice as long as you think! Allow enough time to plan for changes

Evaluation of each criterion helps to identify weaknesses and the ways of their elimination and outline a plan for self-improvement using the checklist:

1. When planning change, I remember and note what I do well.
2. I do not try to change more than two things at once.
3. I try not to get discouraged – change needs time and practice.
4. I plan to repeat the analysis process a few times throughout the year, which helps me note patterns and track improvements.

6.14 Self-assessment questions

1. What theories of learning have most influenced modern approaches to assessment?
2. In what direction was the interpretation of the evaluation process changing?
3. What is the difference between assessment and evaluation?
4. What are the two key characteristics of any form of assessment?
5. Why could assessment as learning be an effective educational tool?
6. What are the differences between traditional and alternative assessment?
7. What are the advantages and disadvantages of fill-in-the-blank assignments?
8. What are the criteria of an essay question?
9. Compare summative and formative assessments.
10. What are the goals of a cognitive diagnostic assessment?
11. Explain the essence of performance assessment.
12. What are the core elements of formative assessment?
13. What form of assessment is the most effective when measuring a single learning outcome, objective, or goal: direct or indirect assessment? Provide arguments.
14. What type of rubric is based on an overall judgment of the student's work?
15. Describe the specifics of the analytic rubric.
16. What are the benefits of Low-Stakes Assignments?
17. What are the conditions for effective student feedback?
18. What are the features of 'good feedback practice'?
19. What are the main systems of evaluation of teaching activity?
20. What is the aim of the self-assessment approach?

6.15 Practice exercises

6.15.1 Designing assignments for evaluation and criteria for assessment

STEP 1. Identifying the purpose of the assignment

STEP 2. Defining the result according to the course outcomes and the topic

STEP 3. Choosing the type(s) of assessment

STEP 4. Choosing the form of assessment and its content

STEP 5. Considering the *strengths and limitations of the assessment activity*

Assessment Activity	Strength	Limits	Implementation (method, *instructional context, time*)

STEP 6. Modifying the grade structure
Rating scales turn the grading criteria you have defined into levels of performance expectations for the students that can then be interpreted as a letter, number, or level

Level of Achievement	General Assumption	Comprehension

STEP 7. Considering the strategy of feedback

INDEX

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У навчальному посібнику викладено основи базового навчального курсу «Педагогічна майстерність у вищій школі» для здобувачів вищої освіти освітньо-наукового рівня «доктор філософії». Курс систематизує знання аспіранта з дисциплін психолого-педагогічного циклу та допомагає інтегрувати їх із знаннями, отриманими під час вивчення фахових дисциплін.

Зміст посібника структуровано відповідно до навчальної програми дисципліни. Він містить теоретичний матеріал та практичні завдання, спрямовані на засвоєння: сутності професійної діяльності; технологій розвитку та саморозвитку особистісних і професійних якостей; особливостей педагогічного спілкування, естетики, етики та культури викладача вищої школи. Проаналізовано різноманітні педагогічні ситуації, наведено приклади розв'язання педагогічних задач тощо.

Навчальний посібник призначений для аспірантів і викладачів вищих навчальних закладів.

Навчальне видання

Юферева Олена Володимирівна
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Педагогічна майстерність у вищій школі

Навчальний посібник

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