Capacity building Course Material

Innovation – based and Student – centered teaching in Higher Education Institution

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Subtopic: STUDENT-CENTRED LEARNING IN HIGHER EDUCATION

Expected results:

- be able to define essence of student-centered learning;
- be able to list and explain the principles of student-centered and teacher-centered learning;
- be able to identify and describe conditions of student-centered learning: transmission and facilitation;
- be able to apply or recognise the principles of student-centered learning in their topics;
- be able to define the concept of deep learning;
- be able to specify examples of student-centered learning/teaching methods;
- be able to analyse and explain examples of student–centered assessment in the subject they teach;
- be able to assess and compare the differences between teacher-centered and student-centered paradigms.

Keywords: student-centered learning, educational environment, deep learning, higher education.

Theoretical part

Definition of student-centered learning

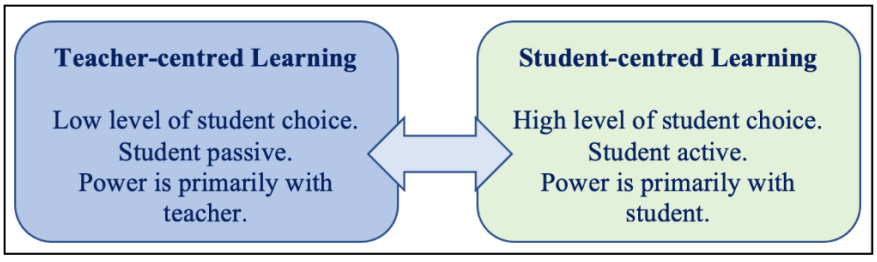
The development of higher education is one of the conditions for the development of society. The link between the higher education system and the labour market is ensured through the knowledge, abilities, skills, and it is means competencies acquired by students. “With the rise of cognitive and learning sciences in recent years, there has been increasing interest in determining how best to teach students and promote their learning (Sawyer, 2005). As information becomes more readily available, competition more prominent and technology more pervasive, learning itself becomes more important to participate in the present knowledge economy. But the economy also becomes more complex since it is no longer just about the accumulation of knowledge and information. Many education theorists and researchers have tried to explore the best ways students learn, retain ideas, improve skills, and create innovative projects, with the goal of improving engagement and instruction (Slavich and Zimbardo, 2012). Student-centered learning (SCL) offers an umbrella term to describe efforts for students to become actively engaged in their learning and for teachers to design and facilitate the learning process (cited in Trinidad, 2020). SCL began to be explored in the early twentieth century.

According to Trinidad (2020) there have been many variations, definitions and terms that relate to SCL, and these have at times led to confusion. For example, *active learning* involves students reading, writing, discussing, analysing, evaluating, and creating to exercise higher-order thinking skills (Ott et al. 2018). On the other hand, *collaborative learning* involves students working with their peers: students do not only participate in content and knowledge-building but also learn skills in cooperation and communication (Ralston, Tretter, and Kendall-Brown 2017). *Experiential learning* involves students engaging in or reflecting on their personal experiences to abstract knowledge and gain skills. This model usually involves four phases of concrete experience, reflection, abstract conceptualisation, and active experimentation. *Problem-based learning* involves instructors posing complex issues and problems on groups of students, and helping them brainstorm, formulate, and structure their ideas. In the process, students learn concepts and principles that are much broader than the specific problems posed. These different terms are closely related to student-centered learning, which emphasises the centrality of the students' role in terms of practice, curriculum, and content. Given these different terms, different people may also have different ideas about what truly constitutes SCL.

Kember described two broad orientations in teaching: the teacher centered/content (TCL) oriented conception and the SCL oriented conceptions. In a very useful breakdown of these orientations, he supports many other authors views in relation to student–centered view including that knowledge is constructed by students and that the lecturer is a facilitator of learning rather than a presenter of information (O'Neill, McMahon, 2005). This definition emphasises the concept of the student "doing". Other authors articulate broader, more comprehensive definitions. Summarises some of the literature on SCL to include the followings tenets:

1. „the reliance on active rather than passive learning,
2. an emphasis on deep learning and understanding,
3. increased responsibility and accountability on the part of the student,
4. an increased sense of autonomy in the learner
5. an interdependence between teacher and learner,
6. mutual respect within the learner teacher relationship,
7. and a reflexive approach to the teaching and learning process on the part of both teacher and learner" (O'Neill, McMahon, 2005).

Learning is often presented in this dualism of either SCL or TCL. In the reality of practice, the situation is less black and white. A more useful presentation of SCL is to see these terms as end of a continuum, using the three concepts regularly used to describe SCL (1 Figure).



1 Figure. Student–centered and teacher–centered continuum (O'Neill, McMahon, 2005)

Although there are varying ways of understanding SCL, it is often contrasted with teacher-centered learning (TCL) since the former is a constructivist approach that assumes that construction of knowledge is shared with students actively involved. In contrast, the latter is an approach where teachers share knowledge to their students who are thought of as passive receivers of information (Kain, 2003). Some simplistically think of it as SCL involving active learning techniques and collaborative pedagogical activities, and TCL including unidirectional lectures and tests. However, SCL is not so much just about classroom practices since what it provides is a perspective for the teacher-student-content relationship and environment. Seen in this way, being student-centered does not mean forgoing lectures since different learning outcomes will need their own appropriate pedagogical modes – at times necessarily inclusive of lectures and didactic forms of teaching (Mascolo, 2009). Nonetheless, at the core of SCL is a perspective of the teachers' design of active and deep learning, and the students' autonomy and responsibility for learning (Arman 2018; O'Neill and McMahon 2005).

In higher education, the concept of SCL is more thoroughly problematized because of SCL's misconceptions and assumptions, teachers' pedagogical preferences, and the practical feasibility of transitioning to a SCL environment. First, some faculty question whether this pedagogical practice truly enhances students' sense of involvement given that it also assumes that learners are motivated and engaged. Relatedly, there are difficulties implementing SCL in 'high power distance' societies where hierarchical relationships are more salient, like in Asia. Second, lecturing is still the most employed means of transmission of knowledge in higher education despite critiques like student absenteeism and lack of engagement. Most professors still prefer this mode of instruction for a variety of reasons, including the necessity of covering content, having large classes, introducing new information, and helping students with difficult readings. Lastly, both students and teachers talk about the positive benefits of SCL but wanted the balance between teacher-directed and student-centered approaches since students are anxious of pedagogical approaches that lack structures and supports, and resources may not be present for SCL's effective implementation (Trinidad, 2020).

SCL are based on several principles: students' learning styles, needs and expectations differ; there is no single correct teaching / learning method - each higher education institution decides for itself; students are given a choice, which encourages their responsibility and interest; the work of the teacher becomes focused not on instruction but on empowerment; active learning replaces passive learning; superficial absorption of information is replaced by a thorough understanding; develops mutual respect between the student and the teacher; more active cooperation between students and teachers is formed - dialogue is the essence of studies; the teaching / learning process must be monitored and regularly evaluated by all stakeholders (Čiburienė, Guščinskienė, 2017).

Different authors (Cox, 2010; Wright 2011; Weimer 2013, Čiburienė, Guščinskienė, 2017; Trinidad 2020 etc.) have both written about key aspects of SCL in higher education, and they outline five crucial aspects.

- First, there must be a balance of power with its being shared by both professor and student in terms of activities, decision-making, and assigned roles.

- Second, the function of content is to contribute to the learning process and acquisition of skills rather than just memorization of concepts.
- Third, the role of the teacher shifts from being the sole knowledge source to being a guide, designer, and facilitator of learning.
- Fourth, there is the assumption that the responsibility for learning rests on independent and self-motivated students.
- Lastly, the purpose of the evaluation is not only to generate grades but also to be a means for students to learn, practice skills, and be given feedback.

In summary we can give such a definition of student-centered learning. SCL is about helping students to discover their own learning styles, to understand their motivation and to acquire effective study skills that will be valuable throughout their lives. To put this approach into practice, teachers need to help students set achievable goals; encourage students to assess themselves and their peers; help them to work co- operatively in groups and ensure that they know how to exploit all the available resources for learning. Learning is thus more a form of personal development than a linear progression that the teacher achieves by rewards and sanctions.

Student-centered learning: transmission and facilitation

When we talk about student-centered learning: transmission and facilitation it is very important talk about the focus is not just on **what is taught** but on **how** effective learning should be promoted.

In this context, an enabling educational environment is important. Empowerment is understood as enabling students to participate in the learning process, to shape it, to participate in decision-making. Educational environment - a dynamic information space of learning activities, created and influenced by the educator (teacher) and conditioned by the educational goal, the content corresponding to it and the educational forms, tools, methods, infrastructure facilitating its assimilation. The educational environment, according to Jucevičienė, Gudaitytė, Karenauskaitė et al (2010) is:

- *dynamic, i.e., constantly changing, adapting to changes and needs;*
- *designed and influenced by the educator, it is the expertise of the teacher, lecturer or other educator that determines the impact on the individual and the educational value created;*
- *conditioned by the educational objective, the content, the forms, methods and means of education, these aspects of the educational environment also have a major impact on the learner and the competence he/she develops;*
- *infrastructure, i.e., the physical environment, material resources.*

Having clarified the key concepts of the topic, it can be argued *that an enabling learning environment is the entire learning environment that enables a student studying in higher education to acquire the knowledge, meanings and skills needed to build his/her personal and professional life.*

There are two aspects to study empowerment:

1. When empowerment is related to the individual, that is, to his or her inner strengths, knowledge, experience, motivation. Students' motivation plays an important role in the study process. In their analysis of the phenomenon of motivation, Gage, Berliner (1994) characterise

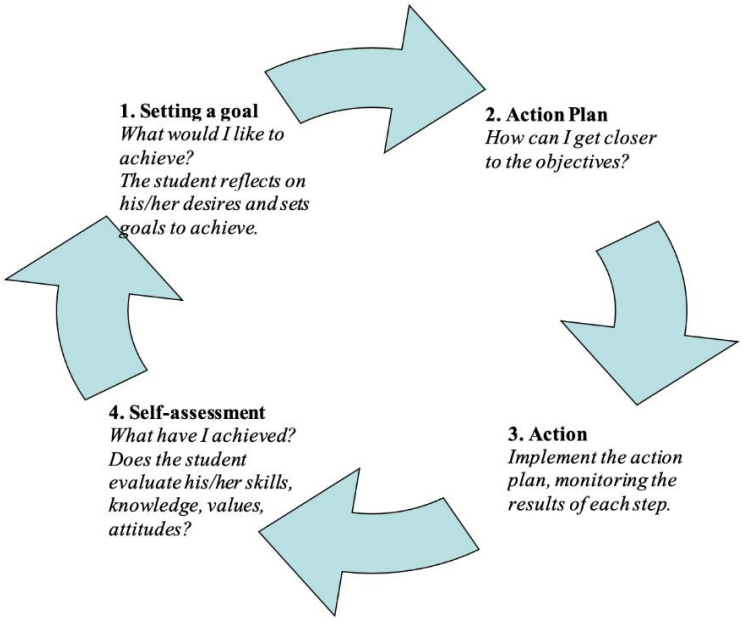
motivation as a phenomenon fraught with extremes, which can lead to liminal states, such as endless boredom or an insatiable thirst for and pursuit of knowledge. There are various reasons for wanting to learn, e.g., Petty (2008) identifies the following reasons:

- I learn because I find it useful;
- The specialty I am studying will be useful to me;
- I realise that I am doing well in my studies and that it raises my self-esteem;
- If I learn well, I will please my teacher(s) and/or my peers;
- If I don't study, I will immediately get in trouble;
- What I am learning is interesting and meets my expectations;
- I enjoy learning.

2. When empowerment is linked to the external environment, it is the physical environment (what technology is used, what learning materials are available, the size of the classroom, the furniture, the tools, etc.) and the social environment (the mood of the learners, the mood of the group, the role of the teacher, the relationships between the learners, the attitude towards learning).

An empowering educational environment is of great importance for the success of a student's studies, as it empowers the student to learn, enables him/her to control his/her own learning process, fosters creativity, innovation, reflection, improves the student's self-confidence and motivation for quality activities and learning, and promotes a deep attitude towards learning. An empowering environment also promotes self-directed learning by giving the student autonomy and the opportunity to take responsibility for their learning and its outcomes.

Student learning becomes the main preoccupation of the teacher (not his/her performance as a teacher or a raw number of facts to be transmitted to the students). In this way, the student is supported in making sense of their "journey" through knowledge construction. The student must take responsibility for his/her own learning and oversee his/her own learning (Figure 2).



2 Figure. Student-led learning cycle (Petty, 2006 p. 28)

In a student-led cycle, it is important to be involved, to set goals, to create a plan of action according to one's own learning style. Self-assessment is an important skill that allows one to have confidence and to guide oneself in the right direction. It encourages taking responsibility for one's own development.

According to O'Neill and McMahon (2005) SCL have implication: *on curriculum design, for teaching/ learning methods, for assessment practices.*

Implication on curriculum design. In relation to curriculum design, SCL includes the idea that students have choice in what to study, how to study. However, to what extent can this be carried out in the structures of today's Universities? Modularisation, which will be expected in all European undergraduate courses by 2006, provides a structure that allows students an element of choice in what modules they study. Students can choose the subjects and in this way they can modules they study. One student–centered approach to curriculum design, Problem–Based Learning, allows for some choice within a programme of areas that students may study. It allows students to set some of their own learning objectives/outcomes, dependent on prior knowledge. Problem-Based Learning, using problems/issues/triggers, encourages the students to develop their own learning goals, thereby filling in the gaps in their knowledge or understanding (O'Neill and McMahon, 2005).

Student-centered learning – consequences for Competences and Learning Outcomes. Student-centered learning encourages:

- the prioritising of higher order thinking and information skills - problem-solving, accessing, organising, interpreting and communicating knowledge;

- students to work with teachers to select learning goals and objectives based on their prior knowledge, interests, and experience.

With a student-centered approach to HE:

- syllabi and curricula, too, are organised not just around the facts the learner is supposed to acquire but around the processes through which learning is to be developed;

- where possible, curricula also take account of students' prior knowledge, interests, and experience – as well as the gaps in these.

This strengthens the desirability of providing choice within the curriculum:

- It promotes structures incorporating electives;
- It therefore places demands upon logistical planning and resource provision;
- As a result, it creates a drive towards fully-modular structures with standardised module sizes.

Student–centred Learning Outcomes: Some examples	Traditional Learning Out-comes/Objectives
*By the end of this modules: **you** (the student) will be able to:*	*The course will cover:*
Recognise the structures of the heart	The anatomy of the heart
Critique one of Yeats' poems	A selection of Yeats poems

3 Figure. Learning Outcomes and Student–centered Learning (O'Neill and McMahon, 2005)

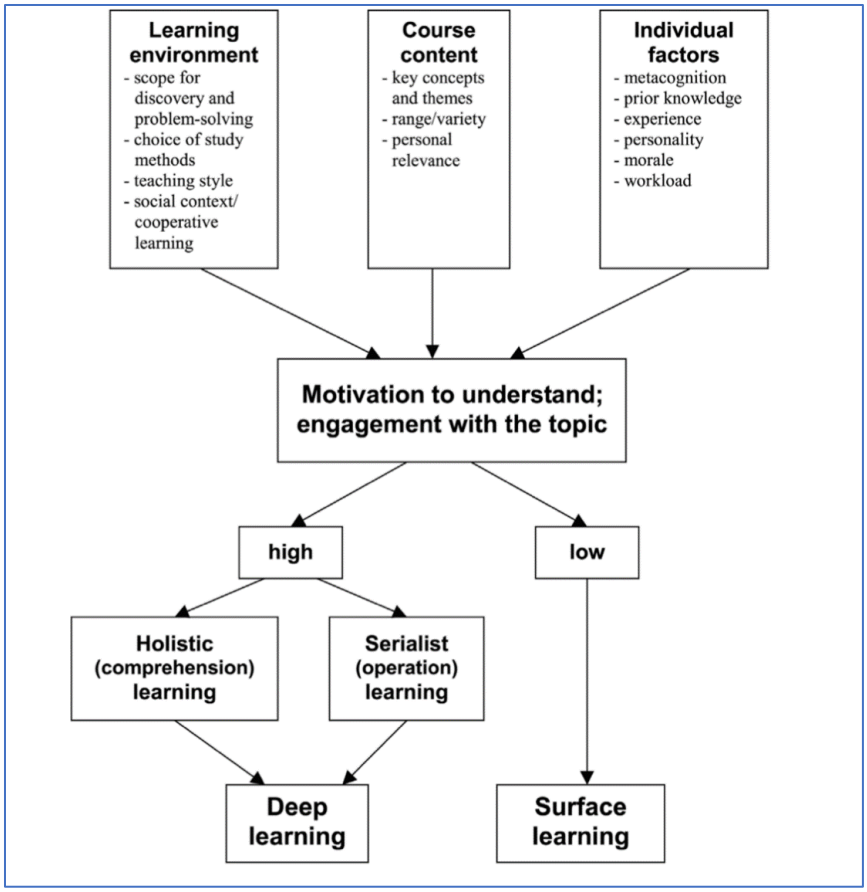
Implication for teaching/ learning methods. The phenomenon of learning is a multifaceted one, which we can look at from different angles. Learning is not seen as the accumulation and possession of knowledge, but as a personally experienced and lived awareness of the lived world and the relationships within it, which matures and transforms learners. In terms of learning and SCL, we can distinguish deep learning. Deep learning is learning in which students' study, analyse and try to understand and comprehend the material presented to them, rather than just memorising the details.

As well as deep learning, there is also surface learning. These learning attitudes differ in motives and learning strategies (Table 1).

Table 1. Motives and learning strategies in relation to learning preferences (Warburton, 2003)

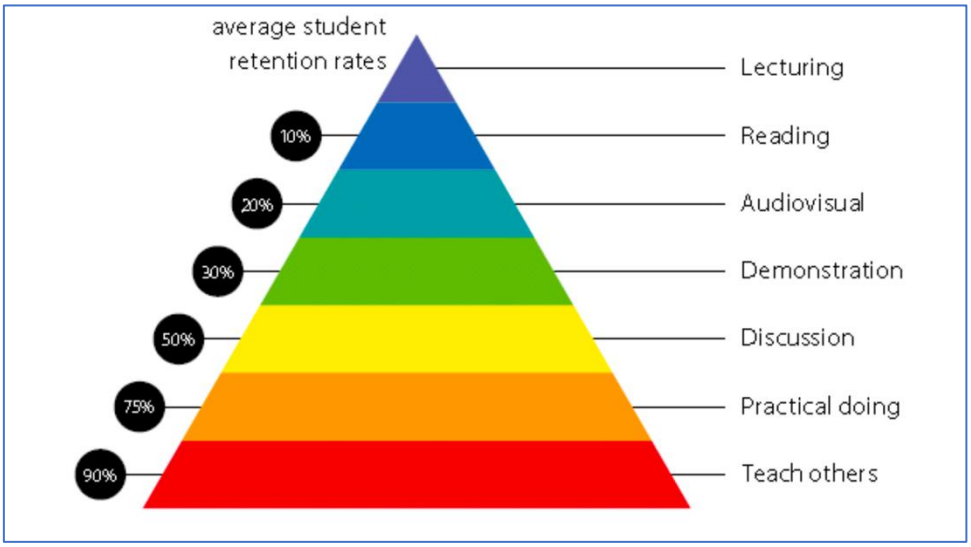
Learning preferences	Motives	Learning strategy
Surface learning	The main goal is to meet the minimum requirements, balancing hard learning with the goal of staying in school.	Reproduction: limited intention to understand the essence and reproduction of information based on mechanical memorisation.
Deep learning	Deep intrinsic motivations: learning based on a deliberate interest and the holistic development of competences by learning each specific subject.	Meaningfulness: interest and reflection, linking existing knowledge with new knowledge.

Various factors are thought to influence attitudes towards deep learning (Figure 4).



4 Figure. Some factors influencing deep learning (Warburton, 2003)

It is very important that students' retention rates based on different types of activity (5 Figure).



5 Figure. Students' retention rates based on different types of activity (Cox, 2010)

Table 2 highlights a sample of student–centered learning/teaching methods and includes some ideas for lecturers both within (more teacher–centered) and outside of the lecture format.

Table 2. Examples of student-centered learning/teaching methods (O'Neill and McMahon, 2005)

Outside of the lecture format	In the Lecture
Independent projects	Buzz groups (short discussion in twos)
Group discussion	Pyramids/snowballing (Buzz groups continuing the discussion into larger groups)
Peer mentoring of other students	Cross-overs (mixing students into groups by letter/number allocations)
Debates	Rounds (giving turns to individual students to talk)
Field-trips	Quizes
Practicals	Writing reflections on learning (3/4 minutes)
Reflective diaries, learning journals	Student class presentations
Computer assisted learning	Role play
Choice in subjects for study/projects	Poster presentations
Writing newspaper article	Students producing mind maps in class
Portfolio development	

Implementation for assessment practices. O'Neill and McMahon (2005) summarised some of the difficulties highlighted in the literature in assessment, for example, a) that the giving of marks and grades are over emphasised, while the giving of advice and the learning function are under emphasised, b) pupils are compared with one another which highlights competition rather than personal improvement. He also explains the concept of self-assessment as essential activity to help students "take responsibility for their own learning", an important aspect of SCL. Foucault argued that the examination was a technique of power, where a student is 'controlled through a system 'micro-penalties', the constant giving of marks which constitutes a whole field of surveillance'.

Figure 4 presents practical examples of student–centered assessments.

• Diaries, logs and journals • Portfolios • Peer/self assessment • Learning contracts and negotiated assessment	• Projects • Group work • Profiles • Skills and competencies

Figure 4. Practical examples of student–centred assessments (O'Neill and McMahon, 2005)

Theus of the written examination is still a strong practice in today's Universities and is primarily a summative assessment, i.e., an assessment for judgement or accreditation.

Evaluation involves many aspects: *gathering, interpreting, summarising, and giving feedback.* Assessment in teaching and learning can have very different aims and purposes. The most important purpose of assessment is to support student learning. For deep learning, assessment that supports learning is essential, where the teacher continuously monitors students' learning by providing timely and specific feedback on their progress and achievements, pointing out successes and gaps, helping them to achieve more (Žibėnienė, Indrašienė, 2017).

Feedback is also important as a means of motivating students to study. Feedback is a prerequisite for successful learning for the student and a tool for the lecturer to improve his/her performance and communication with students. For the improvement of learning, students need to have information about their level of knowledge, which must be obtained from the lecturer through feedback. Nicol, Macfarlane-Dick (2006) identified seven main functions that are inherent in good feedback:

- helps to clarify the criteria for completing the task (in line with the set objectives, criteria, standards);
- facilitates self-assessment (reflection) in the learning process;
- provides quality information to students about their learning;
- promotes dialogue between students and lecturers about their learning;
- encourages action and confidence;
- provides an opportunity to bridge the gap between the actual performance of the task and the ideal performance of the task;
- provides lecturers with information that can be used to improve the learning process.

Student-centered learning: the role and responsibility of the lecturer

As we said one of key aspects of SCL in higher education the role of the teacher shifts from being the sole knowledge source to being a guide, designer, and facilitator of learning.

The university lecturer moves from being a transmitter of information and knowledge to a learner and collaborator with students and colleagues, learning and deepening existing knowledge and concepts (Crisol, 2011). This paradigmatic shift can be illustrated by the teacher-centered and student-centered paradigms (Table 3). The paradigm shift also particularly changes the roles of lecturers in the university, which promote collaboration and collaborative learning. It is important to note that lecturers, by becoming student facilitators, primarily share leadership roles that encourage students to engage in the educational process and share their knowledge and insights (ALRowais, 2015). Such a process enables peer exchanges between university lecturers and students, and these manoeuvres open opportunities for university lecturers to not only be formal knowledge providers, but also to learn and contribute to student growth and change.

Table 3. Paradigm shift (Sawant ir Rizvi, 2015)

Teacher-centered paradigm	Student–centered paradigm
Knowledge generated by a university lecturer and transmitted to students.	Students construct knowledge by collecting, synthesising, and integrating it. Collaboration, critical thinking, and problem-solving skills are developed.
Students passively accept the information.	Students are actively involved in the educational process.
The focus is on the acquisition of knowledge but not on the contexts in which the knowledge will be used.	Emphasis is placed on the application of acquired knowledge and on collaboration, which can be used to solve real-life problems effectively.
The primary role of the university lecturer is through the transfer of information to students and their assessment.	The role of the university lecturer is manifested through teaching and supporting students. The lecturer and the students evaluate the learning process together.
Teaching and assessment are separated.	Teaching and assessment are interrelated.
Assessment is only used to monitor teaching.	Assessment is used as an aid to learning.
Emphasis is placed on correct answers.	The focus is on question formulation and learning from mistakes.
Learning is assessed by tests.	Learning is assessed through the student's work, projects, portfolios, etc.
Focus is on one subject.	Interdisciplinary links are sought.
Teaching culture is based on competition and individualism.	The teaching/learning culture is based on support and cooperation.
Only students are seen as learners.	University lecturer and students learn together.

It has been observed that there is a correlation between the teaching methods that university lecturers use in their lectures and the goals they pursue in the educational process:

1. *A teacher-centered strategy to convey information.* In this transmission, the most important element is the transmission of facts and knowledge, in which the student is a passive listener.

2. *A teacher-centered strategy to gain an understanding of the subject.* In this process, university lecturers' desire to uncover the concepts and show the links between them.

3. *A strategy of interaction between lecturers and students to develop an understanding of the discipline being taught.* In this process, through interactions between university lecturers and students, the aim is to reveal the concepts of the taught discipline and help to find the links between them.

4. *A student-centered strategy to enable students themselves to shape their perception.* In this process, university lecturers aim to help students to connect the already existing knowledge and skills with new knowledge, thus building their own personal perceptions.

5. *A student-centered strategy to get students to change their existing perceptions.* Through this process, university lecturers aim to help students construct new and reconstruct existing perceptions, critically evaluating them, and forming their own authentic viewpoints.

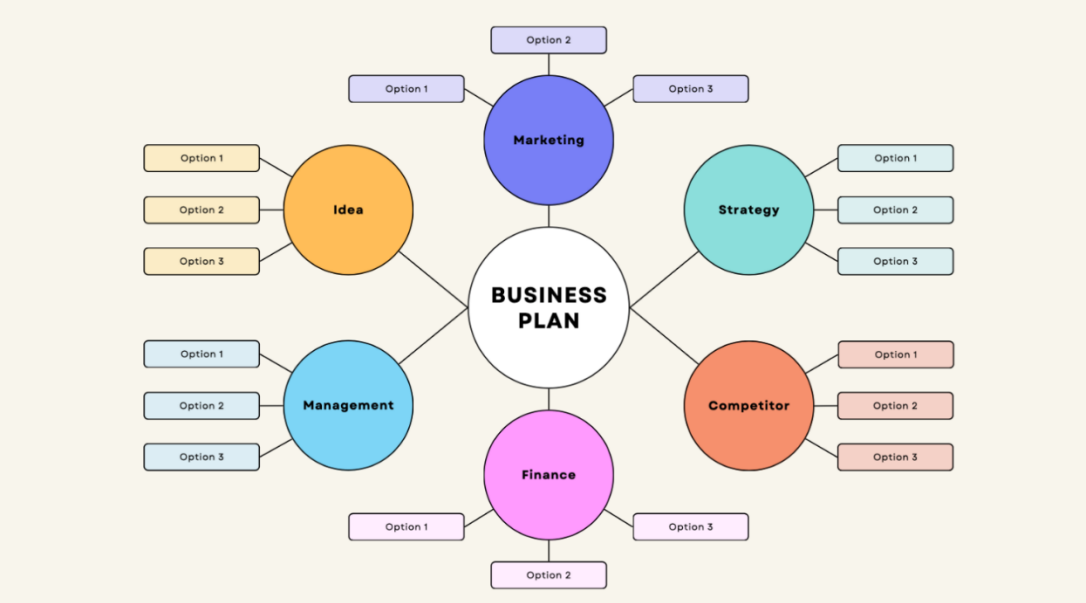
When the aim is only to transfer information to students, the most common approach is teacher-centered strategy is used, but a student-centered learning strategy is used to develop

students' critical thinking or to help students to develop personal, authentic conceptions (constructing and reconstructing existing and new perceptions) (Daugėla, Žydžiūnaitė, 2021).

Practical part and reflection questions

1. Based on the theoretical material, draw up a concept map, which should include the principles and key concepts of student-centered learning.

For example: used Canva https://www.canva.com



2. Please explain the differences of the principles of student-centered and teacher-centered learning.

3. Analyse your institution's educational environment using a SWOT (Strengths, Weaknesses, Threats, and Opportunities) analysis.

For example: *Analysis of the educational environment of the institution using the SWOT method*

Strengths	**Weaknesses**
Strengths reflect those areas that show the advantages of the educational environment. What are the strengths of the educational environment? What are the strengths? What are the positive features? What resources do we have? What knowledge, skills and experience do we have in creating an educational environment?	Weaknesses reflect areas where neither you nor the institution achieves what should be valued in an educational environment. What are weaknesses? What are the weaknesses? How are we worse than others? What do we not know, what knowledge, skills and experience do we lack?
Opportunities	**Threats**

Opportunities let's consider what could give new impetus to the creation and renewal of the educational environment in the institution. What are the latest trends? What are the needs of our students? What are the opportunities in the environment that we can seize? What are the changes in our sphere of activity?	Threats – obstacles that could hinder the realisation of the ideas behind the renovation of the educational environment in the institution. What challenges might we face? What risks can we identify?

4. Provide a description of one of the student-centered subjects you teach, including the aim, the expected learning outcomes, the teaching methods, the self-assessment tasks, and the assessment criteria for the tasks.

5. Identify the factors that are necessary for deep learning? How can technology contribute to deep learning? Give examples of deep learning.

6. Give examples of the links between the teaching methods used by university lecturers in their lectures and the aims of the educational process.

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Subtopic: INNOVATIVE TEACHING METHODS. DIGITAL TOOLS AND THEIR APPLICATION POSSIBILITIES

Expected results:

- Will acquire knowledge about digital technologies in the study process and will be able to apply this knowledge with reference to the taxonomy of cognitive goals and critical thinking development (Bloom, 1956).
- Will be able to plan the technology-based teaching/learning process, selecting innovative teaching/learning methods, predicting digital tools.
- Will be able to think analytically, creatively and critically, will be able to solve problems and use digital technology in the context of lifelong learning.

Keywords: digital technologies, innovative teaching methods, digital tools, study process.

Theoretical part

Digital technologies in the study process

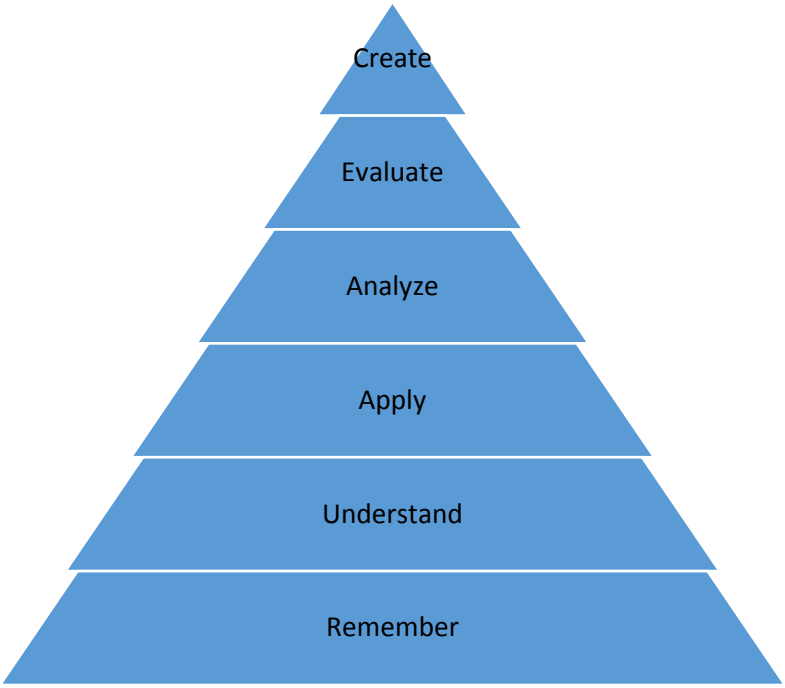
Digital technologies (DT), which have become an integral part of life, both facilitate the study process and open opportunities that we would not have if we did not use them. The implementation of the pedagogical process is unimaginable without digital tools for communication, sharing of educational content, evaluation, analysis, implementation of creative tasks, personalization of material. Without video streaming tools such as ZOOM, Microsoft Teams or Skype, we would not be able to connect with people who are remote or unable to communicate live. The emergence of new DT provides the prerequisites for transferring part of the educational process to the virtual space. This becomes a valuable support tool for teachers but poses challenges for their professional preparation.

When organizing the study process, the fact that teachers must maintain a high level of media literacy (digital pedagogical competences) becomes obvious in order to organize and share educational materials with participants in the study process. Then there is the problem of choosing the most appropriate digital technologies. Despite the mentioned problem, digital technologies open up new opportunities to easily record the study process, copy the educational material presented in the lecture, distribute it on the information platforms available to students, and receive feedback using digital tools. When using DT, it is the duty of teachers to teach their students to manage the received information, to share in appropriate digital spaces, to develop media literacy.

Dissemination of the pedagogical process in the study process expands and creates new opportunities for interaction between teachers and students. Educational process systems are being developed for this purpose. One of the most popular and comprehensive is the American

educator and psychologist Bloom's (Bloom et al., 2001) taxonomy of cognitive goals and critical thinking education. The 6-level learning process system established by Bloom substantiates the achievement, consistency and implementation of educational goals in the study process. When analyzing the possibilities of the application of digital technologies and the dissemination of educational content in the pedagogical process, the aforementioned taxonomy, created in 1956, is referred to (Bloom, 1956).

This taxonomy is continuously revised and updated (Krathwohl, 2002; Ekren & Keskin, 2017). The goals of the study process are analyzed based on one of the most famous systems of the pedagogical process, which analyzes the constituent parts of the process. According to Bloom's taxonomy, a classification pyramid of educational goals is made.



1 Figure. Classification of educational goals

Bloom's taxonomy is a powerful tool because it explains the learning process based on the set goals (Shabatura, 2013):

1. To understand a concept, you need to memorize it.
2. To apply a concept, you need to understand it.
3. To evaluate a process, you need to analyze it.
4. To create an accurate conclusion, you need to do a thorough assessment.

According to Bloom's taxonomy levels:

1. Memorization: recalling information and demonstrating knowledge of previously acquired material (may include facts, terms, key concepts, or answers to questions).

2. Comprehension: demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, describing, and indicating main ideas.

3. Application: use information in new or familiar situations, use acquired knowledge, facts, rules and methods to solve problems.

4. Analysis: examine and divide information into parts, understanding reasons or motives; draw conclusions and find evidence to support generalizations.

5. Evaluation: express and defend opinions, making decisions about information, authenticity of ideas or quality of work according to certain criteria.

6. Creation: organize, integrate and use concepts into a new plan, product or proposal; collect information differently.

The possibilities of applying the mentioned taxonomy are revealed in the development of the learning of a specific topic, as well as in the evaluations of the quality of students' work (Ugdymas(is) paradigmų kaitoje, 2017) Therefore, self-assessment becomes very important in the study process.

Self-assessment

The ability to self-evaluate the completed task gives students the opportunity to be honest in the process of improving their competences (Kazlauskienė & Gaučaitė, 2018). A student can follow the level of change by self-assessment in order to achieve higher learning results. The teacher, recording the results of the students' self-assessment, has the opportunity to model the educational content taking into account the topics and subject areas in which the students need help.

Digital technologies can be an opportunity for all participants in the study process, especially teachers, to try and apply various digital learning solutions. The possibilities of using and applying digital technologies cover all educational subjects, but due to their abundance, it becomes a challenge for the teacher to choose the most necessary and suitable quality tools. The abundance of developed tools does not always meet expectations for quality in the study process. Therefore, the teacher must devote time to self-assessment and self-evaluation of tools or participate in professional development programs.

In scientific literature, learning based on digital technologies is associated with the quality principles of innovative, modern learning: the implementation of the idea of open learning, its availability in all digital forms. Digital forms must be supported by technological means:

- The opportunity for the learner to decide which technological solutions, quality content resources, content or means of communication to choose;
- promoting independent learning;
- Selection of interaction options;
- Availability of open resources, recognition of open learning, ensuring quality use of resources;
- ensuring the diversity of participants, opinions, forms and learning outcomes.

The application of digital technologies provides an opportunity to engage students:

- include them in interactive training(s);
- To increase the effectiveness of training;
- develops their independence;
- encourages them to search, discover and experience a sense of familiarity.

These tools open up opportunities to apply methods that encourage cooperative learning, help to allocate lecture time more rationally, etc.

Taking into account the possibilities of digital technology tools to implement innovative learning methods it is appropriate to find out innovative educational methods, digital tools and the need and possibilities of their application in the study process.

Innovative learning methods. Digital tools and their applications.

When dealing with applied digital technologies, the concept of innovativeness is increasingly discussed. In the scientific literature, **innovative** learning is described as a teaching method that the teacher chooses for the implementation of a specific goal and achieves the desired results, taking into account the individual characteristics of the student. Innovative learning is inseparable from the application of digital technologies and targeted innovative methods. In modern pedagogy, methods that use digital technologies and active learning methods are called innovative.

These learning methods allow students to actively participate in discussions, projects, perform creative tasks, learn collaboratively, create mind maps, use virtual laboratories, audio-visual tools, etc. possibilities. Innovative learning methods are based on the application of digital technologies, which open up new possibilities for presenting learning materials. A properly designed activity can develop cooperation, independence, creativity, critical thinking, information culture, etc.

Innovative educational methods are based on the 4 rules:

- TELL ME - AND I WILL FORGET
- SHOW - AND I WILL REMEMBER
- LET ME TRY - AND I WILL RECALL
- LET ME TEACH ANOTHER - AND I WILL MEMORIZE.

Different methods, different skills, abilities:

- **With tests**, we train reading and encourage not missing small details
- **Projects** are creativity
- **Teaching** will teach listening skills
- **Group work** - discussion, persuasion and working with others skills
- **The method of questions** - stimulates curiosity, shows the logic of the subject, and allows knowledge to be transferred to another situation.
- **DT teaching methods** - promote communication and cooperation, develop creativity.

The teacher needs to test the methods three times: ***Learning - applying - improving***.

Researchers distinguish one of the directions of DT application in education as a virtual learning method. Virtual learning is "learning that takes place in virtual space, using virtual space tools as well as synchronous and asynchronous virtual communication" (Targamadzė, 2011, p. 14). Virtual learning is described as one of the most convenient ways of learning. It emphasizes flexibility and mobility. Targamadzė (2011) describes flexibility and mobility of learning as the ability to access learning material at a convenient time, learn at an acceptable pace, allocating as much time as needed to understand the topic. Flexibility includes not only flexible study

schedules, but also self-paced learning. The aforementioned features expand the circle of learners. Such learning is attractive to various groups of learners: 1) persons who have left the country where they are studying; 2) working students who do not have the opportunity to attend an educational institution; 3) for students with special needs; 4) for students who are temporarily unable to attend an educational institution.

The application of virtual learning opens up new possibilities for the presentation of learning materials. The material is easily updated, its accessibility is facilitated, and complex learning content can be presented using various methodological tools. Virtual learning uses virtual learning environments. A virtual learning environment is "a system with tools that can be used to provide electronic learning materials" (Alcattan, 2014, p. 58). A properly designed virtual learning environment can foster cooperation, independence, creativity, critical thinking and information culture. Kaklauskas & Kaklauskienė (2013) distinguish 7 main tools of the virtual learning environment:

1. Means of communication and cooperation that promote group activities, communication between students and the teacher. These facilities include messages, chat rooms, forum, etc.

2. Student and teacher presentation areas - this is information for participants connected to the environment.

3. Means of student registration by which participants are registered or connected to VMA.

4. Educational content and its management tools are designed to create and present educational content, learning objects, information.

5. Task preparation and survey organization tools are designed to check students' knowledge, to present them with tasks and surveys.

6. Student learning and progress monitoring tools are designed to monitor the achievements and activity of course participants.

7. Tools for changing the environment interface are tools for changing the layout, appearance and design of the components of the virtual course.

VMA provides the teacher and students with all the necessary tools with which they can carry out educational activities. In virtual learning, these activities are performed only in a virtual space where only virtual communication is used.

Digital tools

The teacher, modelling the content of the taught subject, constantly plans, analyzes and evaluates the educational material, sets goals, predicts results, and creates new educational content.

Based on Bloom's taxonomy, the following is an analysis of digital technology tools that a teacher can use in teaching (see Table 1).

Table 1. DT tools that dominate in memorization and information dissemination (Žalytė - Linkuvienė, 2020)

DT tools for memorization	Zoom, Skype	Communication, video streaming, sharing of visual, graphic, video, audio material, arranging virtual meetings, conducting discussions; depending on the version, a large number of participants may participate
	Microsoft Teams	Synchronization of application network user account data, real-time communication, live video conferencing, material sharing; depending on the version, a large number of participants may participate
	Flip grid	Video calls, face-to-face communication, topic discussion, discussions, audio-visual sharing, educational resources tool.
	Explain everything	Real-time virtual communication, whiteboard function, possibility to include audio-visual and textual material in communication, possibility of virtual meetings
	Kialo edu	Descriptive management of discussions on preferred topics
	Edu creations	An interactive whiteboard and screen display tool that can provide visual material on the topic under analysis, its interpretation, create and share short instructional videos, use already created content
DT tools for understanding	LearningAppsOrg	Presentation and delivery of educational content in the form of interactive tasks
	Kahoot	Consolidation of knowledge and understanding of teaching materials through interactive tasks
	Interact	Modelling of online quizzes, interactive tests
	Quizizz	Modelling of quiz game form, preparation of topic presentations, development of visual communication tools
	Breakout Edu, Classcraft	Learning, understanding and mastering of teaching materials while playing games online
DT tools for application	This mode organizes the process with gadgets and digital hardware: iMO cubes, Photon robots with Photon EDU, Blue-bot robots, Lego constructors with WeDo2, interactive maps with DT tool Clever Books Geography, interactive T-shirts with DT tool Virtual-tee.	
DT tools for analysis	Coggle	Creating mind maps, initiating discussions
	Mentimeter	Real / current communication with the audience, sharing of thoughts, dissemination of feedback

	Goggleforms	Conducting surveys, compiling questionnaires, analyzing results
	GoSoapBox	Analysis of knowledge, assimilated material
	iBrainstorm	Ideas, elements of thought maps, material are shared in the individual and group educational process
	Crowdsignal	Execution of surveys, voting
DT tools for evaluation	Quizalize, Zzish, Quizlet	Differentiation of tasks, knowledge testing
	ClassDojo	Tracking and recording a person's behavior, activities and achievements
	Nearpod	A tool for interactive lessons, videos, formative assessment
	Yacapaca	A tool for resources that complement the content of formative assessment and education
DT tools, creative	Edpuzzle, H5P	Interactive video lecture creation
	Doink	Animation creation
	Flipsnack	Creating a virtual magazine with translated sheets
	Visme	Creation of presentations, illustrations, infographics
	Canva	Illustration, photo management
	Pixton	Comic book creation
	Storybird	Creating virtual books
DT tools for self-assessment	Digital graphic symbols of self-assessment: smiles, traffic light, number scale, thumbs, cobweb, star, cake, coloured steps	
	Multi-DT plugins for evaluating results or capturing feedback - self-evaluating	

Churches and Schrock (2009) present the classification of DT tools according to Bloom's taxonomy, indicating the activities that can be performed with these tools (see Table 2).

Table 2. Classification of DT measures according to Bloom's taxonomy (Churches & Schrock, 2009)

Level of thinking (according to Bloom's taxonomy)	Learning activities	Tools
Creating	Video casting, collaboration, filming, programming, storytelling, creation, simulation, wiki creation, writing.	„Prezi“, „Sreener“, „Wevideo“, „Google Sites“, „DimDim“, „Google Hangout“, „ScreenCast-O-Matic“, „Google Docs“, „MS Office 365“, „Twiki“, „Wikispaces“, „Animoto“, „Audacity“, „YouTube“, „SlideRocket“, „WeVideo“, „Open Drive“, „PowToon“, „Revisu“, „ Google Drive“.
Assessing	Testing, moderation, experimentation, discussion, ranking, recommendation, support.	„Docebo“, „Google +“, „KidBlog“, „Google Groups“, „Diigo“, „Form+“.
Analysing	Surveys, calculation, integration, differentiation, concept mapping, planning.	„Docebo“, „Survey Monkey“, „Google Forms“, „TexploraTree“, „Create a Graph“, „Mindmeister“, „Mindmodo“, „Lucidchart“, „Cacoo“, „MindMup“.
Applying	Demonstrating, sharing, presenting, illustrating.	„Docebo“, „Slideshare“, „YouTube“, „Pod-o-Matic“, „PcMonkey“, „Voki“.
Understanding	Commenting, grouping, searching, filtering, annotation.	„Docebo“, „Twiki“, „Wikispaces“, „Penzu“, „Google Search“, „Bing“
Knowledge	Explanation, question, watching, reading, telling.	„Docebo“, „Google +“, „Diigo“, „Youtube“, „Google Drive“.

Khalid, Rongbutsri & Buus (2012), provides the classification of DT tools according to pedagogical activities. In the classification of tools according to learning methods and activities intended for these methods, the tools used in higher education are distinguished (Table 3).

Table 3. Classification of DT tools according to learning activities and methods (Khalid, Rongbutsri & Buus, 2012)

Type (what)	Activities/methodology (how)	Tools
Acquisition: reading; demonstration; hearing.	Reading, demonstration, listening	„Mahara“, „Moodle“, „Quickr“, „Adobe Connect“
Information analysis: processing; collection; handling; classification; choice; analyzing; manipulation.	Concept Maps, Brainstorming, Crosswords, Search, Definition	„Mahara“, „Moodle“, „Quickr“, „Adobe Connect“
Adaptation: modelling; simulation.	Simulations, modelling.	„SecondLife“.
Communication: discussion; demonstration; debate; criticizing.	Argumentation, briefing, debate, fishbone, discussion, icebreaker, interview, dialogue, questions - answers, short answer, snowball.	„Mahara“, „Moodle“, „Adobe Connect, “ „Quickr“

Creation: writing; drawing; drawing up	Artefacts, Assignments, Book Analysis, Essays, Exercises, Demonstrations, Portfolios, Tests, Voting/Survey.	„Mahara“, „Moodle“, „Adobe Connect“, „Quickr“
Experimenting: practicing; application; exploration; acquaintance	Experiments, game, role playing, simulation, case study	„SecondLife“.

The classification of DT tools presented by the authors (Churches & Schrock, 2009) shows that various DT tools are assigned to active learning activities and presentation of learning materials. They are classified according to the performed functions, level of thinking, pedagogical activities and methods. Therefore, DT tools can be used for learning. By using these tools in the study process, the student is provided with an interactive learning environment based on modern learning methods. Students can access learning content online, take tests, attend courses, receive feedback from teachers, complete projects, create mind maps, complete assignments, collaborate and share resources in a virtual learning environment. Students can access the learning environment 24 hours a day. 24/7, the resources are easily updated; they have all learning tools and a flexible learning environment (Alcattan, 2014).

Viswanath, Kusuma & Gupta (2011) distinguish the following advantages of DT for the teacher: the teacher can create more diverse and attractive learning materials, apply project activities, communicate and send feedback to students. Therefore, it is appropriate to model a learning environment based on innovative learning methods and DT tools. The functions of the analyzed DT tools provide an opportunity to enrich the study process and correspond to Bloom's taxonomy pyramid.

DT is developing rapidly not only in the fields of computer software and hardware. The latest plug-ins for smartphones and tablets are delivered every day, various consoles and virtual interactive products are being developed.

Therefore, the most relevant question today is not whether to use technologies, but which DTs are most suitable for one or another stage of the study process. Thus, the need arises for the teacher to constantly read and be interested in all available information about the possibilities of the latest digital tools. The use of DT creates great opportunities for learning, as it opens up new ways of collaboration, content creation for different subjects, distance learning, assessment, and dissemination of results. In the virtual teaching/learning environment, the learner is encouraged to search for the necessary material, work and reflect. Second, the training(s) material is available anytime, anywhere, as long as there is an internet connection.

Globalization, explosion of information, rapid change impose new demands on the individual, society and education (Barkauskaitė et al., 2005), so the ability to learn, lifelong learning becomes a necessity. In order for a person to be able to learn successfully throughout his life, he must develop the abilities and skills of independent learning, i.e. learn to independently define learning goals, plan appropriate learning steps, find information for learning in various sources, solve emerging problems, self-critically reflect, and evaluate achieved progress. In other words, independence can be described (Jovaiša, 2007) as a personal personality trait that enables one to correctly choose activity and communication goals, means, and methods in order to be able to act actively and productively. Petty (2007), emphasizing the perception of self-directed learning as deep

rather than superficial learning, claims that the freedom of learning given to learners increases their responsibility, motivation and learning performance. The researcher emphasizes that self-directed learning is the best teaching method when digital technologies can be applied in the context of lifelong learning.

Practical part and reflection questions

Based on the theoretical material and Bloom's taxonomy, model the content of one of your taught subjects with innovative learning methods and DT tools, choosing DT tools, creating more diverse, more attractive learning materials for students.

1. How to choose the most appropriate DT when organizing the study process?
2. Explain the learning process based on Bloom's taxonomy and name the levels of Bloom's taxonomy.
3. Based on Bloom's taxonomy, indicate the DT tools that dominate memorization and information dissemination. Give some examples.
4. How are DT classified? What DT tools do you use in the study process, in the virtual learning environment, in communication, etc.? Give examples of the application of DT tools according to the performed functions, level of thinking, pedagogical activities, methods, etc.

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Subtopic: ASSESSMENT OF ACHIEVEMENTS IN HIGHER EDUCATION

Expected results:

- acquisition of a systematic approach to the assessment of achievements;
- knowledge of assessment types and their application in higher education;
- knowledge of the principles of student achievement assessment and the ability to implement them;
- knowledge of the variety of student achievement assessment methods and the ability to choose and apply them purposefully by implementing study programs in higher education qualitatively.

Keywords: assessment of achievements; higher education.

Theoretical part

Systematic approach to the assessment of study achievements

Assessment of achievements in higher education is perceived at several levels: institutional level, study program level, study subject (course) level, student achievement and progress level. All these levels determine the results to be achieved. The results of the researches must reveal the competence (knowledge, abilities, skills and values) of the future specialist, i.e. the complexity of the activities a person will be able to perform.

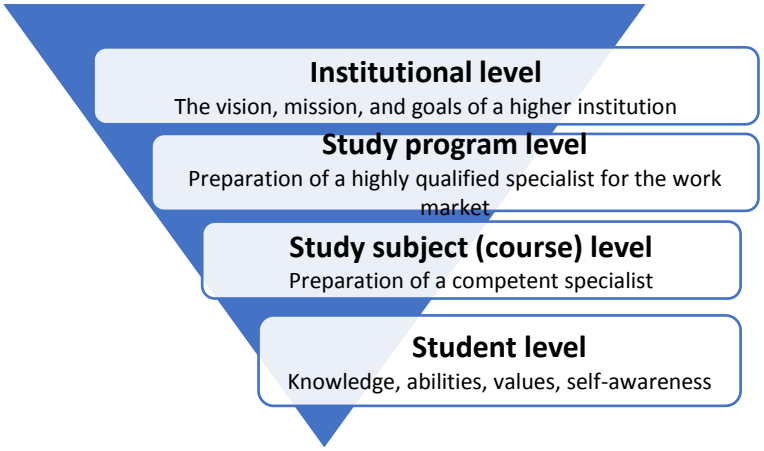

Figure 1. Achievement assessment levels in higher education

Determination of study results is associated with B. Bloom (1956, 2001), SOLO, R. J. Marzano (2005) or other taxonomy. In the field of achievement assessment, the 6 levels of knowledge presented in B. Bloom's (1956, 2001) taxonomy are identified by using the appropriate verbs (you can additionally look at the following sources): https://www.flickr.com/photos/vandycft/29428436431/in/photostream/ or https://www.utica.edu/academic/Assessment/new/Blooms%20Taxonomy%20-%20Best.pdf,ect.).

When evaluating achievements at the level of a high school student, we can use the B. Bloom's taxonomy, revised by the authors in 2001 (more about this): https://ies.ed.gov/ncee/edlabs/regions/northeast/onlinetraining/ResourcesTools/Bloom%27s%20Taxonomy.pdf).

The authors made 4 types/categories of cognition from the 6 main levels:

- Factual Knowledge: knowledge of terminology, knowledge of specific details and elements.
- Conceptual Knowledge: knowledge of classifications and categories, knowledge of principles and generalizations, knowledge of theories, models, and structures.
- Procedural Knowledge: knowledge of subject-specific skills and algorithms, knowledge of subject-specific techniques and methods, knowledge of criteria for determining when to use appropriate procedures.
- Metacognitive Knowledge: strategic Knowledge, knowledge about cognitive tasks, including appropriate contextual and conditional knowledge, self-knowledge.

Compatibility between study results and student's learning achievements. The achievement of study results at the institutional level shows the quality of studies of a higher education institution, the implementation of its mission, vision and goals. Referring to the level of a study program, study results are associated with the competence of trained specialists, i.e. training of specialists with the highest professional qualifications. At the level of a study subject the expected study results are linked to the results of the entire program and are compatible with each other. At the level of subject study outcomes must be clear, reasonable and measurable. We are presenting an example (see Table 1) of how the result of a study subject and the student's learning achievements corresponding to it could be formulated according to 4 types of cognition.

Table 1. Relationship between a study result and student's learning achievements (example)

Result *referring to the content of the subject/course one of the possible study outcomes is provided*	**Achievement type** *expected type/category of study achievement*	**Achievement** *learning/study achievement of a student*
Knowledge of basic concepts, ability to use them purposefully in professional discourse and creatively apply them in practical activities.	student's learning/studying achievement corresponding to factual knowledge	knowledge of the key concepts related to the course material and an ability to explain them.
	student's learning/study achievement corresponding to conceptual knowledge	analysis of the concepts related to the course material, comparison of concepts and their conceptions.
	student's learning/study achievement corresponding to procedural knowledge	an ability to apply concepts in practice in individual and group tasks and to demonstrate them by analysing situations, participating in discussions and debates.
	student's learning/studying achievements corresponding to metacognitive cognition	awareness of changes in conceptualizations of concepts, awareness of paradigms related to the concept and development of concepts, identification of regularities, demonstration of new insights, creative application of concepts.

Referring to the formulated results of a subject/course of the study, achievements, i.e. knowledge, abilities, skills, attitudes, etc., are determined, and appropriate methods for assessing students' achievements are selected and applied.

Assessment of students' achievements and progress is understood as criteria-based monitoring and feedback of education and learning, collection and accumulation of information about learning processes and results, interpretation and implementation in order to ensure the quality of teaching and learning (The Order of the Minister of Education and Science of the Republic of Lithuania Regarding the Approval of the Description of Primary, Basic and Secondary Education Programs of December 21st, 2015, No. V-1309 (***Summary version from September 1st, 2016***) Vilnius). Figure 2 provides an example of what methods could be used referring to the expected achievements according to cognitive types.

Figure 2. Compatibility of study achievements and assessment methods

Each provided assessment method must contain described criteria. While introducing students to the assessment tasks, it is necessary to familiarize them with the evaluation criteria for each task. Table 2 presents indicative criteria for assessment methods that each academic should prepare according to the content of his subject and expected study results.

Table 2. Evaluation methods and indicative criteria (prepared according to Žibėnienė, 2014; Bulayeva, 2007; etc.)

Evaluation methods	Indicative criteria for assessment methods
Concept map	Naming of essential, related concepts; relations of concepts and attributes (correct, incorrect); the relation of essential features to the concept.
Essay	Maintenance of thematic outline; compatibility of scope and topic development; originality and individuality of thoughts; consistency of teaching; reasoning; generalization; proper citation and references.
Report	Referring to the content of a report: compliance with the general technical recommendations for the preparation of reports; clarity of structure; completeness of topic analysis; consistency and integrity while presenting the topic; presentation ethics; applied scientific aspect (theoretical justification, scientific analysis, ability to distinguish and present essential points); originality (independence, speakers' contribution) are important. Referring to presentation and visualization: language style; language culture; speech pace, clarity, suggestiveness; speaker's posture; usage of visual material; communication and feedback with the audience; ability to answer questions clearly; an ability to answer questions correctly are essential.
Scientific paper	Achieving a work‘s goal; maintaining subject boundaries; paper structure; analyticity; consistency and logic of laying out; neatness and correctness

	(proper citation and putting references to literary sources); compatibility of the length of paper and the development of the topic.
Case study	Achieving the objectives of case study; consistency and logic of the analysis process; quality of analysis, application of knowledge; the decision-making process during the case study; quality of judgment and comments.
Problem analysis	Achieving the set goal; quality of problem solving; consistency and logic of activity; quality of argumentation.
Review	Adherence to the review structure (if indicated); demonstration of knowledge of the reviewed object; depth of analysis and reasoning; consistency of analysis; validity and consistency of the assessments made; validity of the recommendations provided; ethical commenting.
Debates	Argumentation and persuasion; correctness, appropriateness and timeliness of the use of examples and sources; the success of cross-examination; adherence to debate methodology; oratorical abilities of participants.
Oral presentation	Clear presentation of ideas; quality of speech (clearness, loudness); quality of argumentation; quality of an introduction (part of the introductory presentation); quality of conclusions; eye contact with the audience; usage of demonstration tools and programs; quality of visually presented material; question management (quality of answering questions); time management (whether time allocated for delivery is properly used), using this oral presentation method for formative assessment.

The system of assessment of the results of higher education studies is determined by the main state education documents. A ten-point evaluation system has been established in Lithuania. Table 3 summarizes the descriptions. A student must have achieved at least 50% of expected results of a study subject.

Table 3. Study results assessment system of a student (the case of Lithuania) (prepared in accordance with the order of the Minister of Education and Science of the Republic of Lithuania Order No.-2194 "On the approval of the Study Results Evaluation System" (Zin., 2008, No. 86-3437), Žibėnienė, 2014, and others)

Evaluation	Description
10 (excellent) *all expected study results have been achieved*	Excellent, exceptional knowledge and skills. Comprehensive knowledge and its application in solving complex practical problems. Understands and uses concepts fluently, is able to analyze them in a wider context of the subject, has excellent analytical and evaluation skills. Excellent application of theoretical knowledge, high-quality performance of complex non-standard tasks. Excellent expressiveness and presentation skills. Understanding the purpose of the actions
9 (very good) *90 percent of expected study results has been reached*	Extensive, profound knowledge and skills. Extensive, profound, comprehensive knowledge and its application in solving complex practical problems Understands the studied material

	perfectly, uses concepts correctly. Thinks originally and independently. Has perfect analytical, evaluation and synthesis skills. Applies theoretical knowledge splendidly. Performs complex typical tasks with ease and quality. Has very good presentation and presentation skills. Understands what techniques the technician uses and why.
8 (good) *80 percent of expected study results has been reached*	Better than average knowledge and skills. Better than average knowledge and its application in solving practical problems. Familiarized with the mandatory material. Able to work independently with additional material. Understands concepts and principles, and applies them appropriately. Provides arguments well and supports them with facts. Good application of knowledge. Performs medium complexity and tasks that are more difficult correctly and qualitatively. Good speech resolution and presentation skills. Knows what methods and techniques to apply.
7 (average) *70 percent of expected study results has been reached*	Average knowledge and ability, there are minor errors. Average knowledge, there are minor errors. Applies knowledge to solve practical problems. Familiar with the basic material, understands and uses concepts and principles. Several essential parts are linked into a whole. Provides reasons well enough, applies knowledge based on given examples. Good performance quality. Performs moderate tasks correctly. Sufficient expression and presentation skills.
6 (satisfactory) *60 percent of expected study results has been reached*	Knowledge and abilities (skills) are below average, there are mistakes. Applies knowledge to solve simple practical problems, familiarized with basic material, understands concepts satisfactorily, is able to describe received information in his own words, focuses on several aspects when analysing, but is unable to connect them, satisfactory preparation for further studies. Knowledge is applied following the examples provided, quality of performance is satisfactory, knows how to act by analogy, performs easy tasks correctly, but does not understand more complex ones, satisfactory expression and presentation skills.
5 (weak) 50 percent of expected study results has been reached	Knowledge and abilities (skills) meet the minimum requirements. Applies knowledge to solve simple practical problems, simple naming of mastered concepts, retelling a text, an answer is focused on one aspect, minimal preparation for further studies. A minimum of sufficient problem-solving ability by example, ability to work by analogy, satisfactory expression and presentation skills.
4 to 1 (unsatisfactory) 50% of study results has not been reached and the subject has not been mastered, it is evaluated negatively	Minimum requirements are not met. Knowledge and skills do not meet minimum requirements.

Specific descriptions are prepared referring to the subject topic. It indicates the specific knowledge, abilities, skills, attitudes and understanding to be achieved by each assessment score.

Inclusive management of evaluations of achievements

The study prepared as part of the project "Compatibility of student-centered learning, teaching and assessment of achievements within Bologna learning network; LOAF" (2018)" provides recommendations. They indicate that the evaluation of achievements must begin with educational **values**. Assessment is **effective** when learning is reflected as a complex process, where it is important not only what students know, but also how they can use what they have learned. Assessment is a **purposeful**, goal-oriented process, designed to compare achievement with learning outcomes. During the evaluation process **attention** is paid to both the results and students' experience. Assessment helps to understand which **methods** students learn best and what is needed to make a progress. Assessment is **cumulative**, as it is a process that takes place throughout the whole study period. It aims at progress through continuous growth. Assessment is important at all levels (see Figure 1), which, based on its experience, can **adjust** study results and standards. Assessment helps to **develop**, so, it is important to have feedback. Assessment **promotes change**, so, an assessment-friendly, supportive educational environment is essential.

Getting a feedback is important not only for students from lecturers, but also for lecturers (study program curators, administration, etc.) from students. The feedback received from students enables to improve the content of the subject, its implementation, procedures, and increase the quality of the entire program. Most of the time student survey on course assessment issues is carried out in the following semester after the course studies, and is carried out by the members of the university student union according to approved forms.

Requirements for study achievement assessment methods, tools and procedures

After summarizing EU directives (Standards and Guidelines for Quality Assurance in the European Higher Education Area (ESG). (2009, 2015). Brussels, Belgium), experiences of Lithuania (Žibėnienė (2014), Bulayeva (2007), Pukelis et al. (2007), foreign countries (American Association for Higher Education (AAHE). Principles of Good Practice for Assessing Student Learning. [interactive]. [accessed on 2022-08-18] http://assessment.uconn. edu/docs/resources/AAHE_Principles_of_Good_Practice .pdf ; Nine Principles Of Good Practice For Assessing Student Learning [interactive], https://www.ncat.edu/_files/pdfs/campus-life/nine-principles.pdf) and researchers (Csibi, E. (2020) and other, the following main principles of assessment of study achievements can be distinguished:

- of **validity** (the assessment is related to the goals of the study program (subject of study) and must measure the results of the studies intended to implement them);
- of **reliability** (the assessment information received and results must be objective and not change when an assessor changes);
- of **clarity** (the evaluation system must be informative, understandable for both assessors and students);
- of **relevance** (the assessment carried out must be positively evaluated by students themselves and contribute to the implementation of the goals of a study program);

• of **impartiality** (the assessment methods applied during the assessment must be equally suitable for all students).

When discussing the basic requirements **for assessment procedures**, it is necessary to clarify the types of assessment. Assessment can be: diagnostic, formative (incorporated self-assessment) and summative. According to the formalization of the assessment of acquired competences, it can also be formal and informal. The definitions of the concepts presented below in the text are taken from the Order of the Minister of Education and Science of the Republic of Lithuania Regarding the Approval of the Description of Primary, Basic and Secondary Education Programs of December 21st, 2015, No. V-1309 (Summary edition from 09/01/2016) Vilnius https://e-seimas.lrs.lt/portal/legalAct/lt/TAD/481fb7d0a82611e59010bea026bdb259/ejTyNDsnvQ?jfwid=-3u88yonh7).

Diagnostic assessment *- an assessment that clarifies student's achievements and progress made during a certain period of learning, predicts opportunities for further learning, and helps to overcome difficulties.* It is an assessment that determines student's achievements at the time of diagnosis. Therefore, diagnostic assessment methods, such as, test, control, written survey, oral survey, etc. are used. This type of assessment is usually used at the end of a topic or after finishing a part of a course. After the diagnostic evaluation, it is necessary to explain the errors, indicate which criteria of the intended results were not achieved and/or explain which criteria with which score were achieved.

Formative educational assessment *- a mutual response, feedback provided in an educational process, which helps a student to improve his learning/teaching, guides what still needs to be learned, and allows a lecturer to adjust his teaching in order to achieve the best possible results.* This type of assessment focuses on the development of student‘s progress and personal development. The following evaluation methods, such as, group discussion, case study, performance evaluation, report, presentation of independent work, reflection, etc. are used for this. Self-assessment should be classified as one of the essential assessment methods which aims for the development of students' self-awareness, personal development and learning to learn competencies. ***Self-assessment –*** *self-monitoring, evaluation and reflection on student's own educational process, achievements and progress, predicting further learning steps.* Evaluation methods such as SWOT, essay, self-reflection, self-assessment, etc. are used for this. When conducting a formative assessment, it is necessary to provide detailed feedback to students indicating areas for improvement and strong, promising directions.

Summative cumulative assessment *- formally approved results of student's education after completing the program, course, module or other stage of education.* This type of assessment is aimed at the assimilation of final assessment of subject/course. The following assessment methods are most often used: written or oral exam, presentation of independent work, etc. In university practice (Lithuania and elsewhere), the evaluation of the exam is at least 50% of the final assessment, while the next part of it is cumulative. During the subject/course, according to the predetermined calendar work plan, students perform independent, group or other tasks, the amount of which is 50% (or less) of the assessment of the final assessment score.

Each formal assessment in high school is concluded with a written assessment recorded in points or credit in the report card. An informal assessment takes place continuously,

throughout the student's study period, when a lecturer observes and analyses students' activities, notices initiative, activity, independence, assignment of responsibilities, contribution to group work, etc. Universities in the EU, the USA and other countries encourage informally acquired competences to be evaluated and recorded as student achievements.

Higher education institutions should monitor and assess students‘ non-formal learning activities. Students, who actively participate in scientific research, volunteering, mentoring, art, sports activities etc., should have an opportunity for their above mentioned activities to be recognized as achieved learning outcomes. Higher education institutions are recommended to confirm the procedure of recognition of these activities for ensuring the transparency and objectivity of this process (The Compatibility of Student-centered Learning, Teaching and Assessment of Achievements. Compendium of Recommendations, 2018).

Achievement assessment methodologies, methods and their combinations.

Depending on the expected results of the studies, individual methods, combinations of methods or methodologies can be used to evaluate achievements.

Let's start with the more complex evaluation methodologies. Achievements corresponding to the metacognitive cognition will require complex, mutually compatible assessment methods. For example, (see table 4) during professional practice, a student has to perform not one, but several tasks, the assessment of which may require different assessment methods. Some tasks can be more complex, others - simpler. Therefore, grading different assignments may have different effects on the final grade.

Table 4. Contents of the practice folder *(*example from *Practice, 2nd* description)

Task type according to the subject (sand) program	Task	Total hours	Influence to grade, %
Practice report	Practice portfolio and mentor evaluation	5	10
Individual work	Reflection of lessons observed during practice	8	15
Independent performance of laboratory work and description of laboratory work (report)	Lesson protocols of all the subjects observed during practice	106	50 (30 and 20)
Activity reflection	Writing an activity reflection according to the attached form	10	15
Self-evaluation	Self-evaluation of one's practical activities in educational institutions according to the provided form	2	5
Verbal illustrated report	Practice presentation using *Power Point* program in practice discussion	2	5
Total:		33	00

Each task named in the table has its own performance description, performance instructions, or a corresponding protocol or a filling form are provided. All this is prepared and

attached in the appendices. Also, a student is informed exactly how he needs to submit the assignment for assessment, how to staple it, what clerical requirements to follow, etc. During the internship briefing, each student receives a complete description of the internship, verbally discusses how the internship will take place, how to fill out the portfolio, and all the questions that arise during the briefing are answered. A pedagogue-mentor and a lecturer-practice supervisor, who will guide and advise a student during the entire internship, are assigned.

The evaluation can be carried out by means of a collegial evaluation, when not one, but several lecturers, specialists or students of this field participate in the evaluation (see Table 5).

Table 5. Example of collegial evaluation of the subject/course *Practice 2*

No.	Assessor	Task	Impact, final assessment.%	Impact, final assessment%
1.	Practice supervisor	Independent performance of laboratory work	30	85
		Description of laboratory work (report)	20	
		Individual work	15	
		Activity reflection	15	
		Verbal illustrated report	5	
2.	Mentor teacher	Practice report	10	10
3.	Student	Self-evaluation	5	5
			100	100
A university organizes a practice discussion in which students, practice supervisors and mentors participate. During the discussion students present the summarized results of the practice. **Students evaluate the order of practice organization, express their suggestions for its improvement.**				

In the text at the end of the table we see that students are asked to evaluate and submit their suggestions regarding the organization of practice and its improvement. In this way, additional feedback on practice implementation issues is collected.

Each assessment method can have various modifications of its application, such as oral or written examination, oral presentation, report, performance reflection, individual work, etc., can take place by allowing the usage of available resources, literature or notes, can take place remotely, synchronously or asynchronously and etc. In this case the evaluation method must also be modified. For example, if a written survey (test) takes place in a remote asynchronous way (i.e. students can answer the test questions via e.g. moodle system at their convenience before the set date), then the questionnaire must be modified in such a way that it is possible to assess not the abilities of factual knowledge, but critical thinking, reasoning, problem solving, etc..

In Table 6 we are presenting examples of assessment methods referring to cognitive types.

Table 6. Achievement assessment methods (prepared according to Žibėnienė, 2014, Bulajev et al., 2011, Csibi (2020) and others)

Cognitive type	Evaluation methods
Factual knowledge	Test, interview, oral survey, written survey, incomplete sentences, concept map, question words, "thick" and "thin" sentences, concept and definition scheme, 6W (questions and answers), B. Bloom's question book,
Conceptual knowledge	Interview, problem interview, heuristic interview, 3K method, press conference simulation, report, debate arguments for and against, mind map,
Knowledge of procedures	Debates, heuristic conversation, problem conversation, critical reading, T-diagram, angles, M-diagram, Venn diagram, nine-sided diamond, Frayer model, essay, blogs, publication review, peer review, role-playing didactic game, laboratory work, term paper
Metacognitive cognition	Problem talk, case study, debates, project, fishbone diagram, M diagram, Venn diagram, nine-sided diamond, simulation, problem solving scenario, activity reflection, self-reflection, thesis,

The classification of assessment methods presented in Table 6 is conditional. When assessing students‘ achievements, an educator must be creative, a professional in his field and have the vocation of a teacher to work with students. Cooperation, mutual communication and mutual understanding between a lecturer and a student guarantee a high-quality process of assessment of achievements and the constantly improving training of highly qualified specialists.

Practical part and reflection questions

1. Look at Fig. 2., and based on your practice in higher educational institution, add the assessment methods you use in your practice to the picture.
2. Using the examples given in Table 2, create criteria for other assessment methods (test, final test, activity reflection, etc.), extend the table.
3. Provide your insights on how different assessment methods could be combined to assess students' conceptual, procedural and metacognitive knowledge.

*

1. What interested you the most, left an impression, was memorable when analysing the topic of assessment of achievements?
2. What have you learnt about assessment of achievements, assessment process, assessment methods?
3. What will you use in your practical work with students?
4. Share your insights on the material presented.
5. Share your experience about the study evaluation process at your higher education institution.

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Subtopic: DEVELOPMENT OF CRITICAL AND REFLECTIVE THINKING SKILLS, AND DESIGNING THE STUDY SUBJECT

Expected results:

- Expand theoretical knowledge and understanding of the possibilities of their practical application, related to the development of critical and reflexive thinking through the subject of study.
- Improve the quality of higher education and life-long learning by introducing new teaching methods and innovative assessment tools for the evaluation of students' 21st-century skills (such as critical and reflective thinking).
- Promote voluntary convergence with EU developments of curriculum development in the field of education studies in the higher education system through the sharing of best practices.

Keywords: critical thinking, reflective thinking, ABD Learning design, IBL (inquiry-based learning), planning of study subject (the content, teaching-learning process, methods and tools).

Theoretical part

In many EU countries, the development of critical thinking skills is associated with the development of other important skills for ensuring the social development and social well-being of a person. After all, learning to learn, information literacy, information technology management, responsible decision-making, and creativity are impossible if a person does not think critically (Ananiadou, Claro, 2009). As noted in the OECD Review (2018): "*Students will need to apply their knowledge in unknown and evolving circumstances. For this, they will need a broad range of skills, including cognitive and meta-cognitive skills (e.g. critical thinking, creative thinking, learning to learn and self-regulation); social and emotional skills (e.g. empathy, self-efficacy and collaboration); and practical and physical skills (e.g. using new information and communication technology devices*)." That is why critical thinking education in schools (general education, universities) becomes so relevant in modern societies. In reviews of the state of education in various countries, it is noted that as societies change and technologies develop, the purpose of education changes, that is,

1 Figure. OECD Learning Compass 2030

changes in the understanding of what educational results should be achieved (OECD 2030); OECD 2009, 2009).

Critical thinking is associated with transformative competencies in nowadays schools. Thus, great attention is paid to the ability to enable change and the maturity of change, person, and social transformation. Here, along with critical thinking abilities, personal reflection abilities are also important, reflecting on one's own and others' actions, how much the decision will be useful to others, and what the possible consequences are (OECD. *Transformative Competencies For* 2030, p.7)" The OECD Learning Compass 2030 distinguishes between three different types of skills (OECD, 2018):

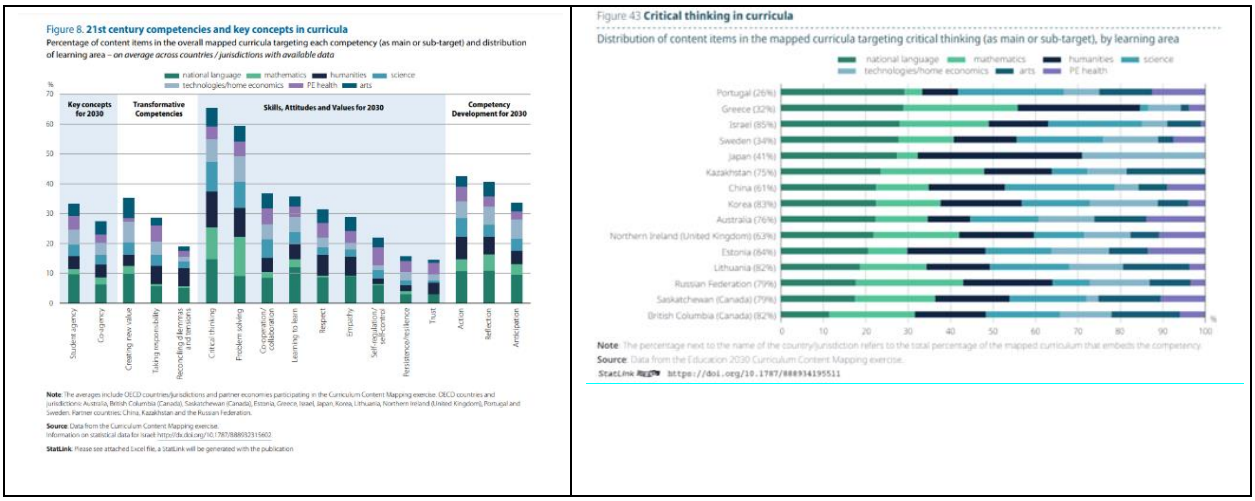
- cognitive and meta-cognitive skills, which include critical thinking, creative thinking, learning-to-learn, and self-regulation
- social and emotional skills, which include empathy, self-efficacy, responsibility, and collaboration
- practical and physical skills, which include using new information and communication technology devices.

Critical thinking as a personal skill is so important for developing these transformative competencies (1Figure) because it is a crucial student skill for these complex competencies. It should be noted that each competency is intricately interrelated with the others. They are developmental in nature, and thus learnable. In this case (teaching and learning processes) have to provide more possibilities for a sequenced process of reflection, anticipation, and action. Reflective practice is the ability to take a critical stance when deciding, choosing, and acting, by stepping back from what is known or assumed and looking at a situation from other, different perspectives. Anticipation mobilizes cognitive skills, such as analytical or critical thinking, to foresee what may be needed in the future or how actions taken today might have consequences for the future. Both reflection and anticipation are precursors to responsible actions. The OECD Learning Framework 2030, therefore, encapsulates a complex concept: the mobilization of knowledge, skills, attitudes, and values through a process of reflection, anticipation, and action, to develop the inter-related competencies needed to engage with the world. (OECD. *The future of education and skills Education* 2030; OECD. *The Future We Want*, 2018). It should be noted that promoting peace and sustainable development through education is now enshrined in the United Nations Sustainable Development Goal (Target 4.7). For this purpose, crucially important to pay attention to the critical thinking of the learner, critical thinking development, and ensuring that students recognize the relevance and purpose of their learning. Young and Muller (2016) suggest that if curriculum designers and policymakers want students in 2030 to be critical thinkers, good problem solvers, and able to develop the skill of "learning to learn", they need to focus on the pedagogies and curricula of the different knowledge domains. To what extent do formal curricula and assessments help students and teachers connect what they learn to the applications of knowledge in those domains? (OECD Review, 2018)

Based on the review of the education situation carried out by the OECD (2020), it is stated that insufficient attention is paid to the development of critical thinking. As the report notes: cognitive skills are the most emphasized across all countries and territories, with critical thinking first (66%), problem-solving second (59%), but student agency/learning aspect strongly underplayed. The ability to think critically is most common in mother tongue (15%) and least

common in physical and health education (4%). The ability to solve problems is most prominent in mathematics education (13%), and least common in physical and health education (5%) and art (5%) (OECD, 2020). (Figure, 2)

The ability to think critically is valued and emphasized in various countries and fields of education. However, among universal skills, content is likely to emphasize cognitive skills (e.g. critical thinking) rather than social or emotional skills (e.g. respect, trust) or complex skills (e.g. action, joint action). This chart is based on data provided by primary education teachers. Countries and economies are ranked in descending order of the percentage of teachers who have included interdisciplinary skills in their training programs. Interdisciplinary skills include creativity, critical thinking, and problem solving.



2 Figure. OECD data on the inclusion of the development of critical thinking skills in the national curriculums

According to the data of the OECD report (2020), compared to other competencies, the ability to think critically is emphasized more in educational programs, i.e. i.e. it is included in more than 60% of the curriculum subjects of the participating countries and territories (Figure 2). This competence is particularly emphasized in the fields of humanities and mother tongue in Greece and Japan: in the curricula of both countries, about 60% of all the elements included in this competence fall into these two areas of education. A similar situation exists in other areas of education, such as, science, technology, engineering, and mathematics (STEM) in these countries, with 29% of critical thinking skills in technology and home economics in Japan and 27% in mathematics in Greece. In general, countries and territories with high teacher confidence in their ability to help students develop critical thinking skills are also characterized by a higher proportion of teachers reporting that they often assign tasks that require students to think critically.

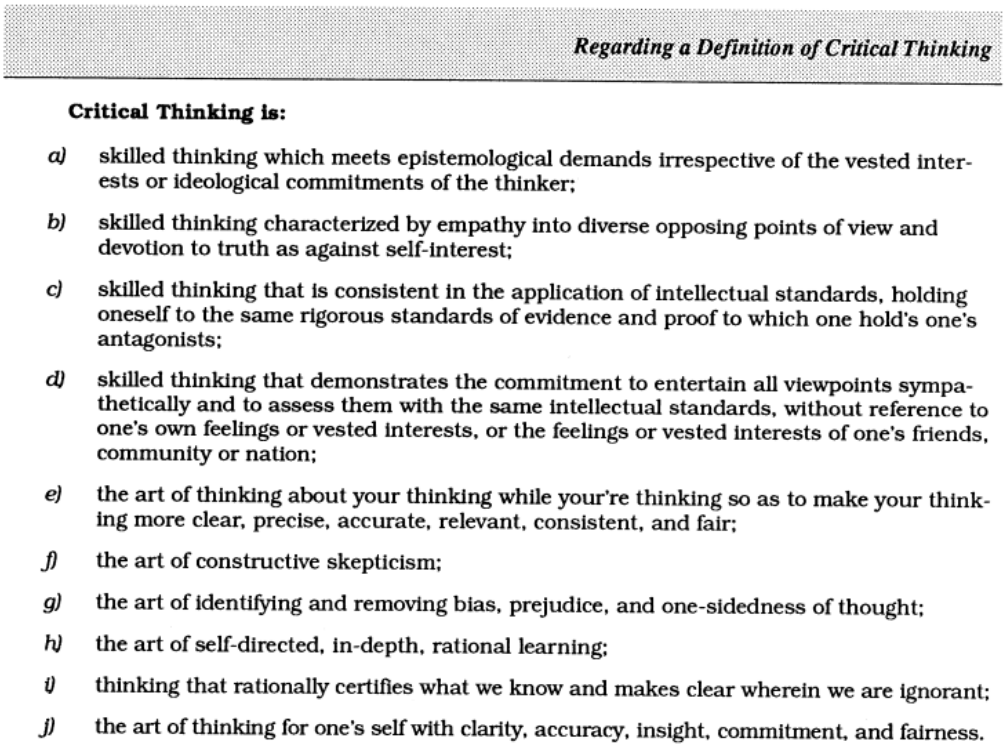
General principles of study subject content construction (Bloom, Marzano, and SOLO taxonomies)

Briefly reviewing the genesis of the definition of critical thinking can assert critical thinking in the modern sense probably began in the 1910s by John Dewey's "How We Think". According to Dewey, the concepts of reflective thinking and problem solving are very important for critical thinking and its formation. Therefore, Dewey explained the concept of reflective thinking by relating it to the scientific method and created the basis for the concept of critical thinking used today. In the 1980s and early 1990s, Ennis conducted research on the definition of critical thinking and provided a broader concept of the term and rational thinking, and later called this broader concept critical thinking. On the other hand, critical thinking for Paul Freire was not an object lesson in test-taking, but a tool for self-determination and civic engagement. According to Freire, critical thinking was not about the task of simply reproducing the past understanding, but more about understanding the present, and possibilities of changes (Yi-Huang Shih, 2018).

According to Paul and Elder (2001) critical thinking is that mode of thinking – about any subject, content, or problem — in which the thinker improves the quality of his or her thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them (Paul and Elder, 2001). According to Paul and Elder (2001), critical thinking is that mode of thinking – about any subject, content, or problem — in which the thinker improves the quality of his or her thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them (Paul and Elder, 2001). Alternatively, attention is paid to thinking operations which are a feature of critical thinking. Such as critical thinking is conceptualized as a combination and synchrony of many cognitive skills including experiencing, observing, analyzing, conceptualizing, synthesizing, evaluating, reflecting, and communicating (Howard, Le-Ping Tang, & Austin, 2015). Or statements that critical thinking includes inductive and deductive reasoning, making correct analyses, inferences, and evaluations (Facione et al., 1995).

The widest panorama of critical thinking concepts is analyzed by M. Lipman in his works (Lipman, 1987). In his works, discussing the features, peculiarities and differences and similarities of critical thinking with other types of thinking processes, he concludes that:

- Critical thinking is self-corrective thinking.
- Critical thinking is thinking with criteria.
- Critical thinking is thinking that is sensitive to context.



Regarding a Definition of Critical Thinking

Critical Thinking is:

a) skilled thinking which meets epistemological demands irrespective of the vested interests or ideological commitments of the thinker;

b) skilled thinking characterized by empathy into diverse opposing points of view and devotion to truth as against self-interest;

c) skilled thinking that is consistent in the application of intellectual standards, holding oneself to the same rigorous standards of evidence and proof to which one hold's one's antagonists;

d) skilled thinking that demonstrates the commitment to entertain all viewpoints sympathetically and to assess them with the same intellectual standards, without reference to one's own feelings or vested interests, or the feelings or vested interests of one's friends, community or nation;

e) the art of thinking about your thinking while your're thinking so as to make your thinking more clear, precise, accurate, relevant, consistent, and fair;

f) the art of constructive skepticism;

g) the art of identifying and removing bias, prejudice, and one-sidedness of thought;

h) the art of self-directed, in-depth, rational learning;

i) thinking that rationally certifies what we know and makes clear wherein we are ignorant;

j) the art of thinking for one's self with clarity, accuracy, insight, commitment, and fairness.

3 Figure. Matthew Lipman about the definition of critical thinking (1987)

Matthew Lipman (1987) defines critical thinking as "skillful, responsible thinking that is conducive to judgment because it relies on criteria, is self-correcting, and is sensitive to context." Cognitive skills comprise verbal, nonverbal and higher-order thinking skills. According to Lipman, noncritical thinking represents a formless, random, untidy, misleading and structureless way of thinking, which is why he defined critical thinking as an applied thinking, so it is not only a process but also starting to develop a product. (Demir et al.2011). Understanding criteria's role in critical thinking is important for this definition. The criteria and Criteria Development is the stage where the development of criteria and principles to be used in criticism is carried out. It contains the determination of what kind of criteria and features can be used in the criticism of an object, an event, or a phenomenon. It gives the minimum features a criterion should have.

Demir et al. (2011) suggested analyzing the definition of thinking by Lipman features and supplemented understanding of thinking as hopeful thinking. The authors point out to quadruple thinking. The authors claim that thinking ways are divided into two cognitive and affective weights. Accordingly, while critical thinking and creative thinking are mainly cognitive, caring thinking and hopeful thinking are mainly affective thinking ways. They compare critical thinking and caring thinking and conclude that both take to abide by the rules (convergent) in the foreground. They suggested analyzing critical thinking as one of the fourth thinking ways. According to these authors, critical thinking is associated with cognitive and convergent processes (Demir et al., 2011) (Figure 4).

	Convergent	*Divergent*
Cognitive	Critical thinking	Creative thinking
Affective	Caring thinking	Hopeful thinking

4 Figure. Connections of the concept of critical thinking with different forms of thinking (Demir et al., 2011)

Many researchers listed sub-dimensions of critical thinking in different ways. As an example, according to Watson and Glaser (1964) critical thinking has 5 sub-dimensions. These are as follows: 1. Getting to know the problem 2. Collecting and selecting suitable data for the solution of problem 3. Getting to know the structured and non-structured assumptions 4. Selecting and formulizing the assumptions that are related and leading to conclusion 5. Deducting the valid results and discussing the validity of the deductions Ennis and Millman (1965) regarded critical thinking skills under 4 sub-dimensions. These are: 1. Inductive judgment 2. Deductive judgment 3. Judging the reliability of the assertions 4. Defining the assumptions at discussions. The Paul-Elder (2001) critical thinking system consists of three components:

1. Elements of thought (reasoning)
2. The intellectual standards that should apply to the elements of reasoning
3. The intellectual traits associated with a trained critical thinker result from the consistent and disciplined application of intellectual standards to the elements of thought.

Complementary relations connect the concepts of critical and creative, responsible, hopeful, rational, convergent, and other thinking. Creative thinking according to most researchers, critical and creative thinking is the two sides of a coin. Both are cognitive. Even though they are cognitively based on terms of processes and have a common denominator, they are separated at the end of the process of thinking in terms of the outcome obtained. Lipman (2003) is to say that critical thinking is included both at the beginning and at the end of creative thinking. In that way, there becomes a cycle, since the individual should inquire about the current case in order to start the process of creative thinking, which is why there is a need for critical thinking. Similarly, the extent of the product put forward by creative thinking is related to critical thinking in the process of judgment.

Gary and Schik (2022) state that reflection has been framed as a vital process of meaning-making leading to growth through questions such as: *What happened? Why did it happen? What are the implications of this for what might happen in the future?* On the over side introspection is a particular kind of reflection by which we place ourselves within those questions, and it becomes possible in the context of critical thinking. So, in addition to asking the questions that develop the study project (a student's research work), also it is worth asking, what did I/we/they do? Why did I/we/they do that? What was I/they thinking? What was the effect? What does it mean? These questions can focus on our behavior, our thinking, or our emotions. As researchers emphasize when reflection takes the form of introspection, the mental work can get harder, in part because of the inherent subjectivity involved. From this perspective, introspection has the potential to make us better at what we do while at the same time challenging us to confront the realities of our work as objectively as possible. Gary and Chick (2022) presented introspection taxonomy, and invite teachers to expand upon, critique, apply, or revise it.

Critical Thinking is defined as questioning and evaluating ideas and solutions (OECD, 2016). This definition embodies components of metacognition, social and emotional skills (reflection and evaluation within a cultural context), attitudes and values (moral judgment and integration with one's own goals and values), as well as a combination of many cognitive skills including experiencing, observing, analyzing, conceptualizing, synthesizing, evaluating, reflecting, and communicating. Critical thinking is a higher-order cognitive skill and includes inductive and deductive reasoning, making correct analyses, inferences, and evaluations. Critical Thinking is defined as questioning and evaluating ideas and solutions (OECD 2016). Or, as described by OECD (2020) - "this definition embodies components of metacognition, social and emotional skills (reflection and evaluation within a cultural context), attitudes and values (moral judgment and integration with one's own goals and values), as well as a combination of many cognitive skills including experiencing, observing, analyzing, conceptualizing, synthesizing, evaluating, reflecting, and communicating. It should be noted that critical thinking is a higher-order cognitive skill that includes inductive and deductive reasoning, making correct analyses, inferences, and evaluations".

The importance of Bloom's, Marzano's, and other taxonomies in preparing the study subject

Bloom's Taxonomy is known from 1956, Benjamin Bloom with collaborators Max Englehart, Edward Furst, Walter Hill, and David Krathwohl published a framework for categorizing educational goals. The framework elaborated by Bloom and his collaborators consisted of six major categories: Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. The categories after Knowledge were presented as "skills and abilities," with the understanding that knowledge was the necessary precondition for putting these skills and abilities into practice. All these categories are connected and involve stages of increasingly complex thinking.

Many universities around the world prepare specific recommendations for their teaching teams about the possibilities of applying Bloom's taxonomy in planning and conducting study subjects. For example, Teaching Innovation and Pedagogical Support (TIPS) is a partnership between the University of Arkansas' Wally Cordes Teaching and Faculty Support Center (TFSC), IT Services, and Global Campus. This center prepared a few recommendations Bloom's taxonomy to apply in the study process. These six levels can be used to structure the learning outcomes, lessons, and assessments of your course:

1. **Remembering:** Retrieving, recognizing, and recalling relevant knowledge from long-term memory.
2. **Understanding:** Constructing meaning from oral, written, and graphic messages through interpreting, exemplifying, classifying, summarizing, inferring, comparing, and explaining.
3. **Applying:** Carrying out or using a procedure for executing or implementing.
4. **Analyzing:** Breaking material into constituent parts, determining how the parts relate to one another and to an overall structure or purpose through differentiating, organizing, and attributing.
5. **Evaluating:** Making judgments based on criteria and standards through checking and critiquing.

6. **Creating:** Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing. (University of Arkansas)

Curriculum mapping and lesson planning platform for K-12 schools - ***CHALK*** suggested the use of Bloom's taxonomy for various reasons and purposes and structure learning in classrooms at all levels. And this common recommendation can be useful for colleges and universities. Bloom taxonomy is applying not only just for assessment:

- It is helpful for setting clear and measurable study subjects/ study activities objectives. Because all six stages and the expectations under each are expressed as verbs, the taxonomy places its focus on observable behaviors that demonstrate student learning within a specific lesson, unit, or study subject.
- Organizing content of study (academic knowledge, theories, facts, information) in study subject (within a study program: Which standards should you address, and in what order? This framework helps outline the sequence of learning in study program maps, unit plans, and lesson plans by identifying which standards align most closely with lower-level stages like "Remember and Understand" vs. those that align with higher-level stages like "Analyze and Create".
- Designing appropriate evaluating system (assessments and self-assessments) for students.
- Collaborating with other study program professors/teachers. Bloom's Taxonomy provides a structure or scaffolding of learning that can help set expectations for progression throughout a student's entire educational journey at your university/school.

For Content of study subject Bloom's Taxonomy helps address the question, "What should students know or be able to do at the end of this study year?" For lessons/seminars units Bloom's Taxonomy helps create and link unit plans by considering the behaviors through which students will show mastery of the topic they're learning before they're ready to move on to the next one. Bloom's Taxonomy can even help map student learning within a single lesson or between lessons, or projects in support of larger unit or curriculum goals. No matter the type of outcome, we can recommend a few tips to follow when writing them:

- Make sure those verbs are appropriate to each level of the taxonomy. If students are at the Apply level, for example, you can expect them to be able to do everything at Understand and Remember as well… but not Evaluate or Create.
- Avoid favoring higher-level outcomes over lower-level ones. After all, deep learning needs a strong foundation.
- Express outcomes in terms of what students will learn, rather than what will be covered in the seminar. (CHALK, 2021).

When discussing the emotional domain of Bloom's taxonomy, it is noted that it is particularly important in higher education, as certain attitudes and values must be developed. The attitudes and values to be developed must be clearly stated so that students, teachers, and the public know what the specific study program aims to achieve (Savickiene, 2010). According to Savickienė (2010), the requirements in study subjects or in the study program defining the attitudes and values that students should develop during their studies are associated with the results of studies in the emotional field.

Level	Process	Description
6	**Self-System Thinking**	Identifies learning motivation Identifies emotional responses Identifies improving ability or understanding Assess own learning
5	**Metacognition**	Gauge own level of accuracy Determine own understanding Monitor own progress toward a goal Outline learning goals and plan to achieve them
4	**Knowledge Utilization**	Investigate outcomes Experiment to find different outcomes Test theories Solve Problems and make decisions
3	**Analysis**	Inform of consequences Make generalisations Spot errors Categorise Note similarities and differences
2	**Comprehension**	Draw up information Design information outputs Combine information and summarise Structure information
1	**Retrieval**	Displaying more complex processes Simple procedural actions Recollection of simple information Producing information Recognising information appropriateness Identifying information and assessing for accuracy

5 Figure. Summary of Marzano and Kendal's New Taxonomy (2008)

The criteria according to which it is possible to find/see the emotional results of the study or program in Bloom's taxonomy - the expression of the study result in one verb, the orientation of the study result to the student, the correspondence of the study result to the purpose, the mutual harmony of the study results and the connection of the study result with the evaluation of its achievement. Marzano released a new version of taxonomy called The New Taxonomy of Educational Objectives (2000). Marzano claimed that this was a response to the shortcomings of the widely used Bloom's Taxonomy. "The New Taxonomy is designed as a replacement for Bloom et al.'s taxonomy. Although that work was powerful and enduring, it had some flaws and inconsistencies that can now be reconciled..." (Marzano and Kendall, 2008). Marzano and Kendall's taxonomy is two-dimensional. One-dimension addresses levels of mental processing. Instead of categorizing learning activities, it describes six levels of processing knowledge of the mental process. And the other addresses three domains of knowledge. This taxonomy includes three systems of thought Cognitive System, Metacognition System, and Self-System. There are also include three different types or domains of knowledge information, mental procedures, and psychomotor procedures. These domains provide the content. According to the six levels of processing knowledge, the highest level (6) denotes the so-called Self-System that contains a network of interrelated beliefs, attitudes, and expectations that are involved in making judgments as to whether to engage in a new task. It is at this level that the motivation of

accomplishing the goal is determined. If the decision is made to engage in a new task, the metacognition system (Level 5) is activated. At this level, goals relative to the new task would be defined and strategies would be developed for reaching these goals. Finally, the Cognitive System (levels 1 to 4) is responsible for the effective processing of knowledge. Researchers from Cambridge Assessment (UK) claim two taxonomies are better than one (Greatorex et al., 2019). They combine Hutchins ir kt. (2013), and Marzano, Kendall (2007, 2008) taxonomies. In conclusion, they found that the taxonomies of Hutchins et al. (2013) and Marzano and Kendall (2007, 2008) can be combined. Moreover, the combined taxonomy was successfully used to compare the domains, categories and operations elicited by a variety of tasks and assessments, as well as compare the demand of such tasks and assessments. Furthermore, this taxonomy is accessible and appropriate for a variety of assessments and subjects. According to Irvine (2020) using the principle of Marzano taxonomy in the study process students indicated that the classroom activities were enjoyable and interesting, and that the students were more engaged in their own learning compared to the regular classroom instructional strategies, which typically consisted of traditional, teacher-centered lessons. The performed analysis confirms that when planning the study process, it is important not only to transmit academic knowledge, and a clear desired result of teaching and learning, but also to actualize the academic content for the student, to create opportunities for students to get involved in research activities (inquiry-based learning), reflect on them, learn, and reflect together with others.

The SOLO taxonomy can be used to assess knowledge and understanding. SOLO (Structure of Observed Learning Outcomes) is a structure of observed learning outcomes created by J.B. Biggs and F.K. Collis after analyzing the specifics of university studies and students' knowledge and understanding. According to Biggs (2003), the SOLO taxonomy, which hierarchically describes student achievements, is an excellent instrument for planning, implementing, and evaluating study programs and the educational content of individual subjects. When planning the subject of study, it is important to think about the evaluation of knowledge. The main object of any understanding is our knowledge, which we acquire while studying, studying in higher education. When assessing students' knowledge or knowledge, it is important to know what kind of knowledge and what kind of knowledge we expect from students (Biggs, 2003; Bigss and Collis, 1987, Bulayeva et al. 2011). Knowledge or knowing can take different forms (types of knowledge) (Biggs, 2003):

- *Declarative knowledge* - knowledge about objects, phenomena, etc. Knowledge of essential facts is official, research-based, reasoned, reliable, logically consistent academic knowledge. This knowledge is usually presented in academic lectures in higher education. Declarative knowledge is easily verified by a test or by offering students to present their own examples.
- *Procedural knowledge* is skill-based knowledge of procedures, sequence of actions, operation according to algorithm. This knowledge is the basis of competence.
- *Conditional knowledge*. They combine higher-level declarative knowledge with procedural knowledge. This is knowing when, why, under what conditions one or another activity must be performed.
- *Functional knowledge* is based on the idea that understanding it has been practically applicable in new situations.

The SOLO taxonomy can help overcome the challenge of assessing student understanding. The hierarchical structure proposed by this taxonomy allows the teacher to determine the complexity of understanding the studied material when analyzing student answers.

Each level of hierarchical understanding is described as follows:

• Prestructural. The student does not understand the studied material. When answering, he relies on irrelevant information, does not provide a meaningful answer.

• Unistructural. The answer focuses on one aspect or structural element of the studied material.

• Multistructural. In answering, the student focuses on several important aspects, but they are not interconnected.

• Relational. Several essential parts are linked and integrated into a single whole; details are linked to conclusions; the studied material is well understood.

• Extended abstract. In reporting, the learned material is presented broadly as a generalized structure, based on additional studied information, shows the highest-level cognitive abilities, abstracting and theorizing of specific material (Bulajeva et al., 2011).

Developing critical and reflective thinking in higher education: student assessment, self-assessment, and self-directed learning

It should be noted that nowadays didactics' approach to students' role in education was changed. It is increasingly being talked about students' agency as a student learning, self-directed learning, and lifelong learning. Agency can be exercised in nearly every context: moral, social, economic, and creative. Student agency is closely related to student learning, the assessment process, and the critical thinking. For example, students need to use a moral agency to help them make decisions that recognize the rights and needs of others. Exercising moral agency requires that a student thinks critically and asks such questions as “What should I do? Was I right to do that?” (Leadbeater, 2017). There is essential to choose the most suitable methods and forms of evaluation of teaching and learning results for the effective implementation of the critical and reflexive thinking education process. Methods and forms of assessment and self-evaluation are appropriate those encourage critical thinking and reflection in students.

According to Cox et al. (2022) crucial components of the course are the need to better integrate student self-assessment and the development of metacognitive skills. They showed how useful are to evaluate the use of a weekly “rapid responses (RR) to learning” process in the context of teaching a graduate course on research methods. The RR process involved the use of a short set of open-ended questions about key moments in learning that students complete, in writing, during the last five minutes of each class. The questions asked students to identify salient take-away messages, note when they felt the most and least engaged, name actions were taken by anyone that was affirming or confusing, and consider specific “aha” moments. Researchers found that the systematic feedback we obtained in this way supported weekly monitoring of student learning, facilitated response to trouble spots, and assisted in the assessment of student engagement and classroom climate. It also provided insight into the efficacy of pedagogic strategies.

Based on Meinking and Hall (2022) findings, high-achieving students can experience personal growth, meaningful learning, and productive struggle in an ungrading environment, though the process will not be without moments of anxiety and discomfort. These findings are important not just for what they might tell us about this student population's response to an ungrading environment, but also and importantly about ungrading as a practice in other contexts. As researchers state, publications about ungrading, especially in higher education classrooms, have been relatively scant, with conversations and the sharing of resources predominantly relegated to social media, blogs, and other web-based platforms. This seeming dearth of scholarly conversation is particularly interesting in light of the number of instructors who have adopted ungrading or non-conventional grading practices in a broad array of their courses. For instructors wishing to adopt or adapt the approaches explored here, we strongly suggest incorporating the learning charters or similar reflective, process-based writing opportunities as a way of building trust and transparency between individual students and instructors. While not everyone might be ready to take on a full version of ungrading, introducing elements of it (e.g., low stakes assignments, collaborative moments, self-assessments, or comments-only feedback) can offer an entry point and comfortable space for experimentation.

As state Hill and West (2022) the assessment dialogue prompted changes to longer term learning strategies. There was evidence of closing feedback loops, as teacher-student dialogue improved work and enhanced outcomes in terms of short-term actions (single-loop feedback processes) and more complex longer-term adjustments to learning strategies (double-loop feedback processes) (Carless 2019). The teacher initiated meta-dialogue about the purpose and process of feedback. It was evident that the students were able to reflect upon and internalize the teacher's written and verbal comments.

The students incorporated the comments into ongoing ways of thinking and acted productively to improve their drafts (Winstone and Carless 2020). Students self-evaluated their work by monitoring their performance against criteria (Steen-Utheim and Wittek 2017; Tai et al. 2018). This process is part of self-regulation (Nicol and MacFarlane-Dick 2006), and it assists students in understanding and applying feedback within and beyond individual tasks.

A different approach to the evaluation process in higher education is offered by C. Katopodis and C. N. Davidson (2020). They make clear why important ungrade in high education and give details on how they implement ungrading. Laura Gibbs (2020) presents her approach, "all-feedback-no-grades," alongside student comments and her ungrading wish list. " From their point of view, grading and critical, independent, and responsible learning are difficult to reconcile. A key criticism of traditional grading practices is that grades represent how well a student follows instructions, not what they have learned (Blackwelder 2020; Stommel 2020). They reflect that "something about the letter grade causes learning to stop" (Chiaravalli 2020, 83), and that "conventional grading can be an obstacle to real learning" (Katopodis and Davidson 2020, 120). Moreover, grades focus attention in the wrong direction, for both learners and educators. Undue attention paid to performance results in learners being unable to fully engage with what they are doing. As Blum (2020b) declares, grades lead to "a misplaced focus on accumulating points rather than on learning" (Blum 2020b, 3).

For the planning of the study subject and the development of student's critical thinking, not only the content of the study subjects, and the planned topics but also a properly prepared

evaluation system and criteria are important. It is obvious that the assessment system needs to achieve a balance between academic knowledge and the ability to apply it, to make complex (non-template) decisions independently. Consider using a transparent assignment framework to structure your assignment details and better support students' ability to complete the work for your course. Frequently it means that the lecturer/teacher has paid attention to overview (to introduce the assignment task and relate it to the recent course concepts and ideas); purpose (to indicate why are we doing this assignment: What do we hope to practice or learn as a result of this activity?), and to include learning goals or objectives for the assignment. One of the most important stages in achieving the development of students' critical thinking is the time and attention devoted to the discussion of evaluation/self-evaluation criteria (to include a rubric or other clearly articulated evaluation plan (ideally provided to students before they submit the assignment); after that clearly indicate your policy for accepting late assignments and indicate how and when students will be provided with feedback. Hill and West (2022) declare engaging in dialogic feed-forward helped the students to clarify the task requirements in terms of aims and content (e.g., ideas and analysis) and form (e.g., the structure and coherence of the text). The survey showed that students reported an improved ability to decode feedback through questioning, discussion, and verification of their revised understanding, jointly appraising the work with the teacher, and identifying actions for improvement. Students commented that the face-to-face dialogue engaged them actively in the feedback process, developing their skills of critical thinking, and empowering them in their learning.

Higher education didactics: study methods, tools, assessment, and forms (blended learning, synchronic and asynchronous teaching)

Various aspects are important for the development of critical thinking in higher education: formulation of study content/topics; selected teaching and learning methods, learning tools, the ratio of contact and non-contact time, mixed learning, and distance learning. Increasingly, national education leaders are calling for schools the schools to 'teach less and learn more", to provide time to reflect by hiring more teachers, reducing the content in the curriculum and setting aside timetabled time for teachers to engage in professional planning, reflection, and sharing.(OECD, 2017).

One of the proposed methods for developing students' critical thinking is the AAR cycle. The Anticipation-Action-Reflection (AAR) cycle is the learning spiral through which students develop transformative competencies and student agency. Critical thinking skills are highlighted in this cycle. Here we emphasize that it is important in all stages of the cycle: the process of using strategic foresight and planning (Anticipation), critically evaluating and reassessing one's actions to develop a deeper understanding and improve future actions (Reflection) (OECD, 2016). As emphasized in this cycle, students' critical thinking is required in all its stages. Reflection is a rigorous, disciplined way of thinking It enables learners to improve their thinking, which leads to better actions towards well-being over time. Through reflection, learners gain a sense of power over their future actions – and a sense of direction – leading to the development of agency (see more information in this links – OECD, 2016)

Another effective way to put new educational methods into practice is to use a reflective writing system to have the teacher or teachers team describe their approach and the strategies

they have implemented, and at a "meta" level they assess what contributes to the viability or success of teachers learning self-prepared professional development plan. Measures of success can be constructed using utilization-oriented evaluation (Ferris and Samuel, 2020). Archer-Kuhn et al. (2020) study results reveal an increase in students' reflective and integrative learning if includes inquiry-based learning in higher education. Higher education study programs (such as science, education, and others) have taken up inquiry-based learning, noting such benefits as increased student engagement in their learning and the development of critical thinking skills. Several conditions are very important in this case: experience of inquiry-based learning, adjustments required for the learning process, impactful facilitators to learning, and developing deep learning.

The development of critical thinking in higher education is closely related to the inquiry-based learning process. Inquiry-based learning like social constructivism focus on learning that comes from interactions with others (Miller-Young & Yeo, 2015). During the inquiry process, students construct knowledge from new and former knowledge to create new subjective realities. In doing so students arise critical questions such as what is valued as knowledge, and how they know what they know. As noticed Arher-Kuhn et al. (2020) very important for developing students' critical thinking are integrated IBL strategies and including scaffolding of assessment tasks and formative feedback to support the inquiry process such as the development of powerful, critical, and essential questions, as known as the central question, utilizing a structured controversy, videos, brainstorming, and a checklist for the development of an inquiry question.

In the process of inquiry-based learning, students' cognitive activity is not limited to finding and presenting facts related to the problem under investigation. Research questions raised by students, formulation of hypotheses (assumptions), planning of research activities, experimentation, data collection and recording, their analysis and interpretation, and reasoning. It should be noted that the role of teachers in the organization of research-based education can be diverse: from a research instructor, a mentor to a research performance facilitator. Depending on the students' learning and research experience, the research conducted by the students can be divided into 1) structured research, where the teacher helps formulate the research question(s), and prepare a detailed plan; 2) guided research, where the teacher presents only the problem, question(s) to be solved; 3) open research, when the teacher submits only problem, idea (Pedaste et al., 2015). Medelain et al. (2022) emphasize undergraduate research projects emphasize the importance of inquiry-based learning in a student's education. With a basis in the theoretical works of Plato and John Dewey, inquiry-based learning stresses the importance of learning to ask good questions over knowing—and notably, memorizing—the "right" answers. The emphasis of inquiry-based learning is on the learner rather than the instructor, with the student determining the focus of an investigation that is meaningful to them (Jennings and Mills 2010), often in close collaboration with a faculty member. Students learn to ask effective questions, consider multiple points of view, engage with critical analysis, reflect on their own learning, and collaborate with others in the co-construction of knowledge (Jennings and Mills 2010). With inquiry-based learning, faculty serve as mentors by asking questions of their own, helping students to work through real-world problems, and exposing them to disciplinary approaches to investigation (Medelain et al, 2022).

More motivated to engage in the study process are participants who are most deeply and experienced the greatest interest and intrinsic motivation with hands-on, problem-based laboratory stations, followed by problem-based case studies and video lecture activities. As noted, Ericson et. al. (2020), case studies and laboratory stations were rated more enjoyable, novel, challenging, and attention-demanding than video lectures. The greater overall situational interest experienced during laboratory stations and case studies indicates that educators and instructional designers can leverage these and similar activities to create learning environments that promote interest, intrinsic motivation, engagement, and critical thinking.

Styles and Povli (2022) showed metacognitive activities (Bleicher's workshop: A Virtual Last Class Workshop) benefits from using a constructivist model for teaching and learning in classes and towards a metacognitive experience of the class that asks students to focus on learning outcomes and critical thinking. In this workshop, students must think critically and reflectively about their process of learning relative to the coursework and evaluate their progress using the learning tools and curriculum provided to them. This student-centered self-monitoring asks the students to lead the way and nudges them towards being self-directed learners.

In Alexeeva-Alexeev et al. (2022) studied undergraduate student attitudes towards team-based projects, connecting those attitudes to challenges and overall perception of this work. The study was conducted with 220 students in the context of three subjects taught at a Spanish University, that included collaborative projects as mandatory assignments to be developed throughout the subject. The findings point to the difficulty in solving specific communication needs and managing students' involvement and commitment to the project. The results show that gender, year of study, students' age, academic degrees, and the context of curricular subjects significantly influence the acquisition of skills related to collaborative work, facilitating or hindering their development among university students. These results have practical implications for the design of collaborative projects within higher education academic programs. They also suggest that the way collaborative work is usually planned is not very effective and should be reconsidered. The Researchers team suggested evaluating the differences found among the groups formed according to the following criteria: (1) gender, (2) year of study, (3) interdisciplinary character of the team, (4) students' age, (5) degree, and (6) subject, within which the team-based projects were developed. All of them can be considered as factors that influence the development of skills related to collaborative work. In this regard, significant differences were detected in similar aspects: (i) the interdisciplinary character of the team, (ii) equal involvement in the project, (iii) poor commitment to the success of the project, and (iv) communication. In describing features of interdisciplinary teams there are emphasized team-based work through interdisciplinary teams, comprised of members with different knowledge, experience, or skills, is very rewarding for students because it helps to create an improved learning environment, develop critical thinking and open mindedness generate new ideas from multiple perspectives. The other important factors are the size of the student group. It is pointed out that collaborative work is much more effective in small groups. This makes it possible to share different skills of each participant for the benefit of the group to find a proper solution to the problem; instructors facilitate; to design of a course with real-world experience, integrate real professionals, and deal with complex interactions (such as using a cross-disciplinary client-based project flipped classroom).

Ghaith and Awada's (2022) Scaffolding Understanding of Scholarly Educational Research Through Teacher/Student Conferencing and Differentiated Instruction his article reports the results of a qualitative study of the effectiveness of a critical reading instructional intervention based on teacher/student conferencing (TSC) and differentiated instruction (DI) in improving the participants' understanding and evaluation of published educational research. TSC and DI entailed using a subset of teaching strategies including pre-teaching, self-selection of critiqued articles, cooperative learning, embedded instruction, extended instruction, reflection to scaffold students' challenges, providing constructive feedback, enabling students to describe their feelings, assessing their learning, and setting goals and plans for further development. Another suggestion by Ragupathi et al. (2022) asserts to promote the development of critical thinking abilities in higher education, important implemented a course design that employed a series of scenario-based multiple-choice questions (MCQs) and informal peer discussions. The researchers analyzed the extent to which the course design was effective at promoting critical thinking and student experience. Deductive analysis of students' qualitative responses indicates that the course design was successful in promoting students' development of critical thinking. Both deductive and inductive analysis of students' qualitative responses also suggests that students largely had favorable attitudes towards this course design, though some express concerns. They described that a course design employing scenario-based MCQs and informal peer discussions promoted the development of critical thinking in students enrolled in a large-cohort introductory humanities course. Study findings demonstrated that the course design strongly promoted aspects of critical thinking involving explaining, interpreting, and perspective-taking abilities. Moreover, the course design's potential to develop critical thinking skills involving empathy and self-knowledge was also evident. Additionally, students suggested that although peer discussions made the overall experience in the course more enjoyable, captured students' interest, and enriched their intellectual capacities, they also gave rise to issues such as unfairness and confusion over course content. Instructors and instructional designers keen on employing similar course designs in the context of higher education may consider these strategies to strike a balance between providing a space for adult learners to mature as autonomous, self-regulated problem-solvers and a space that ensures fair opportunities.

The ratio of contact and non-contact learning, and the appropriate provision of students with learning tools are important for the development of critical thinking in higher education. An effective tool for planning these activities - ABC Learning Design. **ABC Learning Design is a high-energy, hands-on curriculum development workshop developed at University College London (UCL). This tool helps teaching teams work together to create a visual 'storyboard'.** The storyboard is made up of pre-printed cards representing the type and sequence of learning activities (both online and offline) required to meet the module or program learning outcomes.

Practical part and reflection questions

- Why the development of critical thinking is relevant not only in the 20th century but also in the 21st century?
- How has the concept of critical thinking and its development changed?
- How is critical thinking different from other ways of thinking? How we can develop it during the study process?
- How critical thinking is related to reflective, creative, and other thinking? And how this understanding can helps choose and prepared study materials?
- How are the features of critical thinking education related to planning the content (knowledge, skill, context) of the study subject, educational tasks (variety of study forms and methods), and student assessment, and self-evaluation?

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Subtopic: CREATIVITY IN HIGHER EDUCATION: ENVIRONMENT, TEACHING AND LEARNING

Expected results:

- During this course, learners will strengthen their knowledges of the concept of creativity, its various definitions and characteristics.
- During the course, material is presented on the specifics of creativity in higher education, in the process of studies taking place there.
- Learners will learn about the possibilities of developing creativity by appropriately adapting or choosing the study environment, carrying out teaching and learning activities.
- Learners will have the opportunity to evaluate their taught subjects and methods in terms of creativity, reflect on their activities, and discover new opportunities for creativity development in the higher education process and in their pedagogical activities.

Keywords: creativity, higher education, teaching, learning, study process.

Theoretical part

Introduction and problems of the topic

Creativity, a key engineer for facilitating social harmony, sustainable human development, technological invention and scientific revolution, is manifested in human activities at different levels, from everyday life to advanced technological industries. To date, there is no consensus-based definition of creativity; however, according to a standard definition, creativity is often perceived as **the ability to produce something new/novel and appropriate/useful** (Yong, et. al, 2019).

Creativity specifically has become a critical consideration, because "creativity becomes a force of great value when it is applied to causes that benefit humankind and the world at large". There are a number of definitions of creativity, depending on different authors. S. Ozimec said that "Creativity is a such kind of creation by which one produce something new, different from known, which include individual way of problem solving, discovery of unknown". As Isaksen said, creativity is not unambiguous phenomenon which could be defined precisely (Gaspar, Mabic, 2015).

S. Bohm sees creativity as potentially opening *the way to transform the individual.* More importantly, educators will have their own implicit definition of creativity that will influence their acceptance of creativity as an important skill to be taught. In contrast to the popular view in which creativity is characterized as merely weird or non-conformist, an appropriate definition for educators focuses on the process culminating in a novel and effective solution to an open-ended problem. The importance of both novelty and effectiveness is reflected in the following

definition. Creativity is "… the ability to produce work that is both novel (i.e., original, unexpected) and appropriate (i.e., useful, adaptive concerning task constraints)" (Gaspar, Mabic, 2015).

According to S. Yong, et. al (2019), creativity, as *the main product of human culture and a tool for cultural enrichment,* has a very close but complex relationship with culture. In simpler language, if culture is the "background", then creativity is the "object" that, when used, will become the new "background" for the emerging and future "creativity (objects). No one can live and be creative without culture.

Creativity is deeply rooted in all cultures, but its definition and characteristics vary from culture to culture. According to the literature, **the dichotomy of "West" and "East"** is one of the most significant approaches in describing cultural differences in the understanding and definition of creativity.

"East" usually refers to Asian countries, especially East Asian countries such as China and other countries influenced by its culture, Japan or Korea. They have common similarities in social and cultural aspects that are different from "Western" countries. These countries are often considered to represent predominantly "collectivist cultures" (i.e., cultures that emphasize that the collective interest should take precedence over the interests of the individual and that belonging in the collective is more important than uniqueness) and have a similar tradition that reveals its origins in such philosophies, such as Taoism, Buddhism and Confucianism.

"The West," generally considered to represent "individualistic cultures" (i.e. those that value individual goals and interests over collective interests and goals), refers to the United States, Western Europe, Canada, Australia, and New Zealand, which are closely related to ancient Greece and the ideas of Christianity, Judaism, and rationality.

The likelihood of such an East-West grouping has largely been confirmed by several large-scale studies such as the World Value Study (1998) and the GLOBE Project study (2019). Research shows that Western cultures focus more on process- and product-based creativity and emphasize the pragmatic, problem-solving outcome of creativity, while Eastern cultures are highly interested in the creative spirit and personal creativity, treating creativity as a form of revelation or rediscovery and emphasizing the role of creativity in facilitating personal satisfaction and enlightenment or inner essence or ultimate self-expression.

"Western" research shows that creativity is associated with descriptions such as "curious," "imaginative," "independent," "inventive," "original," "broad interests," "nonconformist," "individualistic," "confident," "happening", "brave", "artistic," "open," "intelligent," "talented," and "sense of humor" were often identified as implicit personality traits describing a creative personality.

Eastern research found that all participants listed "originality", "novelty", "thinking", "wisdom", "observation skills", "flexibility", "willingness to try", "self-confidence" and "visualization" as the main characteristics of a creative person.

For *Westerners, creativity means breaking with tradition and moving towards something that does not exist*, while for *Easterners, creativity means reinterpreting or rediscovering tradition.* Similarly, in the West, creativity is valued primarily for solving specific problems through insight or achieving personal success, while in the East, the value of creativity lies primarily in the social and moral contribution that an individual can make to society.

Although a focus on the need to embed creativity studies has been slower to emerge in relation to higher education, L. Livingston (2010), S. Das (2012), and Y. Meng et al. (2017) all argue that **study at this level should foster the development of students' creativity**. Meng et al. (2017) go as far as to argue that "fostering and developing students' creativity is more necessary and urgent than ever before" (p. 605). However, Frick (2011) contends that "there is often a lack of systematic and developmentally organised learning experiences that specifically encourage creativity"

In a study based in the United Kingdom, L. Speers and N. Wilson (2018) focused on creativity in the university sector. Arguing that universities are places for "idea generation, learning, and new and valuable thinking", they claim that creativity is often overlooked, underdeveloped, and under-rewarded. The authors describe a project designed to embed everyday creativity without it becoming constrained or instrumentalised; it was not specified at what year levels or programs the students were studying. After completion of workshops and interviews, the authors argue there were mixed outcomes; although the program did not successfully embed creativity in an everyday situation, they refer to some success in individual and small group situations. The authors proceed to argue that the key conditions of tolerating ambiguity, space to "play", freedom, permission, trust, and risk-taking are essential to support creativity.

Creativity and aspects of creativity in higher education

The case studies demonstrated that exemplary teachers were intentional in their efforts to foster creativity. There was evidence that **creativity can be designed for and fostered in higher education,** in face-to-face, blended and online spaces. In the creative environment teachers cultivated and negotiated an ecosystem of complex relationships, which included four key elements derived from the *Grounded Theory** themes:

1) ways of being creative motivated by a myriad of personal and domain specific goals and practices;

2) methods of designing for creativity by setting up the conditions for creativity;

3) working with the environment rather than against it to establish generative spaces and overcome constraints;

4) the importance of facilitation style, whereby creativity is modelled and mentored.

**Grounded theory*: A methodological approach to the collection and analysis of qualitative data developed by Glaser and Strauss (1967). The purpose is to inductively build theory from the data.

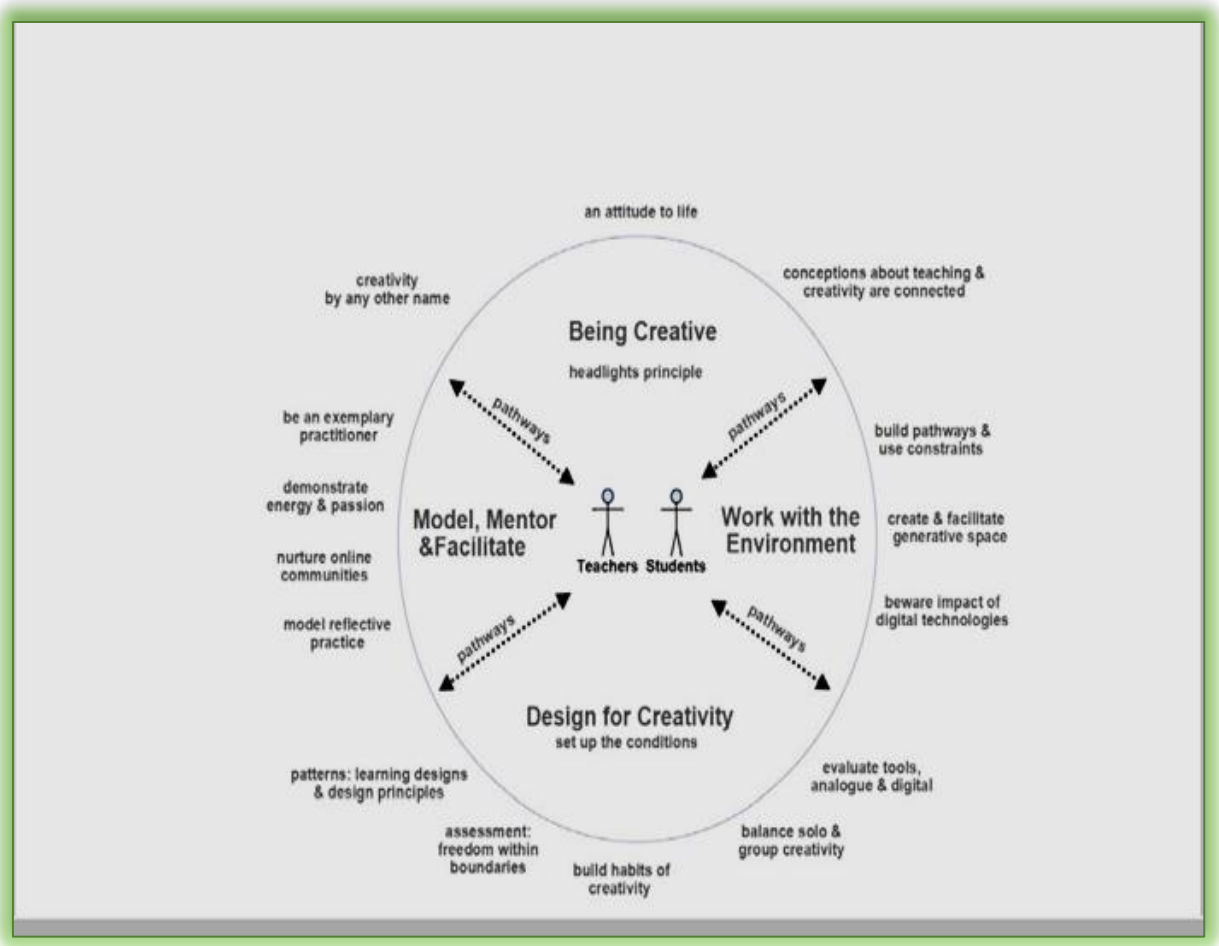

Figure 1. A learning and teaching perspective on fostering creativity in higher education based on four key elements

Creativity is an active process necessarily involved in innovation. It is a learning habit that requires skill as well as specific understanding of the contexts in which creativity is being applied. **The creative process is at the heart of innovation and often the words are used interchangeably.**

According to Kampylis and Berki (2014): "Creative thinking is defined as the thinking that enables students to apply their imagination to generating ideas, questions and hypotheses, experimenting with alternatives and to evaluating their own and their peers' ideas, final products and processes" (Kaufman, Beghetto, 2009).

Kaufman and Beghetto (2009) developed **four categories of creativity**, which help to reveal the nuances between different levels and types of creativity. See Table 1.

Table 1. Four categories of creativity

***Big-C* creativity** (sometimes called 'high' creativity)	*Big-C* creativity is reserved to describe the work of an elite few who have transformed their discipline with their inventions. Their work has been generally accepted as being innovative and groundbreaking, even if it was considered controversial when it was first created. Some examples are scientific works such as Einstein's theory of relativity and Darwin's theory of evolution, and works of art such as Picasso's Guernica, Jane Austen's novel Emma or Ludwig van Beethoven's Symphony No. 9 in D Minor. *Big-C* creativity is out of reach of most of us, and *Big-C* creators themselves are often as extraordinary as their creations.
***Pro-c* creativity**	This type of creativity has involved time (usually at least 10 years) and effort to develop. A musician, who showed promise as a child, has trained to degree level and now makes a living teaching and playing classical music could be classified as *pro-c*. A physicist working at a university who teaches and undertakes academic research could also be classified as pro-c.
***Little-c* creativity**	*Little-c* creativity is about acting with flexibility, intelligence and novelty in the everyday. These results in creating something new that has originality and meaningfulness. This everyday kind of creativity can be found in the kind of person who can resolve a complex problem at work, is a keen gardener with an eye for design, or takes creative photographs and exhibits them on a photo-sharing website. School-age learners may work at *little-c* level if they engage in purposeful practice in their discipline. *Little-c* creativity involves practice and may be developed over a long period. The internet has provided the infrastructure for *little-c creativity* to thrive. Websites such as YouTube, Instagram and Etsy enable creative people to share their expertise and work
***Mini-c* creativity**	*Mini-c* is defined as the novel and personally meaningful interpretation of experiences, actions, and events. This is the kind of creativity that can be nurtured by teachers and parents. *Mini-c* happens when a person demonstrates flexibility, intelligence and novelty in their thinking. It is usually applied, but not necessarily limited, to children's creativity. *Mini-c* creativity may not be visible to outsiders and may consist purely of ideas and connections that the learner creates. As Vygotsky explains: any human act that gives rise to something new is referred to as a creative act, regardless of whether what is constructed is a physical object or some mental or emotional construct that lives within the person who created it and is known only to him. Piaget suggested that „to understand is to invent" meaning that a learner invents' an understanding of new material for themselves. *Mini-c* creativity could describe a learner's achievement in finding several different ways of approaching a math's problem. It could also involve making a new connection between their existing knowledge and a new piece of information which helps them to understand the subject more fully.

The boundaries between these categories can be blurred and they are not age specific. A person could fit into multiple categories in different areas of their life. For example, a chef who could produce dishes at a *pro-C* level while at work might work at a *little-c* level when attending a watercolor painting class.

The two categories most relevant to schools are *little-c* and *mini-c* creativity. They highlight the fact that being creative and innovative is not so much about revolutionary ideas or new inventions that change the world. It is about individual growth achieved through small insights. **Creativity and innovation are fundamental to all disciplines and an essential part of the learning process**, forming an important dimension of learning how to learn. They are also fundamental to teachers improving their professional practice and to school development (Kaufman, Beghetto, 2009).

Being innovative and creative is dependent on the other attributes. Being creative requires reflection, encourages engagement and develops confidence and responsibility. The ability and inclination to be creative is essential to living a fulfilled and successful life, and it is valued in higher education and the workplace. There are many other benefits of maximising one's own creative potential such as physical and psychological health improvements, improved resilience in the face of difficulties and even lower levels of aggression.

Our understanding of innovation and creativity have progressed and broadened over time. In the early 20th century, creativity was considered to be an innate, elusive quality that individuals were born with. Initially creativity was most closely associated with the arts but grew to include science, technology and other disciplines. In the 21st century, *creativity is increasingly viewed as a distributed and collaborative process of communal sense making and problem solving* (Kaufman, Beghetto, 2009).

As with all the learner attributes, cultural perspectives are also very important when considering creativity. Confucian heritage cultures, for example, tend to see creativity more as a collective exercise. They place responsibility for creativity on the social group rather than the individual. Individuals, therefore, are not encouraged to stand out from the class in the same way or to the same extent as in Western cultures. This does not mean that creativity is in any way less valued (Kaufman, Beghetto, 2009).

Higher education needs to see creativity within the important role it plays in preparing people for an uncertain and even more complex world of work, a world that requires people to utilize their creativity as well as their analytical capacities. Sternbrerg and Lubart (1995) argued that a **person needs three different sorts of abilities to be successful:**

1) analytic abilities - to analyze, evaluate, judge, compare and contrast;
2) practical abilities - to apply, utilize, implement and activate;
3) creative abilities - to imagine, explore, synthesize, connect, discover, invent and adapt (Papaleontiou- Louca1 et. al, 2014).

Peculiarities of the process of creativity education in HEIs

Among ten key **recommendations** to European higher education institutions which have been derived from the findings and conclusions of the Creativity Project, the following are **related to creativity:**

- Striving towards a creative mix of individual talents and experiences among students and staff, providing common fora for researchers from different disciplines and offering diverse learning experiences will likely result in conditions favorable to the creativity of the higher education community.
- It is recommended that HEIs explore the concept of a learning organization for their management and governance structures. As important as these structural elements are, they must be complemented with ethical and cultural concerns in order to create an institutional milieu favorable to creativity (Gaspar, Mabic, 2015).

Higher education needs to ensure that graduates have the right skills to equip them for a lifetime in a fast changing working environment. Therefore, education should focus on the *personal and social dimensions of human existence* as well as the *academic and vocational* dimensions. Additionally, it is necessary to establish an appropriate *learning environment* that will encourage students to gain experience, develop their creativity and take advantage of opportunities that their own business environment offers, while developing their entrepreneurial behavior. As Lynda Ball et al. (2010) stated "HEIs provide an environment that fosters creative practice and encourages important employability skills (Papaleontiou- Louca1 et. al, 2014).

A distinctive characteristic of the creative curriculum is that opportunities for transfer of the creative process occur naturally, as students experience **different contexts** in which to apply their learning through live projects, exhibitions, commissions and learning alongside teacher practitioners. Furtherstil, capacity building is required in *research communities to nurture academic careers*, meet aspirations for new knowledge and innovation in the HE sectors, and to bring in the next generation of teacher practitioners".

Hence, higher education must *provide students with a valuable learning methodology*, from which to evolve their practice and important transferable processes and skills that need to be made more explicit. As Knight and Yorke (2003) noted, "the final task for teachers is to design promising learning environments and then help students to discover what they afford, what might be learnt, how and why" (Papaleontiou- Louca1 et. al, 2014).

Essentially, creativity *depends on the people who make up the higher education community.* The more teachers understand about creativity, creative learning and motivation, the more they can help to enhance their students' creativity, as creative teaching approaches encourage students to link their generic and disciplinary skills and highlight the importance of the students' role in developing these skills. Of course, equally important factors in enhancing student creativity and to contribute to the fruitful results of the staff are *structural, ethical and cultural conditions* of the institution in order to create an institutional milieu favorable to creativity.

Another core concept in indulging or suppressing creativity is that innovative practices have to be *constructed directly in the contexts* where they take place and not separately from them. In fact, the content by teacher is just a stimulus for learning but then the teacher himself cannot predict where learners will go through the creation of new meanings and new learning paths in different and various environments. Not only the way of teaching, but also the role of the instructor has to be improved, and in many cases, it has been enhanced.

Inspirational researchers, but also technology through ICT replace in many cases the "traditional" role of the teacher, and this is played not only in the classroom, but also in

alternative virtual learning environment, much-needed capacity-building in research in contexts where this is lacking. ICT resources offer access and flexibility and like e-mail, instant messaging, and online social, networking spaces, they provide opportunities for joint projects and academic research, collaboration, as well as personal and professional networking. The alternative or blended teaching/learning environment has been strongly considered nowadays in reducing the stress of the "standardness" in education, especially in highly scientific sectors.

E. Papaleontiou- Louca et. al. (2014) state that the **following areas are representative as stimulus in bringing creativity in universities**:

- ICT development and proper utilization;
- social inclusion;
- game based learning;
- motivational individual and group;
- quality assurance and management decisions at administrative level;
- industry and government acceptance and cooperation and involvement;
- PDP (Personal Development Plan);
- training in people delivering the courses, motivating the students;
- designing the curricula;
- the assessment methods, changing the metaphor from relevance to risk taking and mistake acceptance;
- international environment based on internationalization;
- mobility and life-long learning;
- aging population and cross-cultural training;
- Furthermore, cloud computing as part of ICT tools streams from a metaphor for the Internet and its blend with computing – access to networks, software services, data storage, etc.

The authors mentioned above outlined the promotion of creativity in many forms three of which take the form of possession, product and process. **In order to promote creativity as possession, that which also develops ownership, teachers should:**

- adopt a learner-centered pedagogy;
- accept the mysterious aspect of creativity;
- encourage an openness to experience;
- help learners to articulate their thinking;
- develop the receptivity of learners;
- be flexible in responding to learners' interest;
- offer opportunities for self-expression;
- acknowledge the emotional dimension of learning; devote time to the development of creative ideas;
- create safe but bounded spaces for creative activity.

Furthermore, in order **to promote creativity process, teachers should:**

- present creativity as an explicable process;
- focus on achievable rather than exceptional creativity;

- explain processes in the form of creativity tools;
- require that the process results in an outcome;
- break down problems or activities into component parts;
- expect all learners to engage in creative process;
- teach a staged approach to problem solving activities;
- combine active individual and group teaching methods;
- reveal and emphasize the complexity and interrelatedness of ideas;
- devote extra time and space for emergence to occur (Papaleontiou- Louca1 et. al, 2014).

Tips that may suit in creativity education

T. Seeling (2012) was right saying not only that "our brains are creativity machines", but also that creativity can be taught; because we are all naturally creative and we just have to unlock our "Innovation Engines". Moreover, the goal "is to create new and sustainable ways of *including young people* in the cultural life of their communities, nurturing their innate creativity and supporting teachers, cultural and creative organizations and individuals to work with them. Not only these are creating opportunities for creative graduates, but *encouraging young people to pursue a creative education*".

More specifically, in enhancing creativity it is also maintained that **certain teaching approaches** become necessary. Some of these approaches are the following (Papaleontiou-Louca1 et. al., 2014):

The *Creative cycle* approaches: Kessler (2000) describes these approaches as including the following stages: preparation, incubation, inspiration or illumination and verification. Preparation involves the gathering of skills, principles and data. Incubation by contrast involves the doing of nothing, 'letting go'. This is an essential unused period, of receptivity and openness, sometimes even chaos or disorder (and thus offers a potential challenge in the classroom). Inspiration, or illumination, comes directly out of the incubation space. Finally, verification involves the refining of the outcome.

The *Single-strategy* approaches: These might include questioning approaches which wonder about possibilities and are both prepared to follow, and to be supported in, seeing the questions through to an outcome.

The *Multi-strategy* approaches: Shallcross (1981) has also identified a range of strategies that included the allowing of adequate space and time for developing a creative response to any given situation. University teachers often interfere too early in a students' thinking process, preventing them from working out ideas for themselves.

In addition, it is also essential to provide an *appropriate environment* for creativity in the classroom which includes fostering self-esteem and self-worth and at the same time adopting a questioning approach which wonders about possibilities and is both prepared to follow, and be supported in, seeing the questions through to an outcome.

In addition, Torrance (1974, 1966) added another **approach as the *Recording and assessing creativity*.** Torrance described four components by which individual creativity could be developed and assessed. These four components are:

- fluency – the ability to produce a large number of ideas;

- flexibility – the ability to produce a large variety of ideas;
- elaboration – the ability to develop, embellish, or fill out an idea;
- originality – the ability to produce ideas that are unusual, statistically infrequent, not banal or obvious.

E. Papaleontiou- Louca1 and others (2014) suggest several **methods to achieve the *Creativity* goal:**

A. *Promotion of Creativity at Individual's Level.* Intrinsic motivation arises when the task itself is a source of interest, enjoyment, self-expression, and personal challenge. An individual will be intrinsically *motivated by a task* if it increases his/her acknowledgement of own capability and autonomy. These feelings of competence and self-determination will, in turn, be influenced by task characteristics, such as skill variety, challenge, autonomy, and feedback.

Furthermore, Personal Development Planning (Jackson, 2010) initiated in the UK helps students plan and reflect on their abilities of managing their learning development, and it is an important policy that might be utilized in promoting more creativity in higher education.

Students are advised that, from time to time during their scientific careers, they will come across unexpected results. They are advised to follow these observations and capitalize on them. Challenging assumptions: Students are requested to list the assumptions they normally make about a specific subject or problem. Then, they are asked to challenge the assumptions by simply asking 'What if?' Analogy: In an analogy two things that are essentially different, but which nonetheless have some similarities, are compared. Students are asked to define a problem then to try to generate an analogy, perhaps by looking to nature for inspiration.

They then use the analogy to apply knowledge or technology from its source to their problem with the aim of bringing a new insight or perspective. The idea is that the analogy will help suggest an entirely novel solution to the problem. Personal analogy: Students are encouraged to look for novel insights and solutions by imagining themselves part of the problem under consideration, as many of us imagine ourselves visually in various situations easier than we can imagine others. The importance of a fresh eye: Students are advised to network and collaborate with people from a range of backgrounds, such as family, friends, colleagues from related or not related disciplines and industry.

B. *Promotion of Creativity at Group Level.* Group chat, idea incubation and submission: People are often at their most creative during periods of "*relaxed attention*". Students are asked to incubate their ideas for a few days and to think about them when they are feeling relaxed (e.g., when taking a shower, during sports, chatting, etc.). They are also *encouraged to exchange ideas with other members of their group using the website's Forum or Chat facility*, anonymously or not. Group sessions: Each group member will have had the occasion to produce, develop and submit ideas for reflection by the group, with a constant pressure and synergy between the individuals and the group.

A constructivist approach to group activities is the *Game-Based Learning*, where teachers and trainers will develop innovative learning artifacts that are interesting and engaging for their students in groups, interdisciplinary activities and real-life game simulations. In admiring the advantages of business simulations, Senge (1990) uses the expression "micro world" to describe the way individuals can immerse themselves and "learn by doing".

At the same time *digital games* do stimulate students' motivation towards learning. For example, Wynder (2004) describes the results of the game simulation "My Muse" in a second-year management accounting course, which successfully offers students the opportunity and motivation to develop creative solutions.

Other games simulations used in the literature as creativity boosters and tools for teaching for creativity are Europia, Fabrica de Tados and many other social Sims. Some (i.e., Europia) are have been developed in joint venture among different European countries and within the framework of projects funded by Lifelong Learning Programme. In consequence, digital games are now a main characteristic and trend in universities and in various industrial training to promote active learning and improve students' problem-solving skills instead of memorization.

It has been confirmed that for certain target groups (e.g., students), they can increase personal realization and reach higher performance. The success factors for games based, according to B. Mellini et al., (2010) are goals, rules, challenge, rewarding systems/short feedback, engagement/immersion, adaptability / flexibility, several levels of access, replay ability, competition / collaboration, entertainment, educational objective, student's profile and communication, learning resources, evaluation methodologies, comprehensive learning scenarios, progressive acquisition of knowledge, personalization, level of autonomy of the learner, motivation, usability, well designed graphics, reusability.

C. *Cooperation vs. Competition Competitive pressures* can be powerful motivators and powerful inhibitors for learning about invention. Cooperative processes are essential to design, engineering and invention, which can be both undercut and reinforced by competitive dynamics. Competitive tension and cooperative partnership are both essential to innovation in the "real world".

Creative teaching occurs when a teacher combines existing knowledge in some novel form to get useful results in terms of facilitating student learning. This may be either planned before the act of teaching, or invented as a response to the demands of the learning situation.

Practical part and reflection questions

Practical task for university teachers:

- Choose one of yours subject and one topic of this subject and model the teaching of this topic "differently".
- Applying methods of creativity education, changing the environment, sources, ways of finding them, etc.
- Describe the changes; provide a description of the possibilities of such changes and the expected results.

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1. Define creativity, give your definition of creativity.

2. Describe the differences in the concept of creativity between Western and Eastern cultures.

3. Discuss the importance of nurturing creativity in higher education.

4. Indicate ways in which teachers can develop student creativity.

5. Identify the methods/means of developing student creativity applied in your personal practice and predict what you promise to apply in the future.

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