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Constructivist approach to teaching and learning in higher education

**Theoretical assumptions and
practical possibilities**

QUESTIONS:

How does the constructivist theory interpret the process of instruction and learning?

What are the most common instruction types and methods in constructivist learning theory?

What is the role of teachers and students in constructivist learning theory?

What are the specifics of assessment in constructivist learning theory?

Why is constructivism important for higher education?

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INTRODUCTION

Constructivism is a relatively new approach to the process of cognition and learning. Although a long period of development of pedagogical thought preceded the establishment of constructivism in education as we know it today, it has become a firm part of educational policies only in the last few decades. Today, one can recognize the increasing trend of popularity and more frequent practical use, we can even consider it the leading theoretical approach in education, and it is also the foundation of many modern education systems (Amineh & Asl, 2015). We can thank the changes in modern society, science and technology that put the individual in new social roles in which he is expected to be more active, aware, critical, independent, adaptable, cooperative, etc. Education systems are expected to support the development of such individuals, and constructivism as an educational paradigm offers methods, techniques, and tools for doing so. University education is more than ever facing the challenge of proper educational activity and nurturing socio-emotional and intellectual skills of its students as well as for developing professional and scientific skills. For this reason constructivist theory becomes the basis for teaching and learning in universities.

Constructivism is attracting more and more attention in modern education for many reasons, but at the core of all of them is the common goal: to make the instruction more efficient in comparison to traditional ways of instruction. Traditional instruction recognized students' success through achievements, and did not focus on learning skills or the practical application of knowledge. This led to pure memorization and misunderstanding the essence of what is being learnt, as well as to rapid forgetting and inability to link learning material with the real-life context. In modern education, the role of individual experiences in learning and teaching is increasingly emphasized, while respecting the context in which these experiences are acquired. Therefore, the goal of the new education

paradigm is to replace passive learning and standardized assessment of knowledge with interactive, collaborative learning and individualized assessment (Milutinović, 2011; Vrkić Dimić, 2011).

Constructivism refutes the long-held idea that knowledge, as such, can be transferred from the "knower" to the learner, that it can simply be transported from one person to another. Constructivism, in contrast, essentially presents the idea that the learner actually has his own share of responsibility in the process, much greater than the responsibility of a simple passive listener. Constructivists believe that knowledge is not received, but constructed. New, constructivist-based pedagogy, develops innovative curricula and strategies, and the transfer of knowledge as such stays in the past (Milutinović, 2016). Such an approach to education is all the more significant in higher education.

The advantage of constructivism is in focusing on meaningful, cooperative and experience-based construction of knowledge, and its value for instruction is significant: the roles of both, those who teach and those who learn are transformed, the focus is on active thinking and participation of all of the participants of learning process and constant development of their skills. Such a change of the educational paradigm is a hard and long-lasting process that requires a change of consciousness, i.e., self-reflection and professional development of the teachers. However, it also brings benefits, the most significant of which is greater affirmation of the teaching profession.

Certain difficulties can certainly be linked to constructivist teaching, such as overemphasized relativism, i.e., too much focus on situational learning at the expense of the systematic learning. However, a well-run learning process by teachers will prevent this, which in turn requires a thorough development of the professional competencies needed for constructivist teaching. The goal is to achieve such learning that is simultaneously experienced as a personal experience, applicable in specific situations, and on the other hand, systemically and logically connected with cumulative human knowledge. One of the biggest challenges of constructivist teaching is to find a balance between the level of attention paid to individual engagement and to leading the whole group to construct the knowledge accordance with the specific field of science.

Constructivism is now present at all levels of education, yet the development of an education system entirely based on constructivism requires much more effort and change and requires the abandonment of many established methods to which we are accustomed. In this chapter, we will explain the main assumptions of constructivism and show why it is justified to base university learning and teaching on the postulates of this theoretical orientation. The most important questions that we will answer are: What changes in the content and methods of teaching need to be implemented, how do the roles of the main participants in the education process change and how does the attitude towards assessment change.

CONSTRUCTIVISM AS A PHILOSOPHICAL, PSYCHOLOGICAL AND PEDAGOGICAL CONCEPT

Constructivism and scientific knowledge

When we talk about the beginnings of the constructivist view of reality in general, the philosopher Giambattista Vico was among the first to point out that people constantly transform themselves and the world around them, and the culture to which an individual belongs inevitably shapes his view of the world and reality. This constructivist view of the world has, over time, taken shape in the influential and widespread paradigm of the postmodern, which has emerged as an alternative to positivist conceptions (Ćirić and Jovanović, 2018). Post-modernism and constructivism question the traditional understanding of knowledge and scientific research and are characterized by the understanding that individuals create or construct their own understanding or knowledge through the interaction between what they believe in and the ideas, events and activities they come in contact with. Reality is constructed in the minds of people, and cannot be considered an external and independent entity; it is understood that knowledge is a subjective category. On the other hand, the positivist approach to research avoids subjectivity, uses standardized measurement instruments, and insists on the neutrality of researchers. It implies that knowledge is objectively measurable.

Constructivists believe that **the researcher is deeply immersed in the context of the situation he is researching**, that he is motivated by his own needs and that research is a creative process during which he finds possibilities and ways to investigate a certain phenomenon. They accept a pluralistic view of reality and embrace the possibility of observing the problem from different perspectives, as well as reviewing the results obtained. Although, seemingly, this approach calls into question the objectivity of the obtained results, it opens opportunities for researchers' creativity, critical review, interdisciplinary cooperation, dialogue, cooperation of researchers who nurture different approaches. Finally, constructivists tend to connect science with the general public, and to question the applicability and usefulness of professional and scientific achievements. Constructivists are open to creative generalizations, reject rigid traditional views and do not see scientific knowledge as static and immutable. The popularity of constructivism in modern society is justified by its contribution to the development of interdisciplinary research and the strengthening of pluralistic and hermeneutic approaches.

For constructivists, the facts that are known about the world do not exist somewhere outside the individual, and it is not in the moment he meets them with knowledge, that he discovers them and accepts, learns, adopts them as such. Instead, the basic position of constructivists is that the individual builds facts and knowledge through his own activity. Therefore, knowledge is always "shaped" by the specifics of the individual who constructs it - culture, values, personal characteristics, etc. (Babić, 2007; Vrkić Dimić, 2011). Authors Ćirić and Jovanović (2018) point out that relativism in looking at reality can be linked to the constructivist paradigm - reality is relative in the eyes of constructivists, i.e., locally and specifically constructed in each specific cultural context. Also, epistemology, i.e., the nature of the relationship between the subject who learns and the reality that he learns about, is essentially subjective, and the ways of knowing are hermeneutic and always imply a guided but subjective discovery of reality.

Constructivism as the education paradigm

Constructivist ideas are not new, they appeared in scientific disciplines even before the emergence of the constructivist approach in social sciences. Many of the ideas that today form the backbone of constructivism were first shaped in philosophy, and later developed in psychology and pedagogy. Some of these ideas can be found in the works of pedagogues and theorists from the end of the 18th to the 20th century, but they were officially introduced into pedagogy by pragmatism and progressivism during the 1920s, only to be revived in the 1960s encouraged by cognitivist psychology. The names of Rousseau, Pestalozzi, Froebel, Freire, and most of all Dewey are important for the development of constructivism within pedagogical science, but thanks to their child-centered orientation, Maria Montessori, Alexander Neill, Ovide Decroly and other prominent European pedagogues are also mentioned. In the field of psychology, the forerunners of today's constructivism, and scientists who mostly affected its development and introduction into education are Jean Piaget, Leo Vygotsky and Jerome Bruner (Ćirić and Jovanović, 2018; Milutinović, 2016; Kim, 2001; Potkonjak, 2000).

All of them, more or less, advocated the thesis of "constructed" knowledge which contains two assumptions: first, the learner constructs that new knowledge on the basis of his previous knowledge, in other words - previous knowledge is important because it affects new knowledge; and secondly - learning, i.e., the acquisition of knowledge is not passive - it is an active process in which we either change new and unknown information by giving it our own meaning and interpretation based on our previous knowledge, or new information changes us or our cognitive structures and raises them to higher levels. The learning environment, in both cases, should be conducive to experimentation and dialogue, with learning outcomes viewed through the context in which they originated (Adams, 2006).

More simply, constructivism is a theory of how people learn. It believes that people construct their own understanding of the world through their experience they experience of the world and through thinking about that experience. When we encounter something new, we have to align it with

our previous knowledge and experience. Thus, new knowledge will either change our knowledge and beliefs about something, or it will be rejected as irrelevant. In both cases, we actively participate in the process: we ask questions, research and evaluate.

Applied to university surrounding, the constructivist approach to learning offers different ways of teaching, the common denominator of which is encouraging students to use active learning techniques (experiments, problem solving), to rethink the obtained results and solutions and to discuss the process and results. This process should be accompanied by self-evaluation and feedback containing the information which activities are the most efficient in understanding the content. By questioning themselves in this way, students in a constructivist classroom master learning technique, that is, "learn how to learn". Learning thus becomes a sustainable process.

Example:

The teacher initiates a discussion about a problem and assigns a group of students to solve it. She does not rush into offering the solution or navigating the students, but encourages them to present their ideas, to reformulate the questions or change the perspective. She gets the students to think about what they already know about it, and when someone comes up with a relevant idea, she “grabs” on it and suggests to the group that it might be a good direction for further research. In the end, they talk about what they learned, how they came up with the conclusions, what was useful to them in their work, and what was not.

As we can see from the example above, contrary to the opinions of critics, constructivism does not reject the active participation of teachers, nor does it underestimate the value of expert knowledge. It only modifies that role, so that teachers help build knowledge instead of reproductive learning. They provide tools such as problem solving and research-based learning that help students formulate and test ideas, draw conclusions, and share their observations in a collaborative learning environment. Constructivism transforms the student from a passive recipient of knowledge into an active participant in the learning process. Guided by the teacher, they constantly actively construct new knowledge, and do not merely memorize it from the teacher or from the book.

Another objection to constructivism that it is a learning theory that needlessly wastes energy because it expects students to "reinvent the wheel". But, although the shorter way would be asking them to memorize facts and get the final solutions, in this case we waste the opportunity to develop inquiry spirit and self-confidence. In constructivist teaching, students are engaged in the application of knowledge and real experiences, they learn to set hypotheses, test theories and draw conclusions from the results obtained. They are not expected to reinvent a wheel, but to understand „how and why it turns and what it serves for”.

In summary, constructivist pedagogy can be described through the following basic features:

1. student-oriented and respect for his origin and prior knowledge
2. providing support to students in building their own perspectives and opinions
3. prioritizing dialogue in the classroom, which allows for a climate open to exchange
4. learning goals and objectives chosen based on authentic problems and needs of students
5. developing awareness of the existence of different points of view and perspectives
6. providing them with opportunities to change and supplement existing attitudes, beliefs and understandings
7. developing awareness of one's own learning process (Milutinović, 2016: 13)

It is also important to highlight that constructivists believe that students construct knowledge in the same way in traditional instruction; the difference in constructivist teaching is that it creates optimal conditions for it and provides adequate support to the student.

Individual and social constructivism

Constructivism in education today is seen in two forms. Those are individual (cognitive) and social constructivism (Milutinović, 2016). In the following section of the paper, we will briefly explain both of these directions and their specifics. However, what they have in common is the main concept that knowledge is not acquired passively, as the traditional paradigms of education have pointed out, but that the subject who learns always actively participates in the construction of knowledge. The main difference between these two variants of educational constructivism is in the role that each of them assigns to the social context.

Individual constructivism starts from the internal, intrapsychological cognitive processes of the learner in the process of his learning and cognition; for that reason, some authors call it cognitive constructivism. Piaget's theory of cognitive development can be considered the basis of individual constructivism. Piaget emphasized that learning does not take place passively, but takes place through an active construction of meaning. In particular, we give meaning to this new knowledge by connecting it with what we already know - we try to assimilate it into our already existing knowledge. In this process, new knowledge is what changes and tries to fit into our already existing system. In contrast, in situations where new knowledge exceeds our ability to modify and assimilate it, we are the ones who modify and adapt to new knowledge - now we restructure our existing knowledge to a higher level of thinking, and this is called the process of accommodation (Amineh & Asl, 2015).

Example:

If I think that friends are people who are always nice, and I meet a person who is always nice to me, I will start to consider that person a friend. Which means I assimilated the new knowledge into the previous one. However, one day I will meet a person who is different because sometimes he pressures me to do my best and I try harder, and he is not always nice to me. Then I will change my scheme (definition of friendship) and I will consider friends as people who do not always have to be nice, but always want the best for us. This change may make me reconsider whether the people I used to consider friends still fit into that picture.

This change of perspective applies also to the scientific and professional knowledge, and the more students are flexible and the less teachers are authoritarian, it is easier to be achieved.

In a word, Piaget believes that knowledge is built on the basis of previous experiences of the individual, and that it is then improved in interaction with the social environment. The direction of the construction of knowledge is here from the inside out, from the individual and his intrapsychological processes to the external social environment. This implies that an individual can learn new information only on the basis of already existing structures, which implies that teaching should be adapted to individual levels of cognitive development (Milutinović, 2016).

Social constructivism, as opposed to individual, emphasizes interpersonal relationships in the process of learning and cognition. It focuses on interpsychological processes, that is, on the interaction between an individual and his environment in order to learn and develop (Adams, 2006; Kapur, 2018; Milutinović, 2011). Social constructivism is increasingly suppressing the individualized approach and today it is a much more common form of constructivism in education. It emphasizes the importance and efficiency of joint construction – co-construction of knowledge in the processes of social interaction.

The foundations of social constructivism are found in the teachings of another great development theorist - Leo Vygotsky. Studying language, opinion, and their interdependence, he came to the constructivist paradigm in which the process of cognition is socially conditioned, that is, it depends on the environment of the learner, as well as on the culture, language and context that prevail in specific conditions. More mental functions are actually internalized social relations. The direction of the construction of knowledge here is from the outside in.

Social constructivists also believe that reality is constructed through human activity, it does not even exist before people construct it in interaction with each other. As far as knowledge is concerned, it is also a product of human activity, and it is socially and culturally constructed.

Individuals create their own meaning through their interactions with other people and with the environment in which they live. Learning does not take place in isolation in the individual, nor does it imply the passive development of certain behaviors, but meaningful learning occurs when the individual is engaged in social activities. They also introduce the notion of intersubjectivity (Kim, 2001), which implies a common notion of reality among individuals whose interaction is based on common interests and beliefs, which forms the basis for their communication.

Social constructivism in education focuses on the role of social processes and cultural context in knowledge creation and learning. The way in which an individual perceives and interprets reality and his own experience in life - depends to a large extent on the social community and culture to which he belongs. The construction of knowledge is a product of social interaction, interpretation and understanding (Babić, 2007). Moreover, social constructivists believe that individuals, through interaction and use of language, share meanings and understandings of reality and thus build common knowledge, which can only then become internalized as an individual property. For that reason, the ultimate criterion for assessing knowledge, instead of objective tests, in social constructivism is considered to be consensus between several different learning subjects, that is, individuals. In other words, only those constructions around which the largest number of people from a given social group agree will be called truth or reality (Adams, 2006).

In university teaching, it is desirable to combine both types of constructivist learning. Scientific work requires deep reflection and dedicated individual work, and therefore it is necessary to give students the freedom of independent research. Using appropriate information, literature, available sources, examples, students can research, solve problems and come to significant conclusions. On the other hand, higher education is increasingly focused on the practical application of knowledge, and students must place their conclusions in the context of the state of modern society, science and the profession for which they are educated. That is why it is recommended to organize evaluation of students' work through analyzes, discussions and presentations in joint work of the whole group.

INSTRUCTION TYPES AND METHODS IN CONSTRUCTIVIST LEARNING THEORY

The mentioned theoretical views of constructivism have also found application in classrooms and influenced the shaping of instruction at all levels of education. The following table summarizes the differences between traditional and constructivist classrooms, and below, they will be explained and illustrated. These features mainly describe pre-university education, but can also be present in university teaching. It is natural that teaching at the university is more open and closer to the constructivist paradigm, but there is space for further development and a more conscious and more systematic application of this approach to university instruction.

Traditional Classroom	Constructivist Classroom
Curriculum begins with the parts of the whole. Emphasizes basic skills.	Curriculum emphasizes big concepts, beginning with the whole and expanding to include the parts.
Strict adherence to fixed curriculum is highly valued.	Pursuit of student questions and interests is valued.
Materials are primarily textbooks and workbooks.	Materials include primary sources of material and manipulative materials.
Learning is based on repetition.	Learning is interactive, building on what the student already knows.

Teachers disseminate information to students; students are recipients of knowledge.	Teachers have a dialogue with students, helping students construct their own knowledge.
Teacher's role is directive, rooted in authority.	Teacher's role is interactive, rooted in negotiation.
Assessment is through testing, correct answers.	Assessment includes student works, observations, and points of view, as well as tests. Process is as important as product.
Knowledge is seen as inert.	Knowledge is seen as dynamic, ever changing with our experiences.
Students work primarily alone.	Students work primarily in groups.

Instruction types and methods based on social constructivism emphasize the need for collaborative learning. Socio-constructivist approaches to teaching include mutual teaching, peer collaboration, problem-based teaching, and many other methods that involve learning with others. From the point of view of social constructivism, learning is effective when students are divided into groups, groups are given a problem to be addressed, and group members approach solving problems from their own perspectives that are different from each other, given that everyone comes with different attitudes and knowledge. In this way, members of the group help each other to solve the problem more efficiently and completely than if everyone worked alone, individually (Kim, 2001).

Other effective teacher-related activities in a constructivist classroom would be: providing enough time for students to interact and exchange ideas; researching the way students think in order to understand their way of thinking which would further serve as a basis for organizing future lessons; encouraging students to engage in dialogue and exchange of ideas, and to contribute to the common construction of knowledge; asking open-ended questions and insisting on explanations from students; promoting and supporting inventiveness and divergence in students' thinking, as well as encouraging students to work in teams as often as possible, etc. (Kapur, 2018; Milutinović, 2011: 187). In addition to these, other methods of cooperative learning are proposed as alternatives to traditional methods: the reciprocal teaching method, cognitive apprenticeship method, legitimate peripheral participation method, learning communities, etc. What all these innovative methods have in common is that they are based on the idea of developing situational cognition, which implies the development of authentic learning and thinking in a significant environment - in the specific context (Milutinović, 2016; Milutinović, 2011).

We will list and explain some of the instruction types and methods that are used to apply constructivist ideas in the teaching process. Those are:

Individual learning. A theory that insists on student activity will, naturally, rely on individual work. Independent individual work is done under the supervision of the teacher, but puts the student in the role of researcher. He uses his previous knowledge and abilities to create something new and thus improve his knowledge and abilities. Individual work also has a positive effect on the attitude towards work and the development of skills and abilities such as time planning, organizing activities, patience, concentration and quality control (Čolović, 2016). By applying the individual form of learning, constructivist ideas can be taken into account, such as: achieving an active position of students and respecting the individual characteristics of students and their experience.

Collaborative learning is a form of learning that uses joint problem solving, students explore agreed topics and create new ideas, combinations or unique innovations (Šefer, 2012). Working together in pairs and working in groups belong to social forms of learning. The reasons for the

application of this form of learning are numerous: enabling the acquisition of collaborative competencies, coming to better solutions, satisfying students' needs and desires for social contact, choosing content according to interest and way of learning, closer cooperation between students and teachers (Matijević and Bognar, 2005).

Team learning is one of the forms of collaborative learning. Team learning involves teams of two or more teachers and several student groups of different sizes working on a common problem. It implies flexible lesson planning and instruction, different sizes of space and time for the realization of the planned content and the use of a wide array of modern teaching aids. Students are worked with in large, medium and small groups, depending on the nature of the teaching material and the set tasks (Vilotijević and Vilotijević, 2016).

Instruction methods often used in constructivist learning are as follows:

Project based learning. As part of working on the project, students should be given tasks related to the current problem, in order to work together to determine the project goal, or a plan for solving this problem. Based on the collected information, they set hypotheses and draw conclusions, and the final phase of the project should be the practical application of the obtained results (Vilotijević and Vilotijević, 2016). Project based learning enables the selection of learning materials in accordance with the interests of students. By working on the project, students will learn how to research a certain type of problem, learn how to search for literature and other sources, to separate the important from the irrelevant, to use information, methods and theories correctly and critically. They will also acquire social skills, respect diversity and other people's opinions, acquire practical skills (modeling, use of tools or devices) and acquire entrepreneurial skills.

Problem-based learning. Solving the problem itself is preceded by a whole series of activities, and among them the most important is the observation that the situation is really problematic and the search for a creative formulation of its solution (Krsnik, 2003). The student is faced with the task of discovering new, hitherto unknown knowledge and ways of acting. Mental strain is accompanied by emotional and nervous tension, and the way out of that situation is problem solving (Vilotijević and Vilotijević, 2016).

Authentic learning method (example demonstration, simulation environment). This type of instruction refers to the process in which learning material is presented to students in real-life conditions, reconstruction or simulation. With this method, it is good to reflect the complexity of the actual conditions and avoid simplification. (Matijević and Bognar, 2005). So it could be concluded that this type of instruction is to introduce students to phenomena and processes in their real form

Cooperative learning. In the broadest sense, it can be defined as any classroom learning situation in which students of different knowledge levels work in structured groups to achieve a common goal. In these groups, they agree, initiate, plan and evaluate each other. Instead of working individually and competing with each other, students are given the responsibility of building a community in which all students participate (Jukić, 2014). In cooperative learning, the interdependence of group members is much greater than in ordinary group work in which tasks can be divided and work is partially independent.

Inquiry based learning. In inquiry-based learning, student should use classroom theoretical and practical activities to discover and understand what is important in the content he wants to master. Teacher's task is to prepare materials that students will observe, analyze, see the relationships within it, highlight what is important and come to a conclusion (Vilotijević, Vilotijević, 2016)

As we can see, the choice of teaching methods is such that they are used to create situations and enable students to experience things during which they will construct knowledge themselves. Within constructivist instruction, direct transfer of knowledge is avoided, but the great attention is paid to the previous knowledge of students because it is the starting point for further learning.

The schedule of activities in the classes should be roughly arranged as follows:

1. Starting activities should help teachers determine the level of prior knowledge. These are short warm-up activities that help to evoke knowledge about a certain problem, short initial tests, informal conversations and the like.
2. It is very important that the learning situations students are introduced to are challenging for them. Those situations should open the way to new knowledge or encourage re-examination of old concepts, i.e., to create the so-called cognitive dissonance. Students will be more active and motivated if the contents are new, interesting and applicable in professional life. This can be achieved by assigning problem situations or research tasks.
3. Main learning activity. Here, it is important to allow enough time students to deal with the given problem. This part of the class can be realised through performing an experiment, proving a theorem, opposing opinions, analyzing the literature, etc. Here, different forms and variants of individual and group work can be applied.
4. When conclusions and new findings are reached, feedback is very important. Students should be given the opportunity to evaluate and compare or practically apply the knowledge they have gained. This can be achieved through short presentations or reports, group discussions and quizzes, or through the creation of tutorials, instructions for future generations, or practical demonstrations.
5. Finally, it is necessary to evaluate the entire learning process. Students should become aware of which methods and procedures have helped them in the learning process, what were the disruptive factors and which learning techniques they could rely on in the future.

The possibility of organizing mathematics lessons based on the theory of social constructivism were explored in a school in Australia. Teachers were supported to create a learning environment in their classrooms that is in line with this philosophy. Instead of simple instruction, teachers used "math games", which were believed to be much more effective methods in terms of student achievement, information retention, increased motivation, and greater student engagement. It turned out that teachers in the process of implementing this project were in a double position: they organized classes for their students with the help of completely new methods, and at the same time they were in the position of the learner, organizing a social-constructivist exchange environment with their colleagues in order to gain new experiences and collaboration, in order to more easily master the new way of instruction. It turned out that, after certain initial difficulties, the implementation of social-constructivist postulates both in the classroom and in the cooperation between the teachers themselves was very successful. Teachers created a cooperative environment in which they could express their impressions, thoughts and experiences about the new way of instruction, exchange advice and learn from each other, and this is exactly the atmosphere they tried to create with their students in the classroom (Irvin, 2008).

THE RELATIONSHIP BETWEEN STUDENTS AND UNIVERSITY TEACHERS IN CONSTRUCTIVIST-SHAPED UNIVERSITY INSTRUCTION

Roles and position of teachers and students

An important concept for constructivist instruction is the concept of "scaffolding". It refers to the fact that the teacher, as well as other students - peers, have the role of a scaffold that serves as a support for students in the process of building knowledge and meaning, until a particular student manages to independently control their own learning process (Milutinović, 2016; Milutinović, 2011). In this sense, the teacher should: provide an environment that encourages group interaction; to discourage competitiveness and encourage cooperation and exchange of experiences, to respect the opinions and contributions of students, without assessing them as true or false; to provide the necessary resources and materials; to create a climate in which students will feel free and safe to ask and participate; to be supportive of their colleagues, at a time when and at the level required (Idaresit Akpan et al., 2020: 54).

The role of the teacher includes guiding, providing proper direction, informing and encouraging students to think and discuss, to engage. In the beginning, his role is dominant, but as the learning process proceeds and students invest in working on the problem, so the understanding that the student has the greatest responsibility for his own learning process begins to prevail (Milutinović, 2011; Vrkić Dimić, 2011). Students, therefore, are required to be active participants in the co-construction of knowledge in cooperation with their peers and teachers, and to manage their own learning. Teachers have a more important role at the beginning - to create teaching situations for cooperative learning, and later their responsibility is transformed and they are there to monitor, structure, encourage and "ignite" learning that is already largely independent among students (Bay et al., 2012). The teacher should act as a guide for students to find their own learning objectives, he is not in the center of the class but learns together with the students, leaving them enough space for self-realization.

The nature of constructivist learning requires teachers to accept that each student constructs knowledge in a different way, and that these differences stem from differences in the ways individuals collect, select, interpret, and organize information they encounter in their life (Adams, 2006). Teachers introduce different ideas about reality into instruction, and provide students with support and guidance in acquiring and placing new knowledge in their own world of meaning. They also actively adapt teaching to students, while learning themselves (Murphy, 1997). Such a relationship is actually a process whose elements are improved, students learn how to learn more successfully, while teachers, based on specific situations, learn how to teach more successfully.

Therefore, social constructivism does not imply diminishing the importance of the teacher's role in the learning process. Moreover, the teacher has a more demanding role here than in traditional instruction, in terms of organizational skills, leadership skills, creativity, skills of active discussion and dialogue, etc. Instead of a mere lecture, the teacher now mediates and structures peer interaction among students, then clarifies students' doubts, directs students' activities and leads one large group interaction down the path of "aha-experience" to new discoveries. He is an organizer, moderator and collaborator, he must know the contents, teaching aids, materials and methods, as well as understand the possibilities of his students. He must ensure that the research problems are important for students and are not related only to the needs and interests of teachers and the education system.

University teachers are expected to:

1. Introduce different ideas about reality into the instruction process, to encourage, support and guide students in the acquisition and placement of new knowledge in their own world of meaning;
2. actively model and adapt instruction to students, while learning themselves;
3. encourage and accept student independence and initiative;
4. use a wide range of learning materials and motivate students to use them;
5. understand students' understanding of concepts before explaining their own understanding of those concepts;
6. encourage students to engage in dialogue with the teacher and with each other;
7. encourage students to ask open-ended questions that do not require an unambiguous answer;
8. ask students questions and encourage them to ask questions to each other;
9. seek reflection on students' initial answers;
10. encourage conversation, discussion and dialogue among the group members;
11. enable students to understand through the application of tasks;
12. expand learning outside the lesson, classroom and the school itself.

Constructivism also puts new demands on students and changes their traditional role. The student should be able to organize their own learning activity, evaluate their work and seek advice, information and support when needed. He should also be able to upgrade, acquire, process and assimilate new knowledge and skills. This requires effective management of one's own learning patterns, and especially the ability to persevere in learning, to communicate over long periods of time, and to critically reflect on the purposes and goals of learning (Mirkov, 2011). Constructivist theory

requires that we change the need to describe reality and instead turn to students so that each of them creates their own model of explaining reality.

In university teaching that is naturally oriented towards research, critical re-examination of facts and creative reshaping of knowledge, the teacher and the student are already taking on the mentioned roles. What is needed for their consistent and continuous sustainability of these roles are adequate organization of space and time, support of modern technology and availability of adequate learning contents. Also, both teachers and students should be trained to use learning platforms, educative softwares, time management skills, communicative skills and other non-subject based competences.

ASSESSMENT IN CONSTRUCTIVIST-ORIENTED TEACHING

When it comes to assessment, constructivism has contributed to seeing academic success and failure differently. Before negatively assessing the student, the teacher will think about why the student answered incorrectly and what is the obstacle to understanding the content in the right way. When we talk about the evaluation of students' knowledge and progress in the instruction process, social constructivism requires the evaluation to be dynamic in nature - that learning is evaluated by authentic monitoring of the student's progress in social, collaborative activities. Students' progress will be positively assessed the more they engage in the activities in the social group within which they work. This includes certain qualitative techniques such as taking notes, collecting student portfolios, using non-standardized tests, etc. (Milutinović, 2011).

The constructivist approach to evaluation and assessment is, therefore, formative, not summative. Its intention is to improve the quality of learning, not to assess the level and quality of information learned. Therefore, evaluation should respond to the specific needs of teachers, students and scientific content. It depends on the context - what is effective in one class is not in another. It is also a continuous process. Teachers receive feedback from students, and then close the circle by giving students information about their achievement and opportunities to improve the learning process. It should not be used as a means to make some students happy with themselves and discourage others from ceasing to deal with certain problems. We can single out three evaluation processes that take place continuously in a constructivist school environment. These are self-assessment, peer assessment and collaborative assessment.

Self-assessment

By self-assessment or self-evaluation we sometimes imply a process in which students simply check their answers according to a predetermined assessment key and evaluate their knowledge on the test, but it is much more than that. Much more important are other aspects of the process, and these are the processes during which students monitor and evaluate their own thinking and behavior during learning and identify strategies that would help them improve learning. Self-evaluation has an effect when students evaluate their work and notice discrepancies between the achieved and the desired result. This aspect of self-improvement can be achieved in outcome-oriented education, which clearly defines learning goals and objectives and points to learning and teaching strategies that can contribute to improving outcomes. In essence, this means that students should first identify their learning strategies and the outcomes they have achieved, then evaluate them based on clearly defined standards and criteria, then decide what steps they will take to improve them, and finally continue to follow the process with new strategies in place. This establishes a cyclical and self-sustaining system that leads to constant progress.

Self-assessment is extremely important because it is an integral part of the learning process. It relies on man's natural tendency to keep track of how far he has progressed in a particular activity. In addition, learning is possible only if the student has understood what else he needs to learn. In the end, it is important for motivation because it gives the student a sense of control and is important for

understanding their own learning process, awareness of their strengths and weaknesses and opportunities to improve them.

Peer assessment

Peer assessment has several variants, but in essence it means getting feedback about your work from peers. This is a process to which we have been constantly exposed since we were little, because those who are engaged in the same activity are naturally interested in our work. They understand best the problems we face and the opportunities we have. Some authors (Falchikov, 2007) believe that this process is not recognized because it is suppressed in the traditional classroom due to the central role of the teacher, where evaluation is one of his main activities. However, it brings multiple benefits: it encourages collaborative learning and gathers students around a particular problem by asking them to assess what has been good for them. It increases the level of concentration in the classroom and leads to discussion. Finally, students who evaluate the work of others practice judgment, drawing conclusions, and making many intellectual and social choices.

Collaborative evaluation

Collaborative assessment/evaluation is a process closely related to the problem-solving process. One of its biggest advantages is that all people who work on solving problems are invited to participate, so that the focus is on the problem, and not on the people. This frees individuals from responsibility and prevents blame from being shifted from one person to another, which is a very harmful practice, and yet certain shortcomings, misjudgments or actions can be pointed out and a better solution sought. Another significant positive aspect of this type of evaluation is that new solutions are reached by those who are already involved in the process and interested in a favorable outcome. This is in contrast to the situation where experts who simply observe the process give suggestions in a much more natural and acceptable way. Collaborative evaluation strives for useful and practical goals, rather than assessments, diagnoses, and classifications of participants.

The most common assessment tools in constructivist teaching

Since the constructivist approach takes into account students' prior knowledge, focuses on their problem-solving skills and seeks to develop the potential for collaborative learning, it cannot rely on standard methods of evaluating student achievement. Traditional tests would not show what skills should be developed, and therefore assessed. To evaluate the outcomes of constructivist learning method, it is necessary to use a much wider range of evaluation techniques and instruments, such as open problem solving, analysis, critical assessment, application of knowledge in problem situations, oral and written expression. Also, the constructivist paradigm requires that student academic success and their contribution to group success be evaluated (Sheppard, 2000). For that reason, evaluation and assessment is a very complex and demanding task. In the following section, we will list some of the evaluation models and tools that are used.

Portfolio is a collection of student papers collected during one or more semesters that track the development of knowledge and understanding of certain problems within a scientific discipline, but also tracks the development of writing and speaking skills, terminology mastered, structured and systematic presentation skills, use of scientific literature and research techniques, etc. Portfolio is one of the most proper ways to track achievement in constructivist instruction for several reasons: it helps students themselves to see their own progress and gain insight into what they have managed and what they have failed to achieve. It provides the teacher with an insight into the speed of progress and the overall knowledge of students, and during the instruction it highlights student weaknesses, bad habits, etc. which can be corrected. Thus, the learning outcomes and the learning process are evaluated through the portfolio. The portfolio also provides individualized access to content and the opportunity for critical and creative expression of students. It is also important that this method of evaluation is not aggressive and does not cause stress, so the effects of anxiety are neutralized. However, since it is a free form, it is necessary for the portfolio to determine the criteria by which it will be evaluated and

the elements it must contain. These criteria must be clearly defined and presented to students. Finally, the portfolio can be a starting point for discussions which will further contribute to its formative role.

Assessment rubrics are sets of criteria for student evaluation that are most often given in tabular form. They facilitate and speed up this process, and at the same time they are clear and enable quick feedback. Task descriptions and criteria and expectations are entered in the empty table. They represent a descriptive form of evaluation and are in line with the outcome-oriented approach. The most common elements of these evaluation tables are: Evaluation criteria, quality definition and scoring strategy. These evaluation procedures and techniques often need to be combined with much more traditional techniques such as tests. In general, even constructivist teachers need more objective assessment methods, but they also use these methods because they create a balance in their evaluation processes.

USE OF MODERN TECHNOLOGY AND CONSTRUCTIVISTIC INSTRUCTION

In the constructivist classroom, the use of modern technology is considered very important. Technology supports the construction of knowledge in many ways and facilitates the organization of the learning process. We have already emphasized that the teacher has a great responsibility in organizing the instruction process and that he must create an environment that will activate students' prior knowledge, help them discover new information and give them meaning, and finally enable adequate evaluation of learning objectives and processes. At each of these steps, modern technology is the most important support to teachers (Isik, 2018). And not just teachers, it is a significant support to students and provides them with a much higher level of freedom of independence and activity and thus supports the whole learning process.

For example, in activating previous knowledge, the teacher can use a short video clip, a series of pictures or a movie. This will remind students of previous experiences or knowledge, and if students do not have them, it will provide them with a basis for future learning. In addition to the obvious advantages such as fast access to information and individualization of the pace of learning that technology allows, its importance for evaluation should be highlighted as well because it ensures very fast and accurate feedback, first to the student and then to the teacher. Furthermore, we must emphasize its role in the formation and development of higher mental functions and higher-order cognitive skills such as critical and creative thinking.

Finally, the great advantage of technology is in facilitating communication and collaborative learning. Whether it is via email, online meetings, discussion forums, online collaborative whiteboards, etc., the possibilities of communication, information-sharing and collaboration are simply inexhaustible. The use of modern technology supports the most important aspect of constructivist teaching, that is, independent activity and independent construction of knowledge. It, above all, motivates students to work independently, and then to share their experience.

CONCLUSION: CONSTRUCTIVISM AND MODERN UNIVERSITY INSTRUCTION

In a society of rapid technology development, social change, and the expansion of information flow, it is essential that students develop skills that will provide them with lifelong learning, cognitive flexibility, and a willingness to be engaged and creative. This means that they are expected not only to know and understand existing concepts and practical abilities, but to search for new knowledge, overcome acquired routines, rethink concepts and ideas they know, and adapt to changing circumstances.

Constructivist pedagogy is necessary and possible in higher education. Students already have certain skills, have certain knowledge and it is assumed that they have developed responsibility for their own learning and independence in learning. This basis needs to be upgraded. University students, as adults and mature students, should be engaged in the active construction of knowledge, cooperative learning and need to be put in real-life situations from which they will gain experience

and learn. This constructivist approach is often called holistic approach (Al-Huneidi & Schreurs, 2012) because it is integrated into the daily personal and professional life of students, with the goal of developing into a self-sustaining system.

However, university instruction is still predominantly traditional and is based on lectures and knowledge transfer. In order to overcome this problem, it is necessary to introduce as many elements of constructivist-oriented instruction as possible and strive to spread that model in university classrooms. The use of modern technology will facilitate this process and pave the way for many forms of instruction that can be permanently maintained in teaching practice, such as cooperative learning, blended learning and problem-based learning. Finally, let us recall the benefits of the constructivist approach and why it is desirable at the university level:

1. Develops thinking skills;
2. Encourages students to consider different possibilities and perspectives in solving problems;
3. Develops flexibility in thinking;
4. Engages students' prior knowledge so that they constantly integrate old and new knowledge. Due to the fact that groups of students are not homogeneous in terms of cultural and social context from which they come, opportunities open up for access to many resources and different perspectives;
5. Students can link the learning material with their real-life situations and experiences;
6. Students learn to support knowledge with evidence, reconsider ideas and oppose alternative views;
7. Students engage mentally, in order to understand and systematize their ideas about the world;
8. Students experience insights that go beyond ordinary learning and recognize the implications for practical use of knowledge;
9. Communication and social skills are developed;
10. Students learn to articulate their ideas clearly, to participate in the exchange of ideas and to cooperate with others in reaching final conclusions. This is a skill that is essential for success in a real life environment;
11. Alternative evaluation methods are encouraged;
12. Evaluation through grade books, reports, modeling, art creations, allows students to express their knowledge in different ways. This helps them retain this knowledge and makes it easier to transfer it to real-life situations,
13. Internal motivation for learning is encouraged;
14. Students' authentic view of the world is appreciated. It builds their self-confidence;
15. The advantages of modern technology are used.

Given all of the above, including these benefits of constructivist instruction, university teachers should be motivated to use this approach in their classrooms. The transition to constructivism can be done gradually, by connecting the traditional with the constructivist paradigm by combining problem-based learning and research that focuses on gaining thorough insight and the conceptual system of subjects (Mirkov, 2011). In some phases of the learning process, traditional methods can be used (introductory phases, recapitulation of what has been learned), while in other phases, research and discovery methods can be applied. Some important section of the learning material (key concepts and connections) can be studied more thoroughly, through research and problem solving. One part of the material can be researched, and the other can learnt informatively through discussions between the research teams of students.

In the field of higher education, constructivist pedagogy is therefore both necessary and possible. Students have already mastered certain skills, possess certain knowledge and it is assumed that they have developed responsibility for their own learning and independence in learning. This basis needs to be upgraded. Students, as adults and mature learners, should be engaged in the active construction of knowledge, cooperative learning and put in real situations from which they will gain experience and learn. The constructivist approach is often called holistic (Al-Huneidi & Schreurs,

2012) because it integrates into the daily personal and professional life of students, with the goal of developing into a self-sustaining system. This makes the use of a constructivist educational paradigm even more justified.

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