

Type of the Paper: Original scientific paper

Received: 8.1.2022.

Published: 31.1.2022.

DOI: <https://doi.org/10.18485/edtech.2022.2.1.3>

UDC: 378.014.5(497.11)

Application of learning outcomes in the teaching process in higher education at ITS

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Summary: The paper first summarizes the concept and importance of learning outcomes, and then presents data on the said concept as defined in the Law on Higher Education, Law on the National Qualifications Framework of the Republic of Serbia, as well as the accreditation standards for higher education, standards and guidelines for self-evaluation of higher education institutions and study programs in the Republic of Serbia, and finally, instructions for review committees for assessing compliance with standards. Second, the paper lists the activities undertaken at the Information Technology School - ITS to apply learning outcomes in the teaching process, as well as the results of a survey conducted on two generations of students on the usefulness of learning outcomes, which justify their application at school period/class level.

Key terms: quality, higher education, learning outcomes, school period/class.

1. Introduction

Learning outcomes are implemented as a method for increasing the quality of higher education in Europe and the world [1].

They are commonly defined as statements that describe the knowledge or skills a student should acquire by the end of a particular assignment, class, course or program [1, 2]. Study programs, courses, lessons, exercises, teaching content, teaching material, teaching methods, learning methods, assessment methods, etc. are formed in line with the learning outcomes. Our experience at the Information Technology School shows that clearly defined and communicated learning outcomes help students in choosing and mastering study programs and courses. According to the accreditation standards for higher education, educational institutions are obligated to define learning outcomes for each course/subject..

Fulfilling learning outcomes demands independent student work, among other things, and all that is the basis for assigning an appropriate ECTS (European Credit Transfer System) value to a course [3].

Well-defined learning outcomes should contain a verb that describes expectations from a student after completing a learning cycle (what he/she knows/is able to do). The list of these verbs should be harmonized with Bloom's taxonomy of learning objectives [1].

The paper briefly summarizes the concept and importance of learning outcomes, listing all the laws and accreditation standards in Serbia where the concept is mentioned, as well as activities undertaken at the Information Technology School to apply learning outcomes in the teaching process, and finally, presents the results of a survey conducted in the same institution on two generations of students on the usefulness of learning outcomes, and basic conclusions arising from its results, and recommendations for teachers.

2. Learning outcomes in the laws and accreditation standards of the Republic of Serbia

With regard to the Republic of Serbia, learning outcomes as a concept are mentioned in the Law on Higher Education, Law on the National Qualifications Framework, and bylaws, such as Standards and Instructions for Accreditation of the First and Second Level of Higher Education, Standards and Instructions for Accreditation of Higher Education Institutions (faculties, colleges, and vocational colleges), Regulation on Standard for Self-evaluation and Quality Assessment of Higher Education Institutions and Study Programs, and Instructions for Review Commission for the Assessment of the Fulfillment of standards for the Initial Accreditation of Higher Education Institutions and Study Programmes, which indicates their significance.

Learning outcomes are mentioned in Articles 34, 38, 132 and 154 of the Law on Higher Education of the Republic of Serbia [4]:

- » Article 34, which refers to types of studies, paragraph 4 reads as follows: "For the purpose of professional training of persons who have acquired secondary education, aimed at inclusion in the work process, a short programme of studies, which has a clearly defined structure, purpose and learning outcomes, and for which a certificate of completion of the short programme of studies and acquired competence is issued, shall be performed."
- » Article 38, which refers to study programs content, states in item 3 that a study program, among other things, shall determine "outcomes of the learning process in line with the law governing the national framework of qualifications"
- » Article 132, which refers to the recognition of a higher education document for the purpose of continuation of education, paragraph 2 reads as follows: "Within the procedure referred to in paragraph 1 of this Article, the continuation of education and the enrolment of the higher educational degree, can be conditioned by the obligation of acquiring additional learning outcomes or rejected thereof, if determined that there is an essential difference between the type and level of the acquired knowledge and skills and the conditions for the enrolment in a specific study programme."
- » Article 154 specifies that "until the adoption of the law on the national framework of qualifications (which was adopted in the meantime), the higher education institutions shall determine the outcomes of the learning process referred to in

Article 38, item 3) of this Law in line with the regulations which were adopted until the entry into force of this Law.”

In the Law on the National Qualifications Framework of the Republic of Serbia [5], learning outcomes are mentioned in Articles 2, 3, 4, 6 and 22:

- » In Article 2, General Terms and Definitions, the terms qualifications (which mentions the concept learning outcomes) and learning outcomes are defined:
 - » “Qualification – formal recognition of acquired competences. An individual shall acquire a qualification when a competent body determines that he/she achieved the learning outcomes of a certain level, corresponding the designated qualification standard, as acknowledged by a public document (a diploma or a certificate)”
 - » “Learning outcomes – are distinct statements of what an individual is expected to know, understand and be able to demonstrate and/or perform after having completed a learning process. They allow for the verification of levels of acquired competences and/or obtained knowledge, skills, attitudes and abilities”
- » In Article 3, NQFS Objectives, the third objective refers to learning outcomes, stating that: “ensuring the focus of entire education on learning outcomes that underpin the competences defined by the standard related to a particular qualification”
- » In Article 4, NQFS Principles, the ninth principle is “Quality Assurance – managing the process of qualification development based on learning standards and outcomes, including the quality system with respect to the process of qualification acquisition and assessment”
- » Article 6, Descriptors of Qualification Levels, reads as follows: “Each level and sub-level of qualifications referred to in Article 5 hereof, have been assigned a descriptor required for performing a job or for further learning. The qualifications are classified per levels, based on the complexity of learning outcomes.”
- » Article 22, Responsibilities of Sector Skills Councils, states that Sector Skills Councils shall “provide opinion on expected outcomes of knowledge and skills within the sector”.

The term learning outcomes is mentioned in the documents referring to accreditation standards on two occasions, namely in:

- » Standards and Instructions for Accreditation of Study Programs of the First and Second Degree,
- » Standards and Instructions for Accreditation of Higher Education Institutions (faculties, colleges and vocational colleges).

Learning outcomes are mentioned in the following standards within the Standards and Instructions for Accreditation of Study Programs of the First and Second Degree [6]:

- » Standard 1. The structure of the study program,
- » Standard 4. Competencies of graduate students,
- » Standard 5. Curriculum,
- » Standard 15. Distance learning.

In the Standards and Instructions for Accreditation of Higher Education Institutions and Study Programs [7], learning outcomes are mentioned within the following standards:

- » Standard 4: Studies,
- » Standard 13: Access to Information of Public Importance.

In the Regulation on Standard for Self-evaluation and Quality Assessment of Higher Education Institutions and Study Programs [8], learning outcomes are mentioned in the following standards:

- » Standard 4: Quality of the study program,
- » Standard 5: Quality of the teaching process,
- » Standard 8: Quality of students.

U standardu 4 se pojam ishodi učenja pojavljuje veliki broj puta.

The term learning outcomes features repeatedly in Standard 4.

In the document Instructions for Review Commission for the Assessment of the Fulfillment of standards for the Initial Accreditation of Higher Education Institutions and Study Programmes [9], learning outcomes feature within the following standards:

- » Standard 1. The structure of the study program,
- » Standard 4. Competencies of graduate students,
- » Standard 5. Curriculum,
- » Standard 15. Distance learning.

Learning outcomes are also mentioned in other documents for reviewers, but we will not list them here.

Learning outcomes can be defined for scientific discipline at all levels: global level, regional level, state level, level of education, study program, course, teaching unit and lesson/class (Figure 1). However, in line with the requirements of the Standards and Instructions for Accreditation of Study Programs of the First and Second Degree, learning outcomes in Serbia must be defined at the level of a course/study subject. In addition, the self-evaluation report requires mapping courses/subjects by learning outcomes. It would be logical to perform mapping according to the learning outcomes of a study program, but when it comes to study programs, standards do not mention learning outcomes, but competencies instead.

By passing the Law on the National Qualifications Framework, which uses the term qualifications with regard to learning outcomes, Serbia has linked its national framework with the European qualifications Framework.

Accreditation documents do not mention learning outcomes at other levels, except the course/subject and study program level (study programs mention competencies), but it would make sense that a teacher teaching the given subject would define learning outcomes for each class/lesson, in line with the subject/course learning outcomes.

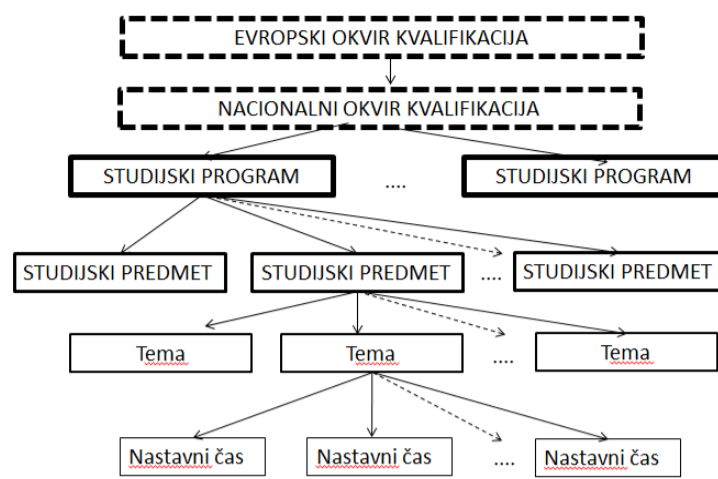


Figure 1. Structure of learning outcomes

3. Application of learning outcomes at ITS

The Information Technology School – ITS has paid great attention to learning outcomes ever since 2010 and its first accreditation in 2007. Learning outcomes have been written for all study programs and courses/subjects, which is one of the requirements in the preparation for accreditation. During the preparation of the self-evaluation report for 2012, all courses (both compulsory and elective) were mapped according to the categories of competencies (general, subject-specific), which were considered learning outcomes for study programs Information Technologies (IT) and Electronic Business (EB), and in 2014, for new study programs, Organization of Business Systems (OBS), and Computer Multimedia (CM), something ITS was obligated to do according to the self-evaluation instructions.

In order to fully realize this process, we believed that the writing (and implementation) of learning outcomes should continue, from the level of course topics to the level of individual lessons/classes. Needless to say, learning outcomes should be in correlation with topic outcomes, and course outcomes in correlation with the outcomes of a study program. Therefore, they had to be developed from the level of the study program and course to the level of the lesson.

This is why, learning outcomes have been written (7-10 outcomes per lesson) for each teaching unit (which corresponds to a 45-minute school period), first for Information and Internet Technologies, followed by Computer Networks and Information Systems Reliability courses, and communicated to students at the beginning of each lesson since 2013/2014.

Due to the significance of the application of learning outcomes in the teaching process, and in order to extend this approach to other study programs, workshops for teachers were organized, where they could learn how to write learning outcomes, and perform assessment in line with them. The importance of learning outcomes was mentioned in a blog post (Student, instead of teacher, in the focus of educational process) from December 2013 [10], and another from March 2016, titled Learning outcomes = What material will be covered in the exam? [11].

The need for the application of learning outcomes have been recognized by others as well, so at their request, a lecture was held at the Conference of Academies for Applied Studies in 2016, and the presentation is available on the website [12].

4. Application of learning outcomes in the classroom at ITS

As already mentioned, learning outcomes were written for each class/lesson of Information and Internet Technologies, Computer Networks and Information Systems Reliability courses, and implemented throughout the semester. After that, a survey about the Information and Internet Technologies was conducted among students of two consecutive years of study, i.e. two generations.

Students were encouraged to use the written learning outcomes for the Information and Internet Technologies course, by outlining the learning outcomes for each lesson in the presentation, and providing a certain number of questions to check these outcomes at the end of the presentation. The outcomes for each lesson comprise 7-10 outcomes, but there are usually 5 questions at the end of each lesson, so not all outcomes are covered by these questions.

Thus, starting from the learning outcomes given at the beginning of the lesson (teaching unit), a student can identify which learning outcomes are covered by the questions for reviewing the lesson, and which are not.

When testing knowledge, i.e. fulfillment of the learning outcomes in a test, colloquium and/or exam, 70% of the questions given after each teaching unit feature in the test, as well as 30% new questions which still refer to the content of the given teaching units. Students can guess the teaching units from which these 30% of questions will be derived based on the learning outcomes, which motivates them to learn, because they know what content will be tested and what they are expected to know, and it is well-known that students primarily learn content that is expected to feature in the exams.

Experience shows students will, as a rule, learn those things they believe or expect to be featured in an exam, instead of the content defined in the curriculum, or even content covered in class [13, 14]. Therefore, why not given them clear information about what they are expected to learn, because after all, this is defined in the learning outcomes of the course/subject (as a requirement of the accreditation standards). The only thing that remains is the implementation in everyday teaching, i.e. defining learning outcomes for each class/lesson.

In other words, a student who is familiar with the learning outcomes has a clear idea of what awaits them during knowledge assessment (colloquia, final exams, etc.).

Of course, this requires additional effort on the teachers' part. They should be well-acquainted with the learning outcomes of their subject defined during the accreditation, and consistently develop them for each topic, and each lesson/teaching unit. There are numerous recommendations and tips on how to write learning outcomes, for example in [13, 14]. We will mention some for illustrative purposes: begin each learning outcome with an active verb; use a single verb for each learning outcome; avoid non-operational concepts such as to know, to understand, to learn, to be familiar with, to be aware of, because they refer to

learning goals rather than learning outcomes; learning outcomes must be clear and measurable; they must be such that they can be assessed (it must be possible to measure their fulfillment); whether they can be achieved in the given period, etc.

On the other hand, well-defined learning outcomes [13, 14] help teachers to tell students more precisely what is expected of them; to choose appropriate teaching methods consistent with the learning outcomes; to establish appropriate methods of knowledge assessment consistent with the learning outcomes; to prepare the teaching material more efficiently, because the learning outcomes serve as a guide, etc. If there are defined learning outcomes for each lesson/teaching unit and questions for reviewing that lesson, it is easier to determine whether these questions really test the adoption of the teaching content covered in the lesson, and defined in the learning outcomes.

Teachers were not interviewed, although we believe that it would be useful to learn their views on this matter as well. A brief insight into the teaching material of randomly selected teachers shows that almost a half of the teachers did not adopt the approach where they communicate learning outcomes for each teaching unit/lesson to students, and even those who use different approaches, or incorrectly defined learning outcomes. Therefore, there are reasons to continue with the workshops which train teachers and motivate them to implement teaching material through pre-defined learning outcomes for each lesson/teaching unit.

To check if students understand and accept the approach where the learning outcomes for each teaching unit are defined and communicated in advance, we conducted an anonymous survey among two generations of students.

5. Results of the survey on the application of learning outcomes at ITS

The survey was conducted in 2016 and 2017 for the Information and Internet Technologies course, among two generations of Year 1 students, after the 2nd colloquium [15–18].

In 2016, the sample comprised 132 students, and in 2017, 150 of them. Both times, the questionnaire included the same 4 questions, the first of which was whether the student took and passed the 1st colloquium. The percentage of students who passed both colloquia in this course is rather high (between 80% and 90%).

The results of the other 3 questions regarding learning outcomes are summed up in Table 1, by providing comparative data, first for the 2016/2017 survey.

The numerical results in Table 1 show that about 90% of students from both generations believe that learning outcomes have indeed helped them, completely or to a certain extent, although there are differences between the two groups.

The percentage of students who stated that they did not use learning outcomes at all was under 10%.

The situation is similar when it comes to the identification of those 30% of questions that do not appear at the end of the teaching units, but are featured in the colloquia and exams.

When asked “Do you believe that it is useful to have written learning outcomes for the course/subject, based on which you know what you are expected to learn, and what will be covered in the exam?”, about 4% more students answered positively in 2017 – 84,67% (compared to the previous year 78,79%), whereas only 0,7% (as opposed to 3% in the previous year) answered negatively, and 14,67% (as opposed to 18,18% in the previous year) was undecided.

Overall, the results of the survey on a significant sample (about one third of the total number of Year 1 students in all study programs, i.e. three quarters of students in the Information Technologies program) show that students use learning outcomes (provided that they have them in writing for each teaching unit, i.e. lesson), that they find them helpful with regard to what they should learn, what to expect in exams/tests, and what material will be covered in exams/tests. In addition, more students stated that they find defining learning outcomes for the course useful, because they know what to expect, what to learn, and what will be covered in exams in 2017 than in the previous year, which shows that they understand the importance and usefulness of learning outcomes.

No.	Question	Answer No.	Answer %	% Answer %
1	I used learning outcomes written for the course/subject:			
	a) all the time	55/41	41,98/27,52	90,83/88,59
	b) occasionally	64/91	48,85/61,07	
	c) never	12/11	9,16/7,38	
		131/149		
2	Learning outcomes helped me identify 30% of the questions featured in exams and colloquia, but not at the end of the teaching units:			
	a) to a great extent	62/58	48,06/36,25	93,8/88,25
	b) to a certain extent	59/78	45,74/52	
	c) not at all	8/14	6,2/9,33	
		129/150		
3	Do you find it useful to have written learning outcomes for a course, based on which you know what you are expected to learn, and what will be featured in the exam?			
	a) Yes	104/127	78,79/84,67	
	b) NO	4/1	3,03/0,7	
	c) I'm undecided.	24/22	18,18/14,67	
		132/150		

Table 1. Students' answers to the questions regarding learning outcomes (data given in the form 2016/2017) [18]

6. Conclusion

Learning outcomes have been introduced into laws (Law on Higher Education, and National Qualifications Framework), and standards for accreditation and self-evaluation of higher education institutions and their study programs, and accepted as a method of increasing the quality of higher education. The laws and standards for accreditation and self-evaluation obligate higher education institutions to apply them. As teachers have a key role in higher education institutions, it is crucial that they are familiar with the essence of learning outcomes, and apply them in the teaching process, not only at study program level, but also at the level of the lesson/teaching unit, i.e. that they are fully implemented at all levels of the teaching process. This is why the Information Technology School has undertaken several activities (mapping courses according to the outcomes of study programs, writing learning outcomes for each lesson/teaching unit, organizing workshops for teachers and associates dedicated to writing learning outcomes and performing assessment in line with the learning outcomes).

The surveys conducted among students about the use of learning outcomes for each teaching unit/lesson show that students use the previously communicated learning outcomes, that they help them understand what is expected of them, and what knowledge will be tested in exams, i.e. what they should learn. In addition, students find written learning outcomes for each subject/course useful, because they help them identify what they are expected to learn.

This survey only included students, but it would be useful to interview teachers as well, and learn their attitudes, experiences and problems regarding learning outcomes. An insight into the teaching material of randomly selected teachers shows that some teachers still haven't adopted the approach to communicate learning outcomes for each teaching unit/lesson to their students.

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