

AMURCON 2020
International Scientific Conference

**EXPECTED LEARNING ACHIEVEMENT DEVELOPMENT FOR
GENERATING ANALYSIS AND PERFORMANCE COMPETENCE**



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Abstract

This paper covers the subject matter and content of the learning achievement. The study aims at defining the basic content of learning achievements and the awareness of a general idea of the learning result as well as a definite model, a criterion for achieving it by a student. The authors apply Bloom's Taxonomy enlarged by various researchers to investigate learning achievements. The research is determined on the mathematics content for students of 10 - 11 grades, provided by the State Standard for General Education institutions of the Kyrgyz Republic. The authors examine the correlation of this concept with an educational goal. They also review the components of the learning result, the levels of achievement, and the notions of Bloom's taxonomy. The authors study the dependence of the learning result on educational content and correlation of principal terms with the achievement levels. The authors conclude that using learning achievements in education in a targeted way let students be active participants involved in evaluating their educational achievements. The finding is that the exact description of learning achievements is the key of achievability. The authors identify that learning results become students' monitored learning achievements, expressed in terms of competence resulted in resolving problem situations.

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Keywords: Multimedia technologies, academic activity, mathematics, multimedia learning system, competence



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1. Introduction

More than ever, the contemporary society centres all its expectations, predictions and future prospects for the development and improvement of education system. Indeed, fundamental changes in all fields of public life, including information technology changes, make it necessary to correct the current educational system and set new challenges for it. Nevertheless, the main criterion to assess the effectiveness of academic performance is its result, that is, the level of education and quality of students' knowledge.

In the adopted State Educational Standard of Comprehensive Secondary Education, there is a reinterpretation of educational result assessment, revision of principle concepts, for example, the concept of accomplishments and performance level are transformed into one of skills/ expertise and competency, and activity techniques into the competency-based approach, which is results-driven (Gosudarstvennyy obrazovatel'nyy standart..., 2014).

After declaring the competency-based learning approach focused on the final result, the efforts have strengthened to find out the role of the learning result and determine its nature (Kaldybaev & Zhunusakunova, 2016). However, it is worth noting that learning results are not a new concept for education. What is more, after the introduction of the concept of learning, it becomes clear that any learning process ends when a certain result is achieved.

In 1956, Bloom identified the issues concerning learning achievements as a consequent of mental activity in academic activity, and later in the 80s of the twentieth century, Mager (1984) as a consequent of carried out training efforts to teach students. The scientists have already made some certain progress in developing the evaluating learning result issues. Several studies have been carried out on different issues of operating procedure development that contribute to the correct texting and evaluation of learning results. The authors of them are Adam (2004), Baydenko (2009), Gibbs et al. (2012), Gosling and Moon (2002), Kennedy et al. (2007), Shea et al. (2016), Pavlovskaya and Klimenko (2018), Browne et al. (2020), Swanson et al. (2019), Hero and Lindfors (2019), Edinger (2020), and others.

2. Problem Statement

According to theoretical scientific works and practice (Deychman et al., 2016; Predmetnyy standart..., 2019), priorities and indicators for achieving the quality of education are determined as a set of elements of the environment that should ensure the achievement of new targeted results. While the field of learning results has not been defined clearly yet, learning results are qualitative and not operationalizable to assess the quality of education. It is the area of introducing learning results and competencies into student curricula where there are no concept solutions and base practice. Finally, it is necessary to determine the foundations of learning achievements and conversion from a general idea of the learning result to a proper model, the criterion for a student to achieve, an operational definition and specialized learning goals.

3. Research Questions

Here are some definitions related to the concept of learning achievements. Learning achievements are definitions of what the learner is supposed to know, understand, and/or be able to apply after completing

the learning process (ECTS Users' Guide, 2005). Learning achievements are definitions of what students are thought to be able to do as a result of their academic activities. (Jenkins & Unwin, 2001). Learning achievements imply a means of rating the competence level (Winterton, 2009). It is necessary to specify the learning achievements, give precise definitions of what students will need to know, understand and/or be able to show at the end of an education course or a part of it, and determine the actual learning achievement that contributes to obtaining competencies.

4. Purpose of the Study

The purpose of the study is to determine the foundations of the learning achievement content and conversion from a general idea of the learning result to a particular sample, a criterion for a student to achieve.

5. Research Methods

The authors use Bloom's taxonomy that is enlarged by various scholars to determine learning achievements (Bloom, 1956). The main focus of the study is on grades 10-11. The subject content corresponds to the Standard on Mathematics subject for grades 5-9 and 10-11 for Comprehensive Education institutions in the Kyrgyz Republic (Predmetnyy standart..., 2019).

6. Findings

In the competency-based approach to learning, the main task is considered to set goals through the learning achievement. In this case, the learning goal characterizes the student's activities at the end of learning (Kaldybaev, 2016). It stands to reason that student's work should be noticeable after completing the education. Here, the most important thing is to translate the learning result into practices. As a basis for dividing learning achievements into groups, the authors view Bloom's taxonomy, which is a classification of levels of mental activity in learning. It provides a ready-made structure and a list of verbs (questions of actions) that help determine certain learning goals (Bloom, 1956). Bloom's original list of verbs was limited and therefore enlarged by different authors for years (Table 1).

Table 1. Examples of verbs used to describe learning achievements

Knowledge	Understanding	Usage	Analysis	Synthesis	Assessment
Cite	Define	Apply	Analyse	Systemize	Assess
Enumerate	Point out	Compute	Evaluate	Assemble	Convince
Give a definition	Explain	Classify	Compare	Compile	Select
Illustrate	Differentiate, characterize	Show, prove	Categorize	Make up, Write	Compare and distinguish
Identify	Discuss, concretize	Act out	Argue, dispute	Construct, design	Criticize
Make a list	Give a talk	Modify	Display	Create, produce	Define, establish, find out, make a decision
Entitle, denote	Interprete	Examine, explore	Subdivide	Work out a model/sample	Appraise, value, name the price
Report	Review	Change	Diagram	Algorithmize	Think out

According to Kennedy et al. (2007, 2009), one should begin writing learning achievements with the verb of action, followed by the object of this verb. It is very important to match learning achievements, teaching and learning activities, as well as assessment.

It is necessary to solve for the learning achievement according to the efficiency levels in advance. This allows an educator to track the entire learning course. The performance level marks the students' skill to digest the academic content, the experienced quality acquired while their training, and, consequently, the quality of activities that students can perform as a result of training. The mathematics standard contains elements of principal and educational competencies. Each of them is decoded as activities for students. They are divided into three levels according to quite a difficult task assigned. The first level specifies students' ability to complete the task as in a model (performing according to a given pattern). The second level attributes the application of the learned algorithm in other cases, where students show the ability to do just a constituent activity. The third level includes a complex activity the students can do and make something up on their own and give explanations. Every expected result can be achieved at three levels. Table 2 shows the learning levels and an example of expected learning achievements and their achievement by the learning level.

Table 2. Learning Achievements on Mathematics

Level 1 (reproductive)	Level 2 (productive)	Level 3 (creative)
Student: - understands the main content of mathematics data presented in the textbook and/or presented by a lecturer; - able to solve mathematical problems and exercises similar to those that were observed in the classroom or the coursebook; - can find the necessary information on the appropriate topics of the course content, apply them in simple situations and present their solutions.	Student: - has an algorithm for solving mathematical problems and exercises, techniques of transmitting information; - can apply mathematical theory/models correctly, laws, formulas and rules when solving problems. - understands the key point of the mathematical object, using reasoning, distinguishes the concept from the general, solves problems for special cases, without transferring the reasoning to the general ideas; - has mathematical skills necessary for everyday life, for studying other subjects and continuing studies.	Student: - can draw analogies and main differences between mathematical structures and objects; - able to analyze mathematical information, evaluate it, and put to practice use; - able to apply maths knowledge and skills of problem-solving in new conditions and other branches of learning; - has logical practices of mental activity (analysis and synthesis, comparison and analogy, etc.) and uses them to establish relations between mathematical objects; - able to plan and carry out research, analyze results, and summarizing.
10th grade A substantial part: functions, equations, and inequations. Subject competence: analytical and functional.		
Expected result: applies equations and inequations and their systems when solving problems. Indicators of their achievement: leads to a standard form and solves equations; derives an equation or system of equations in two unknowns in problems describing real-life situations and solves; interprets the solution taking into account the content of the problem.		
Level 1 The result is achieved if a student can adjust for the standard form and solve quadratic equations.	Level 2 The result is achieved if a student can solve a problem like the one	Level 3 The result is achieved if a student can solve a problem like the one

$(x-3)(x+2) = 6.$	below by setting up a quadratic equation. Getting each of the two square sides longer by 3 cm, we got a rectangle which has an area of 21 square cm. Define the square perimeter.	below by setting up a quadratic equation. Asan left city A for city B. At the same time, Usen left B for A. How much did it take for each person to get to their destination, if it is known that they were moving at a constant speed, met in 2 hours and 6 minutes, and Asan had spent for 4 hours more on his way to city B?
Grade 11.		
A substantial part: functions, equations, and inequations. Subject competence: analytical and functional. Expected result: defines basic concepts of mathematical analysis and applies them to solving applied problems.		
Indicators of their achievement: understands and can use the primitive to calculate the value of a certain integral using Newton and Leibniz integral rule; solves for the shape area bounded by function graphs; models the simplest problems and solves them using a certain integral.		
The result is achieved if a student can calculate the value of the integral $\int_0^2 (x^2 + 3) dx.$	The result is achieved if a student can calculate the shape area bounded by the function graph $-x^2 - 2x + 3$ and the abscissa axis.	The result is achieved if a student can solve the problem: identify producer surplus, as well as the consumer's gains, if supply and demand of the product are set by the functions $p = 22 - q^4$ и $p = q^2 + 2.$

When learning is focused on the final result, feedback makes much sense. An educator and a student can get information about the status of each goal and task to be completed through it. According to this information, the lecturer can track students' actions to achieve the goal. Focus on the final result determines the study of the students, making corrections in learning. The subject standard in mathematics provides methods for evaluating academic achievement at the end of each Chapter (Predmetnyy standart..., 2019).

Therefore, the result of training depends on many factors (the purpose of training, the course content, methods, teaching means and forms, teacher-student interaction, etc.). One of the fundamental values is the selection of the course content. After all, finally, a student must master the course content. To do this, the teacher must structure and prepare the course content so that both methods and tools can be purposefully used to master each of its structural elements. The basis of expected learning results is structured learning material. The selection of the course content is made as to the key concepts. This selection allows one to move on with the following: relate to them, plan the efficiency level, skills and abilities before getting to study a specific topic, paragraph or chapter. The main goal in developing sections, topics, and paragraphs is to identify their links and relations.

Thus, when developing learning results, it is necessary to carry out the following sequential actions:

- content analysis and development of the logical structure of the learning material;
- highlighting the main principle concepts for learning and diagnostics;
- correlation of the key concepts with levels of mastering;
- generalizing them as a learning achievement.

Learning results are emphasized through learning objects and knowledge elements. They, in its turn, are the diagnostic goal of developing knowledge, intellectual skills and experience of students' creative

activity. During the study, an educator must do special work on their mastering. However, he should also diagnose the quality of their achievements. He also should consider the relations between learning objects and knowledge elements. Knowledge elements can be included in the structure of training objects. The same training object can cover several knowledge elements.

7. Conclusion

In conclusion, the statement of expected learning achievements is the maximum description of what a student can do as a result of learning (action).

The exact description of learning achievements is a condition of achievability.

It can be stated that learning achievements become students' measurable learning achievements, denoted in terms of competence, which is revealed in solving problem situations.

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