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Motivation for Studying Mathematics of the Students in Post-secondary Technical Vocational Education – Future Primary School Teachers in the Republic of Moldova

Motywacja do nauki matematyki uczniów policealnego technicznego szkolnictwa zawodowego – przyszłość nauczycieli szkół podstawowych w Republice Mołdawii

Introduction

Being a mental process that has a significant importance in triggering, directing and changing behaviour, motivation is made up of all the motives, which, in turn, are the main causes of behaviour (Cosmovici, 1996, p. 198). Also, motivation has a maximum influence on pupils and students because it determines their behaviour in a learning situation. It is essential that motivation is a product of the learning activity (Cristei, 2017, p. 46), as learning motivation

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is a procedural activity, which is formed during several previous stages of the pupils' school life and their daily one (Postan, 2007, p. 270).

According to one of the basic definitions, motivation includes the creation of availability for the activity, such as choosing directions, objectives, means, methods, place and time of activities, as well as the evaluation of success, and building confidence in the correctness and necessity of educational actions. Obviously, there are a multitude of factors that negatively or positively influence students' interest and motivation for learning.

First of all, the motivation is determined by the educational system itself; secondly, the organization of the educational process; thirdly, the individual characteristics of the subject; fourthly, the subjective characteristics of the teachers and, above all, their relationship with the pupils, attitude to job; and finally, the specifics of academic discipline. In the system of educational motivation, external and internal motives are interconnected and influence each other (Gogleva, 2015, p. 4).

Thus, we deduce that motivation can be based on both external stimuli, i.e., situational motivation, and internal stimuli (internal personal states), i.e., dispositional motivation. These factors correlate with each other as disposition can usually be updated under the influence of a certain situation and the very perception of this situation is based on a personal attitude that is currently being updated.

In this context, based on Self-Determination Theory – a theory that explains the motivation of the educated ones as a continuous activity that goes through different stages, from extrinsic motivation (guided by external rewards) to the intrinsic one (inside the individual), pupil's behaviour can be described from an attitude without motivation or with resentment, through lacking interest (passive) acceptance, up to "active acceptance and personal involvement" (Tucan, 2015, p. 18). Thus, according to (Detkova, 2019, pp. 21–22) motivation goes through the following steps:

I. Emergence of needs.
II. Developing a strategy and finding ways to meet needs.
III. Determining the activity plan and staged implementation of actions.
IV. Satisfying the needs and receiving the reward.

However, whatever the motive is, they are based on the needs of the individual, as the continuous development of the individual or self-realization is the main need.

Thus, we deduce that motivation can be understood as a "self-sustainable" personal education that is based on a set of needs, motives, motivational experiences, interests and values set in the human psyche and determine the person to perform certain actions. At the same time, the internal interaction of these factors determines the main structural characteristics of the personality: character, abilities, etc.

Methodology

In order to obtain certain results regarding the motivation for the study of mathematics of students in post-secondary technical vocational education, the following research methods were applied:

- Analysis.
- Synthesis.
- Method of pedagogical observation.
- Questionnaires.
- Statistical methods of data processing.

Results and discussion

The needs, motives and interest for studying mathematics are quite small for pupils in the Republic of Moldova, according to the analysis of the results of the international assessment PISA 2018, where the Republic of Moldova keeps on average the score equal to that obtained in the previous assessment (PISA, 2015). At the same time, in addition to the fact that mathematics is a compulsory discipline in many educational systems in the world, the pupils in the Republic of Moldova record on average the same results for the national mathematics aptitude exams of the last 5 years, the highest increase for the baccalaureate exam being in 2019, while for the gymnasium one – in 2018.

For the students in the colleges with a pedagogical profile, mathematics is also a compulsory discipline, but not presenting a very increased study interest as these students study in institutions with a humanistic profile where mathematics is allocated 3 hours per week in the first year of study and 2 hours in the second and third years of study, compared to real profile students who have 4-5 hours per week. However, this does not prevent the institutions from pursuing the fundamental mission: "personality formation and integral

development from the perspective of the cultural, axiological, socio-economic, scientific and political exigencies of a democratic society for assuming a set of values necessary for one's own development, social and professional integration in a knowledge society in the context of European and general human values" (Manualul, 2020, p. 5).

The students in the respective colleges, being from different parts of the republic, face several difficulties in the process of studying mathematics. Many of these students come from institutions where a severe problem is the lack of teachers, including the mathematics teachers, which makes it difficult to study mathematics and for many students, due to this, mathematics becomes a difficult discipline to study further on.

Motivation for studying mathematics in post-secondary technical vocational education institutions with pedagogical profile in the Republic of Moldova increases in the second semester of the first year of study, as during this period it is expected to pass the semester assessment in mathematics, where students must demonstrate a set of knowledge, skills, attitudes and values acquired during this period. At the same time, it is during this period that the problem of mathematical education is outlined because the study time allocated to this discipline combined with the students' need to promote the assessment in mathematics significantly complicates the teacher's work. In the desire to overcome these difficulties, many teachers try to replace the entire mathematical apparatus with tasks similar to those in the test to be passed. Another wide-spread approach that influences the motivation to study mathematics and which is limited to the training based on the tasks of the baccalaureate exam does not make sense at all for the given institutions because the baccalaureate exam for these students is on the list of optional exams and the number of students who choose mathematics is very small.

Any educational activity is influenced by a number of motives, including the cognitive one, the motive of preparing for the professional activity, the motive of success, the motive of personal self-affirmation, the motive of emotional satisfaction, the motive of social self-affirmation, socio-emotional motive, socio-moral motive, and motive for professional involvement/ employment. According to this, for the first-year students in post-secondary technical vocational education – future primary school teachers, the study of mathematics is closely related to the cognitive motive correlated with the motive of training for professional activity (Table 1), as cognitive motives are

the ones that reflect students' desire for self-education and that focus on self-improvement through various methods of acquiring knowledge.

Table 1. *Pearson Corelation between Cognitive Motive and the Motive of Training for Professional Activity regarding the Study of Mathematics*

		Cognitive Motive	**Motive of Training for Professional Activity**
Cognitive_Motive	Pearson Correlation	1	.696**
	Sig. (2-tailed)		.000
	N	156	156
Motive of Training for Professional Activity	Pearson Correlation	.696**	1
	Sig. (2-tailed)	.000	
	N	156	156

Source: own study.

Thus, from the table above we observe that there is a statistically significant positive correlation between the cognitive motive and the motive of training for professional activity, $r(156)=0.696$, $p<0.001$, meaning that subjects with high scores on the cognitive motive also tend to obtain high scores on the motive of training for professional activity and vice-versa, students with low scores on the cognitive motive have low scores on the motive of training for professional training.

At the same time, there is a statistically significant negative correlation in terms of the motive of emotional satisfaction and the motive of professional involvement, $r(156)=-0.504$, $p<0.001$ meaning that students with high scores on the motivation for emotional satisfaction have low scores on the motivation for professional and mutual involvement (Table 2).

Table 2. *Pearson Corelation between the Motive of Emotional Satisfaction and the Motive of Professional Implication regarding the study of mathematics*

		Motive of Emotional Satisfaction	Motive of Professional Implication
Motive of Emotional Satisfaction	Pearson Correlation	1	-.504**
	Sig. (2-tailed)		.000
	N	156	156
Motive of Professional Implication	Pearson Correlation	-.504**	1
	Sig. (2-tailed)	.000	
	N	156	156

Source: own study.

Although good results in mathematics increase students' emotional satisfaction, when it comes to engaging in professional activity, the motive of emotional satisfaction loses its intensity. This is primarily due to the fact that the first-year students do not know so well what the activity of a teacher is and how dedicated you have to be to this profession. Also, these nuances are explained by the fact that students are only at the stage of choosing the profession – a stage characteristic of the motive of professional involvement, not knowing the characteristics of the other stages: the stage of choosing a job, the stage of direct implementation of the professional activity.

Researchers note that the implementation of a person's professional activity is determined to one degree or another by the whole set of motives that influence each other in each of the stages listed: "the motives of choosing a profession lead to the formation of the motives of involvement in the professional activity, while the latter lead to the motivation for choosing a job" (Il'in, 2000). It should also be noted that the motive of professional involvement is "the action of specific motives that determine both the choice of a profession and the long-term fulfilment of the duties associated with that profession" (Krylova, et al. 2000) or "a set of internal and external driving forces that induce a person to work and provide this activity with an orientation focused on achieving certain objectives" (Kupriyanov, 2007).

On the other hand, there is a statistically significant positive correlation in terms of cognitive motivation towards mathematics and the motive of success in the first year students of post-secondary technical vocational education,

$r(156)=0.775$, $p<0.001$ in the sense that students with cognitive interest in mathematics tend to have greater motivation to achieve success in this discipline and vice-versa, results that are presented in the table below.

Table 3. *Pearson Corelation between Cognitive Motive and the Motive of Success Achievement regarding the Study of Mathematics*

		Cognitive Motive	**Motive of Success Achievement**
Cognitive Motive	Pearson Correlation	1	,775**
	Sig. (2-tailed)		,000
	N	156	156
Motive of Success Achievement	Pearson Correlation	,775**	1
	Sig. (2-tailed)	,000	
	N	156	156

Source: own study.

We want to mention that the motive for success is one of the types of motivation that determines individuals to be better able to cope with job tasks. Moreover, it also determines them to take on new tasks, and according to (Labăr, 2008, p. 85), "*r* is an expression of the magnitude of the effect, related to the criteria of Cohen (1988)", which shows that the relationship between cognitive motive and the motive of success is a very strong one.

Different motives have different manifestations in the educational process. Thus, we tend to highlight the fact that the real school practice for several motives (lack of time, lack of literature on the spot, instability of students' subject preferences) contributes to the division of students into classes by levels. Moreover, students in classes with different profiles work with the same textbooks, with the difference that in the humanitarian classes teaching is intense. At the same time, teachers try to compensate for the shortcomings of such an education with optional classes, where they focus on solving problems similar to those in exams, which is not characteristic for students in the humanities (Vel'misova, 2005, p. 15–16).

Conclusions

Russian researcher I. M. Smirova notes that "the value of mathematical education in the humanities should not be less than in the real classes, on the contrary it may be higher, as students of the humanities profile complete their mathematical education in the general school" (Vel'misova, 2005, p. 16). Although we generally agree with this remark, we still believe that for the humanities the mathematical activities can serve as a support for testing and developing professionally important skills and intellectual qualities. For these reasons, Professor I. Lupu mentions that the teacher in the process of teaching mathematics must present the multilateral aspects of modern mathematics to students:

- the aspect of the deduction;
- the aspect of semiotics;
- the aspect of application;
- heuristic aspect;
- the aesthetic aspect (Lupu, Choban-Piletskaya, 2008, p. 55).

Definitely, mathematics is one of the basic disciplines of the educational process that directly contributes to the development of personality. The mathematical knowledge and skills acquired by students in the post-secondary technical vocational education institutions with a pedagogical profile precede the study of another specialized discipline: "Didactics of Mathematics in Primary Classes", through which students' interest in the chosen profession increases. The study of mathematics and the didactics of teaching mathematics by future primary school teachers contributes to the expanding of the basis of mathematical concepts, rules and algorithms for solving, questions, and topics necessary for the successful acquisition of the future profession. At the same time, it takes place the creation of the development and improvement conditions for the necessary qualities of the future specialist, because through the study of specialized modules the effectiveness of the students' educational work is activated. The increasing of motivation through the professional orientation of mathematical teaching must be oriented in two directions:

- Selection of the content of the educational material with emphasis on professional activities.
- Organizing the forms of work with students to contribute to the formation of the necessary educational skills for a highly qualified modern specialist.

On the other hand, Professor I. Lupu (2008) considers that forming the motivation for studying mathematics is closely related to the variety of teaching methods that are used during the lessons, such as:

- the method of developing the cognitive interest for mathematics;
- the method of stimulating and enhancing students' educational and cognitive activities;
- the method of problem elaboration and solving, based on creative work;
- method of problematization;
- research method;
- the method of cooperation in teaching mathematics, etc. (Lupu, Choban-Piletskaya, 2008, p. 52).

Regardless of the direction one takes, the motivation of future primary school teachers to study mathematics must start from real-life content problems, which describe an exact situation in which it is necessary to determine values or draw conclusions about a certain problem. The tasks with practical content solved in the course "Didactics of Teaching Mathematics in Primary Classes" enhance the mathematical knowledge that is later used to teach mathematics in primary classes. Problems with such content are more difficult to be understood and students have difficulty in solving them, but still the solutions should be offered to students only after solving the necessary minimum in the problem.

Studying mathematics from two perspectives, both as a student and a future teacher, contributes productively to the development of mathematical culture as well as to the development of a system of skills into students to operate with basic mathematical concepts. Successful teaching of mathematics to young students requires not only methodological skills from the teacher, but also deep knowledge of mathematical concepts and phenomena, as it is at this stage that the most important concepts in mathematics such as "number", "size" etc are acquired.

Thus, the student's motivation and orientation towards the study of mathematics are necessary, allowing the application of mathematical knowledge and skills acquired in practice. At the same time with the study of mathematics, students must become familiar with its place and its methods in modern science and practice. These nuances will help students see the connection between their future and mathematics, and the latter is absolutely necessary for teaching both from pedagogical and psychological positions.

Abstract: Mathematics is the universal compartment through which both the study and the discovery of the surrounding environment take place. At the same time, mathematics is the academic discipline through which the formation of logical and practical thinking is pursued, so for the students of pedagogical specialties this discipline is an abstract science about which students know only what they have learned in gymnasium. Therefore, the motivation and professional orientation for studying mathematics are necessary, allowing in this context the application of mathematical knowledge and skills acquired in practical activities. This article thoroughly analyses the concept of motivation, but also addresses the motivation issue of the students in post-secondary technical vocational education – future primary school teachers in the Republic of Moldova. At the same time, the problematic aspects of the professional training process of future primary school teachers are determined.

Keywords: Motivation, learning motivation, educational activity, mathematical education, motives, etc.

Streszczenie: Matematyka jest uniwersalną dziedziną, dzięki której odbywa się zarówno badanie, jak i odkrywanie otaczającego nas środowiska. Jednocześnie przez matematykę jako dyscyplinę akademicką dąży się do kształtowania logicznego i praktycznego myślenia. Z tej przyczyny dla studentów specjalności pedagogicznych jest to wiedza abstrakcyjna, ograniczona do wiadomości uzyskanych w gimnazjum. Niezbędna jest zatem motywacja i orientacja zawodowa do studiowania matematyki, umożliwiająca zastosowanie zdobytej wiedzy z tej dziedziny i pozyskanych umiejętności matematycznych w działalności praktycznej. W niniejszym artykule przeanalizowano znaczenie pojęcia motywacji, ale także podjęto problematykę motywacji uczniów policealnego technicznego szkolnictwa zawodowego – przyszłych nauczycieli szkół podstawowych w Republice Mołdawii. Jednocześnie określono problematyczne aspekty procesu kształcenia zawodowego przyszłych nauczycieli szkół podstawowych.

Słowa kluczowe: motywacja, motywacja do nauki, aktywność edukacyjna, edukacja matematyczna, motywy

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