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RESULTS OF RESEARCH OF MOTIVATIONAL SPHERE WHEN TEACHING MATHEMATICS IN THE SYSTEM OF SECONDARY VOCATIONAL EDUCATION OF TECHNICAL PROFILE

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Abstract. In the course of scientific research, a pedagogical model for integrating mathematics in the system of secondary vocational education of a technical profile was developed. The specificity of the developed pedagogical model is that it is aimed at the implementation of interdisciplinary connections between mathematics and professional disciplines. The success of mastering professional skills directly depends on the motivation of the student. The study showed that the subject motivation of the learning of mathematics is composed of a variety of interrelated factors. The most important are the cognitive interest, the motive for preparing for professional activity, the motive for achieving success and personal self-affirmation.

Keywords: mathematical education, secondary vocational education, professional motivation, pedagogical model, interdisciplinary communication.

REZULTATELE CERCETĂRII SFEREI MOTIVAȚIONALE LA PREDAREA MATEMATICII ÎN SISTEMUL DE ÎNVĂȚĂMÂNT PROFESIONAL SECUNDAR CU PROFIL TEHNIC

Rezumat. În cursul cercetării științifice, a fost dezvoltat un model pedagogic pentru integrarea matematicii în sistemul de învățământ profesional secundar cu profil tehnic. Specificitatea modelului pedagogic dezvoltat este că acesta vizează implementarea conexiunilor interdisciplinare între matematică și disciplinele profesionale. Succesul însușirii abilităților profesionale depinde în mod direct de motivația elevului. Studiul a arătat că motivația subiectului învățării matematicii este compusă dintr-o varietate de factori interdependenți. Cele mai importante sunt interesul cognitiv, motivul pregătirii pentru activitatea profesională, motivul pentru obținerea succesului și autoafirmarea personală.

Cuvinte cheie: educație matematică, învățământ profesional secundar, motivație profesională, model pedagogic, comunicare interdisciplinară.

1. Introduction

The proposed professionally-oriented technology for teaching mathematics is determined by the tasks of scientific research, which are designed to demonstrate that the introduction of pedagogical technology guarantees:

- the formation of knowledge, skills and abilities of applying mathematical methods in solving applied problems from related disciplines of a professional cycle of a technical profile;
- increasing the level of professional motivation of students and interest in a future profession, adjusting the complex of motives in accordance with professional needs.

To assess the dynamics of changes in various types of motivation for learning in general and the study of mathematical and general professional disciplines in particular, the methodology of E. M. Lepesheva was used. The technique allows to identify the

prevailing type of motives, to trace the dynamics of changes in the structure of educational motivation [1].

Subject motivation for the learning of mathematics consists of a variety of interrelated factors. The most important are the cognitive interest, the motive for preparing for professional activity, the motive for achieving success and personal self-affirmation. All kinds of motivational factors are important for stimulating interest and the formation of intrinsic motivation for the learning of mathematics [2, p. 144].

Motivation can be differentiated into many different types, and the essence of this methodology is to identify the predominant type of student motivation - that is, the motivational mechanism that is dominant for him in his educational activity [3, 4, 5]. These types are represented by questionnaire scales.

In addition to the individual result, it is very important to calculate the average result in different groups, in order to confirm the hypothesis that in groups studying mathematics with a professionally oriented bias, the level of professional motivation and cognitive interest is higher than in other groups. Based on the type of motivation prevailing among students, it is possible to modify the methods and structure of teaching mathematics in order to influence the necessary active mechanisms.

2. Results

At the first stage, the study was carried out in the control and experimental groups before the introduction of pedagogical technology of professionally oriented teaching of mathematics.

Table 1. Processing of the results - Pearson criterion

Motives	Stage 1			Accepted hypothesis
	CG n=18	EG n=21	$\chi^2_{эмп}$	
Prestige studies in the group	0,39	0,27	18,924	H_0
Prestige studies in the family	0,75	0,56		
Cognitive interest	0,63	0,68		
Achievement motivation	0,52	0,45		
The motive of social approval by classmates	0,24	0,37		
The motive of social approval by teachers	0,46	0,57		
The motive of social approval by parents	0,46	0,47		
Fear of punishment from an educational institution	0,41	0,51		
Fear of punishment from an family	0,33	0,25		
Professional motivation	0,65	0,60		
Motive of communication	0,60	0,53		
Extracurricular motivation	0,17	0,33		
The motive of self-realization	0,39	0,55		
The influence of classmates	0,53	0,45		
Family influence	0,40	0,36		
Impact of educational institution	0,44	0,54		

$\chi^2_{кр}(df = 15;\ \alpha = 0{,}05) = 25{,}0$ * - differences are veracious p<0,05;

$\chi^2_{кр}(df = 15;\ \alpha = 0{,}01) = 30{,}6$ ** - differences are veracious p<0,01.

Statistical methods compared the distribution of scores on the scales of motives among different groups of students [6]. The survey results were processed using a statistical package SPSS.20. For each pair of groups formulated working hypotheses. H_0 – the distribution of average scores for different types of motivation in groups of students is not statistically different. H_1 – the distribution of average scores for different types of motivation in groups of students is statistically different. The χ^2-Pearson criterion and the *t*-Student criterion were used as a statistical criterion.

Table 2. Results processing - t-Student criterion

Motives	Stage 1			Accepted hypothesis
	CG n=18	EG n=21	*t*	
Prestige studies in the group	0,39	0,27	1,794	H_0
Prestige studies in the family	0,75	0,56	1,333	
Cognitive interest	0,63	0,68	-0,615	
Achievement motivation	0,52	0,45	-0,110	
The motive of social approval by classmates	0,24	0,37	-1,494	
The motive of social approval by teachers	0,46	0,57	-1,015	
The motive of social approval by parents	0,46	0,47	-0,334	
Fear of punishment from an educational institution	0,41	0,51	-0,055	
Fear of punishment from an family	0,33	0,25	0,107	
Professional motivation	0,65	0,60	1,404	
Motive of communication	0,60	0,53	-0,274	
Extracurricular motivation	0,17	0,33	0,123	
The motive of self-realization	0,39	0,55	-1,560	
The influence of classmates	0,53	0,45	-0,120	
Family influence	0,40	0,36	0,134	
Impact of educational institution	0,44	0,54	-1,045	

$t_{кр}(df = 15;\ p = 0{,}05) = 2{,}131;$ * - differences are veracious p<0,05;

$t_{кр}(df = 15;\ p = 0{,}001) = 4{,}073;$ ** - differences are veracious p<0,001.

At the second stage of the study, the diagnosis of educational motivation in the experimental group was carried out after the introduction of the pedagogical technology of professionally oriented teaching of mathematics, and in the control one with the traditional form of training.

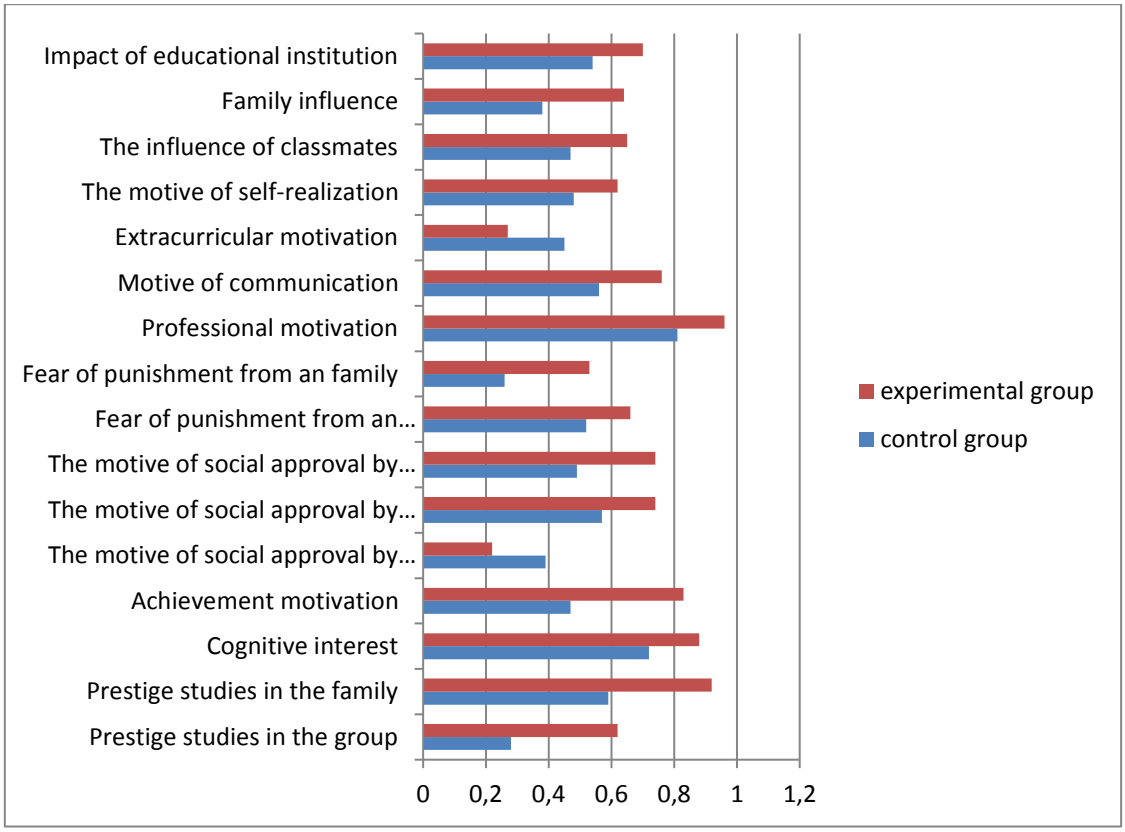

Figure 1. Diagram of the complex of motives before the experiment

The results of statistical processing of the source data are presented in the table 3 and table 4.

Table 3. Processing of the results - Pearson criterion

Motives	**Stage 2**			**Accepted hypothesis**
	CG n=18	EG n=21	$\chi^2_{эмп}$	
Prestige studies in the group	0,28	0,62	**28,647***	***H₁***
Prestige studies in the family	0,59	0,92		
Cognitive interest	0,72	0,88		
Achievement motivation	0,47	0,83		
The motive of social approval by classmates	0,39	0,22		
The motive of social approval by teachers	0,57	0,74		
The motive of social approval by parents	0,49	0,74		
Fear of punishment from an educational institution	0,52	0,66		
Fear of punishment from an family	0,26	0,53		
Professional motivation	0,81	0,96		
Motive of communication	0,56	0,76		
Extracurricular motivation	0,45	0,27		
The motive of self-realization	0,48	0,62		
The influence of classmates	0,47	0,65		
Family influence	0,38	0,64		
Impact of educational institution	0,54	0,70		

$\chi^2_{кр}(df = 15;\ \alpha = 0{,}05) = 25{,}0$ * - различия достоверны p<0,05

$\chi^2_{кр}(df = 15;\ \alpha = 0{,}01) = 30{,}6$ ** - различия достоверны p<0,01

Table 4. Processing of results - t-Student criterion

Motives	Stage 2			Accepted hypothesis
	CG n=18	EG n=21	*t*	
Prestige studies in the group	0,28	0,62	**2,894***	***H1***
Prestige studies in the family	0,59	0,92	**4,025***	
Cognitive interest	0,72	0,88	**2,189***	
Achievement motivation	0,47	0,83	**3,196***	
The motive of social approval by classmates	0,39	0,22	**-2,148***	
The motive of social approval by teachers	0,57	0,74	**2,134***	
The motive of social approval by parents	0,49	0,74	**3,248***	
Fear of punishment from an educational institution	0,52	0,66	**2,054***	
Fear of punishment from an family	0,26	0,53	**2,267***	
Professional motivation	0,81	0,96	**2,242***	
Motive of communication	0,56	0,76	**3,678***	
Extracurricular motivation	0,45	0,27	**-2,128***	
The motive of self-realization	0,48	0,62	**2,684***	
The influence of classmates	0,47	0,65	**3,862***	
Family influence	0,38	0,64	**2,437***	
Impact of educational institution	0,54	0,70	**2,064***	

$t_{кр}(df = 15;\ p = 0{,}05) = 2{,}131;$ * - differences are veracious p<0,05;

$t_{кр}(df = 15;\ p = 0{,}001) = 4{,}073;$ ** - differences are veracious p<0,001.

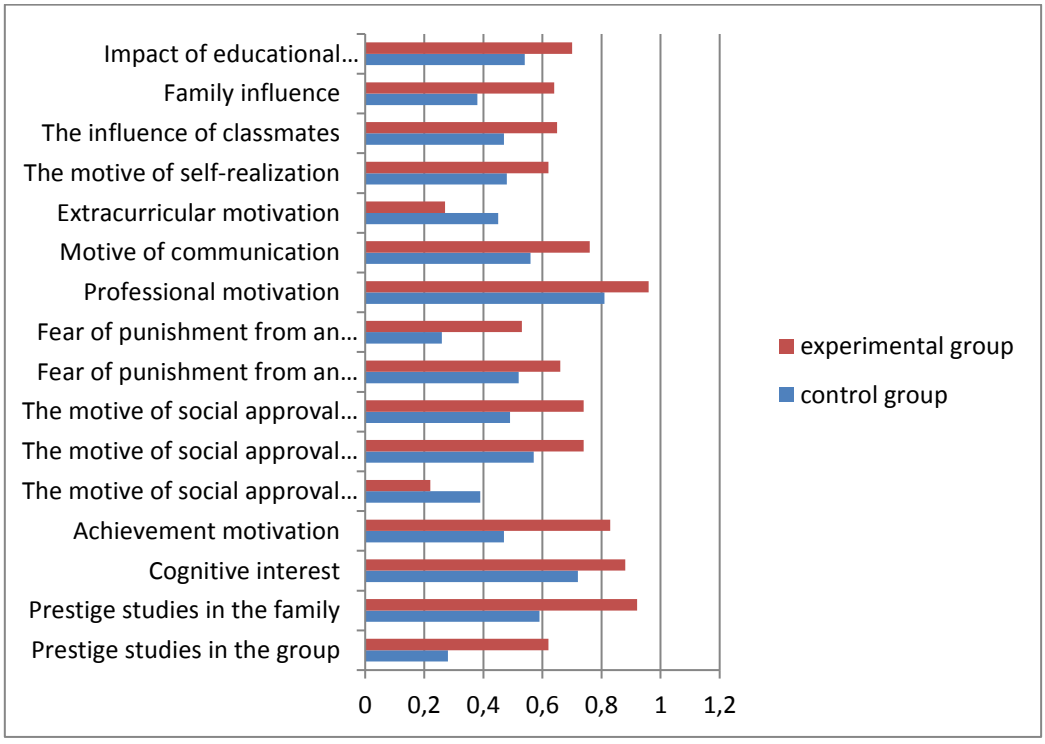

Figure 2. Diagram of the complex of motives after the experiment

At the second stage of the study, differences in all motives between the experimental and control groups are statistically significant at a significance level of $p < 0.05$ - the accepted hypothesis H_1.

Figure 2 shows a diagram of the complex of motives after the experiment.

3. Conclusion

Consider the prevailing motives in the groups before and after the experiment (table 5).

The level of professional motivation of students studying mathematical disciplines using professionally-oriented pedagogical technology is higher than that of students studying according to the traditional methodology. Analysis of table 5 allows us to conclude that the set of leading motives that contribute to increasing the level of professional motivation and the quality of professional skill in the control and experimental groups is different.

Table 5. Prevailing motives in groups before and after the experiment

Control group	Experimental group
Before the experiment	
Prestige studies in the family	Cognitive interest
Professional motivation	Professional motivation
Cognitive interest	Prestige studies in the family
Motive of communication	The motive of self-realization
The influence of classmates	Motive of communication
After the experiment	
Professional motivation	Professional motivation
Cognitive interest	Prestige studies in the family
The motive of social approval by teachers	Cognitive interest
Motive of communication	Achievement motivation
Fear of punishment from an educational institution	Motive of communication

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