

THE USE OF SIMULATION METHODS OF VOCATIONAL EDUCATION

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Abstract

Purpose: A teacher of a vocational school should rationally use such teaching methods that would ensure the training of qualified personnel competitive in the labor market.

Methodology: Educational institutions to meet the requirements of the market economy in the provision of educational services should be guided by a generalized model of a competitive specialist. The technology of development of the model includes the formation of components of professional activity (analysis of professional activity, identification of basic labor functions and professional skills) and training.

Result: The assessment of theoretical professional training of students was carried out by testing with the use of PC in the main academic disciplines in two specialties. The assessment of theoretical professional training of students was based on the methodology proposed by A. A. Leonovich. Based on the assessment of knowledge in the five main academic disciplines, a generalized coefficient of theoretical training was calculated. Personal and business qualities necessary for a modern person in the conditions of market relations were evaluated by a number of psychological tests.

Applications: This research can be used for universities, teachers, and students.

Novelty/Originality: In this research, the model of the use of simulation methods of vocational education is presented in a comprehensive and complete manner.

Keywords: *Simulation Training Methods, Training Profile, Generalized Coefficient of Theoretical Training, Generalized Coefficient of Practical Training.*

INTRODUCTION

Teaching methods as methods of interrelated activities of the teacher and students are aimed at mastering the skills and abilities, as well as the education and development of the individual. A teacher of a vocational school should rationally use such teaching methods that would ensure the training of qualified personnel competitive in the labor market. This is facilitated by active teaching methods ([Abdulatipova, Tsakhaeva, 2017](#); [Abuzjarova, 2018](#); [Badakhova, 2017](#); [Borovikova, 2017](#); [Borisova, Novoseltseva 2016](#); [Borisova, et al. 2018](#)), which, depending on the focus on the formation of the knowledge system or the mastery of skills and abilities are divided into non-simulation (problem lecture, heuristic conversation, educational discussion, search laboratory work, etc.) and simulation – non-game (analysis of specific situations, solving situational problems, exercises-actions according to instructions, etc.) and game (simulation of activity on the simulator, role-playing, business game, moderation, etc.).

METHODS

Educational institution to meet the requirements of the market economy in the provision of educational services should focus on a generalized model of competitive specialist ([Gasanova, et al. 2017](#); [Gadzaov, Dzerzhinskaya 2018](#); [Daudova, et al. 2016](#); [Bolotin, et al. 2017](#); [Zulaeva, et al. 2018](#); [Ilkevich, Medvedkova 2017](#)). This model takes into account external (the level of competitiveness of the country; the level of competitiveness of the industry; the level of competitiveness of the region, etc.) and internal factors (the rationality of organizational and management structures of vocational schools and colleges; the skills of the pedagogical staff, the existing material-technical base, etc.) and contains: technical (degree and specialization), economic (costs to train a specialist), social-organizational (social structure of consumers), personal (psychological, cognitive, behavioral), content (knowledge, skills and abilities in the field, generated in three areas: socialization, adaptation properties in terms of the labour market and professional qualities) characteristics of a specialist. The technology of the model development includes the formation of the components of professional activity (analysis of professional activity, identification of basic labor functions and professional skills) and training (creation of a set of problems and tasks for mastering the necessary skills, making adjustments to the curriculum, improving the forms and methods of training, etc.) ([Kuznetsov, et al. 2018](#); [Sergeeva, Trubakova 2017](#); [Morozov, et al. 2018](#); [Tsahaeva, et al. 2016](#); [Tsahaeva, et al. 2017](#); [Gadzaov, Dzerzhinskaya 2018](#)).

In Tver College named after A.N. Konyaev a scientific laboratory of innovative technologies in education was created. The purpose of the laboratory is to introduce in the educational process the simulation training methods to prepare a competitive college graduate who can: flexibly adapt to changing life situations, independently acquiring the necessary knowledge and skillfully applying them in practice; independently think critically, be able to see the difficulties arising in

the real world and find ways to overcome them rationally, using modern technology; understand clearly where and how the acquired knowledge can be applied in the surrounding reality; be able to generate new ideas, think creatively, work competently with information; be sociable, contact in various social groups, be able to work together in different areas, preventing conflict situations or skillfully leaving them; work independently on the development of their own morality, intelligence, cultural level.

Thus, using administrative and managerial, teaching staff, college students in a single socio-educational space of the institution, we are trying to find new approaches to the training of a specialist of secondary vocational education, competitive in the labor market.

RESULTS AND ITS DISCUSSION

The process of formation of a competitive specialist and its practical implementation was tested in the course of experimental training of students of Tver College named after A. N. Konyaev.

During the experiment it was necessary to solve a number of problems:

1. To determine the content of the training (description of the final knowledge and skills of students, thematic plan, didactic units).
2. To carry out the choice of simulation training methods and pedagogical conditions of their application in the process of training a mid-level specialist.
3. To evaluate the formation indicators of the competitive mid-level specialist.

For two years, the experiment involved students of the college - 12 groups (343 people) studying in the field of "Economics and accounting (by industry)" and "Tourism". From them in the experiment:

- Specialty 080114 "Economics and accounting (by industry)" – 64 students in 2015-2016 academic year and 59 students in 2016-2017 academic year;
- Specialty 100401 "Tourism" – 29 students in 2015-2016 academic year and 27 students in 2016-2017 academic year;

Total – 179 students participated.

In control groups:

- Specialty 080114 "Economics and accounting (by industry)" – 64 students in 2015-2016 academic year and 53 students in 2016-2017 academic year;
- Specialty 100401 "Tourism" – 28 students in 2015-2016 academic year and 20 students in 2016-2017 academic year;

Total – 165 students studied.

The experiment was conducted in several stages: ascertaining, forming, and control.

During the experiment, the theoretical professional training of students in major academic disciplines and personal qualities of students with the help of psychological tests were evaluated.

The assessment of theoretical professional training of students was carried out by testing with the use of PC in the main academic disciplines in two specialties. With this purpose, a computer test was developed, which includes 400 questions on major academic disciplines.

For specialty 080114 "Economics and accounting (by industry)" the test included questions on the following subjects: accounting, analysis of the financial and economic activity of the enterprise (AFEА), management, audit, taxes, and taxation.

For the specialty 100401 "Tourism" the psychology of business communication, management of the functional unit, marketing technologies in tourism, technology, and organization of tour operator activities, leisure activities of tourists were tested.

The assessment of theoretical professional training of students was based on the methodology proposed by A.A. Leonovich. In the process of testing for each j major academic discipline, 30 questions on a random sample were determined and the average score of the i student (B_{ij}) was calculated. On the basis of the average scores of each i

$$K_{j.tr} = \frac{\sum_{i=1}^m B_{ij}}{m}, \quad (1)$$

student, the coefficient of the level of training ($K_{j.tr}$) of students in this discipline was calculated as the arithmetic average of the scores of all students in the group.

Where B_{ij} - the sum of points scored by the i student in the process of determining the level of training in the j academic,

m – Number of students in experimental (control) groups.

Based on the assessment of knowledge in five main academic disciplines, the *generalized coefficient of theoretical professional training* $K_{gen.tr}$ of students in general in the main academic disciplines in the following dependence was calculated

$$K_{gen.tr} = \frac{\sum_{i=1}^m \sum_{j=1}^n B_{ij}}{m \cdot n} \quad (2)$$

Where $n=5$ – the number of major educational disciplines.

The results of the professional training of the ascertaining stage are presented in table 1, from which it can be seen that the professional training of students in the control and experimental groups is almost the same, the generalized coefficient of theoretical professional training in the experimental groups is 4.0, and in the control – 3.99, which indicates equal conditions in which students entered the experiment.

Personal and business qualities necessary for a modern person in the conditions of market relations were evaluated by a number of psychological tests proposed by A.S. Prutchenkov:

- Ability to self-control;
- Peculiarities of behavior in a conflict situation;
- Communication and organizational skills.

Test “Ability to self-control” made it possible to assess the following personal qualities of the students: empathy, authenticity, stress resistance. With the help of tests “Peculiarities of behavior in a conflict situation” and “Communicative and organizational skills” such personal qualities as sociability, responsibility, ability to lead and obey, the ability to take risks were evaluated.

During the forming stage in the experimental groups a new simulation method of training in the form of a workshop “Educational Firm” was introduced. The tasks of the forming stage were the choice of simulation methods of training and pedagogical conditions of their application in the process of training a mid-level specialist, as well as the content and technology of using the new method “Educational Firm”.

Table 1: Professional training of students during the ascertaining stage

Groups	Academic year	Specialty	Professional training results					Generalized ($K_{gen.tr}$)
			On academic subjects ($K_{j.tr}$)					
			accounting (psychology))*	AFEA(ma nagement) *	managem ent (marketin g)*	audit (technology)*	taxes (leisure)*	
Experimental	2015-2013	080114	4,08	3,93	4,13	3,98	3,91	4,01
		100401	3,81	3,72	4,21	4,02	4,08	3,97
	- 2016 2017	080114	4,03	3,96	4,16	3,92	3,95	4,0

Control	2015-2016	100401	3,85	3,78	4,24	4,08	4,1	4,01
		Total	3,94	3,85	4,19	4,0	4,01	4,0
	2016-2017	080114	4,03	3,91	4,1	4,01	3,94	4,0
		100401	3,84	3,78	4,16	4,06	4,02	3,97
	2016-2017	080114	4,1	3,9	4,19	3,89	3,87	3,99
		100401	3,76	3,8	4,18	4,02	4,15	3,99
	Total		3,94	3,85	4,16	4,0	4,0	3,99

Note: in brackets (..)*. The main educational disciplines for the specialty 100401 are specified

In the control groups during the forming stage, classes were held on the usual calendar and thematic plans.

Discussion

The objectives of the control stage of the experiment were as follows:

1. Hypothesis testing.
2. Evaluation of college graduate training, competitive in the labor market and ready for professional growth.

Initially, at the control stage, theoretical professional knowledge was evaluated in accordance with formulas 1 and 2. The results of the verification of professional knowledge during the control stage are presented in table 2.

Table 2: Professional training of students during the control stage

Groups	Academic year	Specialty	Professional training results					Generalized ($K_{gen.tr}$)
			On academic subjects ($K_{j.tr2}$)					
			accounting (psychology))*	AFEA (managem ent)*	managem ent (marketin g)*	audit (technology)*	taxes (leisure)*	
Experimental	2015 - 2016	080114	4,23	4,12	4,31	4,19	4,19	4,21
		100401	3,98	3,95	4,43	4,24	4,21	4,16
	2017	080114	4,23	4,2	4,38	4,18	4,17	4,23

Control	2016 -	100401	4,05	3,89	4,41	4,28	4,31	4,19
	Total		4,12	4,04	4,38	4,22	4,22	4,2
	2015 - 2016	080114	4,11	3,99	4,21	4,12	4,15	4,12
		100401	3,96	3,88	4,27	4,15	4,14	4,08
	2016-2017	080114	4,19	3,98	4,3	3,98	3,96	4,08
		100401	3,88	3,91	4,27	4,13	4,26	4,09
	Total		4,04	3,94	4,26	4,1	4,13	4,09

Comparing the results of data in tables 1 and 2, it can be concluded that the level of knowledge in both control and experimental groups increased slightly. At the same time, in the control groups the generalized coefficient of theoretical training increased by 2.5% and amounted to 4.09 points, and in the experimental groups increased by 5.0% and amounted to 4.2.

Taking into account that the assessment of professional knowledge does not provide a definitive answer to the question of training a mid-level specialist who is competitive in the labor market, it is necessary to go beyond the traditional methods, for example, simply the performance indicator, in assessing the effectiveness of simulation training methods. The existing methods of control are aimed at determining only individual performance.

Therefore, along with the test of theoretical professional knowledge of the same as during the ascertaining stage, in the course of the study, a number of indicators were developed *to assess the practical training*:

1. Number of tasks completed in a given time K_{qt} ;
2. The task quality K_{ql} ;
3. The efficiency of the task K_{eff} .

These types of indicators, except the second, cannot be evaluated during the test, oral response or written work. Therefore, the effectiveness of simulation training methods during the experiment is proposed to test in the course of the business game, both in experimental and control groups. At the same time, the theme of the business game for students of a particular specialization was chosen in one of the main academic disciplines. For students training in the specialty 080114 "Economics and accounting (by industry)", a business game on "Inventory of commodity-material values" was offered. For students training in the specialty 100401 "Tourism", a business game on "Recruitment" was offered.

In the course of business game time and quality of the solution of problems, the ability of students to apply theoretical knowledge at the solution of practical problems were fixed. Indicators were evaluated on a five-point scale, except for the indicator "number of completed tasks" (table 3).

Based on the results of the business game, *the generalized coefficient of practical training* ($K_{gen.pr.}$) was calculated in the control and experimental groups as the arithmetic mean of three indicators (the number of completed tasks, the task

$$K_{gen.pr.} = \frac{K_{qt} + K_{ql} + K_{eff}}{3} . \quad (3)$$

quality, the efficiency of the task), taking the importance of each of them as the same, according to the following formula
Taking into account that the index number $K_{\text{коп}}$ without additional normalization does not belong to the range, therefore, this indicator was calculated in accordance with the expression

$$K_{qt.} = 5 \cdot \frac{p}{q}, \quad (4)$$

Where q – the number of tasks that must be solved during the business game;

p – Number of correctly completed tasks;

5 – The normalizing coefficient.

Table 3: Indicators of professional practical training

Indicator	Point	determination Methods of
Number of completed tasks $K_{qt.}$		For each completed task one point is awarded
The task quality $K_{ql.}$	5	Task completed without errors
	4	Task completed with 1 error
	3	Task completed with 2 errors
	2	The task completed with more than 2 errors
The efficiency of the task $K_{eff.}$	5	Does not exceed a fixed time
	4	Exceeds the fixed time by no more than 20 %
	3	Exceeds the fixed time by more than 20%, but not more than 50 %
	2	Exceeds the fixed time by more than 50%

The results of the business game are summarized in table 4. Analysis of the results of the business game (Fig. 1) shows that with almost the same theoretical training of students in the control and experimental groups (the difference in the average score is about 0.1) evaluation indicators of the quality of training of mid-level specialists in the process of professional action in the experimental groups is much higher. Thus, the indicator of the number of completed tasks $K_{qt.}$ by students of experimental groups is higher by 7.6 %, the indicator of the task's quality $K_{ql.}$ – by 14.5 %, the indicator of the efficiency $K_{eff.}$ – by 7.7 %, and the generalized coefficient of practical professional training $K_{gen.pr.}$ – by 9.7%.

Table 4: Business game results

Groups	Academic year	Specialty	Evaluation indicators of the quality of training of mid-level specialists			
			$K_{qt.}$	$K_{ql.}$	$K_{eff.}$	$K_{b.g.}$
Experimental	2015 – 2016	080114	5	4,6	4,4	4,67
		100401	4,8	4,7	4,6	4,7
	2016 – 2017	080114	4,9	4,9	4,5	4,77
		100401	5	4,7	4,8	4,83
	Total		4,93	4,73	4,58	4,74
Control	2015 – 2016	080114	4,6	4,2	4,2	4,33
		100401	4,4	4,1	4,3	4,27

2016	-	080114	4,7	4,0	4,1	4,27
2017		100401	4,6	4,2	4,4	4,4
Total			4,58	4,13	4,25	4,32

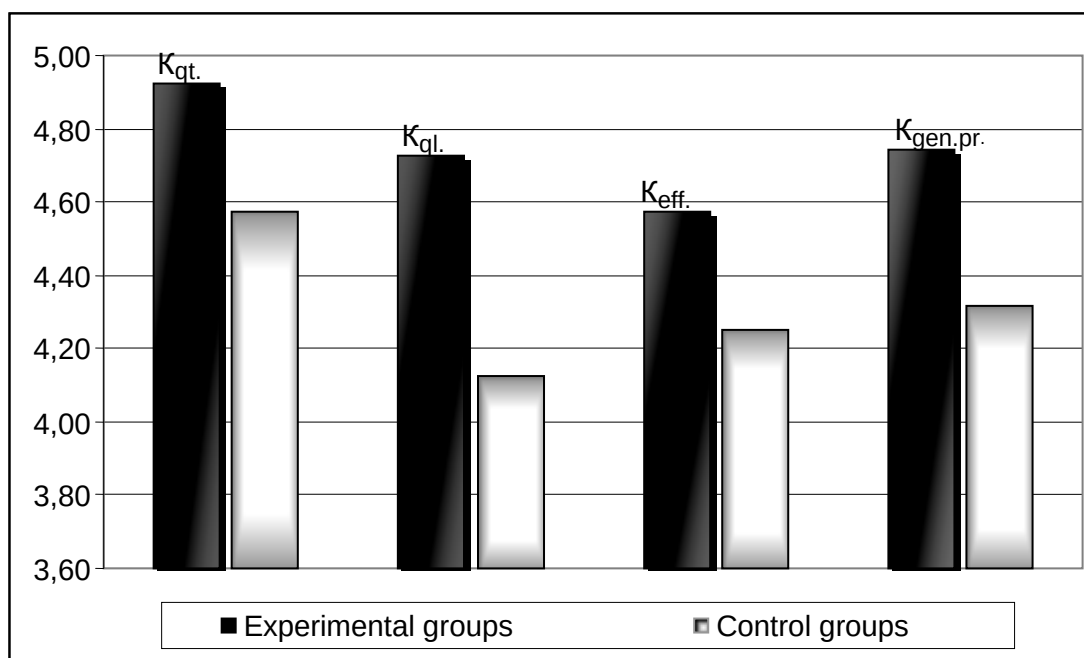


Figure 1. Business game results

The increase in the number of completed tasks and indicators of task quality in the experimental groups shows that the active use of simulation methods of training contributes to the better formation of professional theoretical knowledge and the development of personal qualities. The increase in the efficiency index proves the formation of such personal characteristics as the speed of reaction, the quality of knowledge and their efficiency.

After checking the theoretical knowledge of the main subjects and the performance of the business game during the control stage, a *generalized indicator of the quality of training of specialists* $K_{prof.}$ was calculated according to the formula

$$K_{prof.} = \frac{1}{2} \left(\frac{1}{m} \sum_{i=1}^m K_{gen.tr.} + \frac{1}{g} \sum_{k=1}^g K_{b.g.} \right), \quad (5)$$

Where m – number of students in experimental (control) groups;

g – Number of teams participating in the business game;

1/2 –normalizing coefficient.

The results of the calculations of the quality indicators of training of mid-level specialists are summarized in table 5, which shows that the generalized indicator of the quality of training during the control stage in the experimental groups is higher by 0.26 points (6.2 %).

Table 5: Indicators of quality of training of mid-level specialists

Groups	Indicators of quality of training of mid-level specialists		
	Theoretical professional knowledge $K_{gen.tr.}$	Business game results $K_{gen.pr.}$	Generalized indicator $K_{prof.}$
Experimental	4,2	4,74	4,47
Control	4,09	4,32	4,21

This suggests that, despite the slight increase in theoretical knowledge, students of experimental groups learned to apply better this knowledge in solving practical problems, the ability to work in a team was formed. In addition, during the control stage personal qualities of all students on the above tests were re-evaluated. The results of psychological testing show that students of experimental groups during the classes with simulation methods of training have learned to control themselves and are able to apply different styles of behavior and choose more optimal tactics of behavior.

CONCLUSION

The data of the experimental part of the study confirmed the hypothesis of the study, which is the assumption that the development and implementation of simulation training methods in the educational process of vocational education institutions will contribute to the training of highly qualified specialists, competitive in the labor market and ready for professional growth, if:

1. To form a model of a competitive specialist on the basis of the identified characteristics of the labor market and new requirements for training;
2. To determine the factors and pedagogical conditions of choice of teaching methods that contribute to the development of professional and personal qualities of students;
3. To create a model of formation of the teacher's pedagogical skills;
4. To establish features and to prove the efficiency of application of simulation methods of training in college.

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