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The system of educational situations as a methodological support for updating the content of education

El sistema de situaciones educativas como soporte metodológico para la actualización del contenido de la educación

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ABSTRACT:
The article presents the results of determining the level of students' readiness to implement the methodical system of learning situations, obtained on the basis of the bachelors of the direction "Pedagogical education with two training profiles" (120 students) study. The study found that the preparation of teachers for the planning of educational situations that ensure the actualization of the content of the course of informatics will increase the motivation of future teachers to select the content of teaching informatics.
Keywords: Actualization of educational content, learning situation, information technologies, ICT competence of an informatics teacher.

RESUMEN:
El artículo presenta los resultados de determinar el nivel de preparación de los estudiantes para implementar el sistema metódico de las situaciones de aprendizaje, obtenido sobre la base de los estudios de bachiller de la dirección "Educación pedagógica con dos perfiles de capacitación" (120 estudiantes). El estudio encontró que la preparación de los docentes para la planificación de situaciones educativas que garanticen la actualización del contenido del curso de informática aumentará la motivación de los futuros docentes para seleccionar el contenido de la enseñanza de la informática.
Palabras clave: Actualización de contenido educativo, situación de aprendizaje, tecnologías de la información, competencia en TIC de un profesor de informática.

1. Introduction

Informatics is currently one of the innovative and sought-after school subjects. It is the subject that makes the school modern and close to the needs of society. Today, the informatization of society is fast. There is automation of a wide variety of services, the development of the Internet of things and artificial intelligence. Interaction-oriented inanimate objects are becoming more sophisticated: cars, robots, and heating systems and refrigerators are with them.

The rapid changes taking place in the world of information technologies and the development of informatics as a science associated with this determines the contradiction between the existing content of the school course of informatics and the traditional teaching methods on the one hand; and the acceleration of the pace of the emergence of new information, the requirement of the Federal State Educational Standard of General Education for the development of personality in the conditions of the formation of the information society, on the other hand.

New requirements for the teacher (Teacher's professional standard, 2018) pose the challenge for him not only to be able to design a lesson, b

Psychological and pedagogical aspects of the use of educational situations in the design of a lesson are considered in the works of such scientists as Lerner (1981), Mashbits (1988), Halperin (1999), Matyushkina (2009), and others). The analysis of these works made it possible to define the educational process as a consistent solution of educational situations that are the minimum “unit” of the educational process aimed at mastering scientific knowledge by students. Reference to domestic and foreign records of recent years has allowed us to identify the definition of the concept of “learning situation”.

Domestic authors consider this concept as: projected sets, which are the main source for students to gain personal experience in mastering reality, further redesigning it in a cultured (normative) experience (Ivanova, 2011); organization of educational activities in which children, with the help of a teacher, discover the object of their action and perform various educational activities with it (Polivanova, 2008); a description of some real or specially modeled situation close to the real one used for training purposes (Zabrodina, Kozlova, Fortygina, 2018; Zobov, 2018; Leonova, Fortygina, 2018). Foreign researchers consider the concept of “learning situation” as a complex set of actions that must be accurately described; the actual context to be considered and defined (Raynauld, Gerbé, Beaulieu, 2007).

However, these authors do not fully address issues related to the need to update the course content through the use of learning situations in the design of a lesson and the training of teachers to solve this problem. The presented work is aimed at solving this actual problem.

2. Methodology

The study was conducted in the Federal State Budget Educational Institution of Higher Education "South-Ural State Humanitarian-Pedagogical University", Chelyabinsk, Russia. The experiment was attended by bachelors of direction 44.03.05 "Pedagogical education with two training profiles" (120 students).

To determine the level of readiness of students to introduce a methodical system of learning situations in order to update the content of the course of informatics, a questionnaire was developed based on the system-activity approach of the Federal State Educational Standard and the Professional Standard of the Teacher.

The decision to assign a particular level of quality to the training of each student was based on expert evaluation, in which representatives of professional educational organizations participated.

This questionnaire included ten questions and was aimed at determining the formation of the following skills of future informatics teachers:

1. be able to update the knowledge of students in the course of computer science in accordance with the innovations of the information sphere (0 - 1 point);

2. be able to use modern methods of searching for information about innovations in the field of information technologies (0 - 2 points);

3. be able to establish a correspondence between the content of the subject of informatics and innovations in the field of information technology (0 - 2 points);

4. be able to determine the role of updating the content of the course of informatics in the development of an UCD (0 - 1 point);

5. be able to find new items in the field of Hi-Tech, used to update the content of the course of informatics (0 - 1 point);

6. be able to determine the activity of a teacher in formulating a problem based on the innovations in the Hi-Tech sphere (0–3 points).

To assess the existing differences between the two groups on the formed skills, we use the Mann-Whitney criterion, which will allow us to reveal the significance of the differences between the obtained indicators.

We formulate working hypotheses.

H_0 - the level of readiness to update the content of the course of informatics in the control and the experimental groups does not differ.

H_1 - the level of readiness to update the content of the course of informatics in the control and the experimental groups differs.

Find the value of the Mann-Whitney U-test using the following formula:

$$U = n_1 n_2 + \frac{n_x(n_x+1)}{2} - T_x,$$ where T_x is the largest sum of ranks, n_x is the largest of

the sample sizes n_1 and n_2.

To verify the reliability of the results after the implementation of the elements of the program "Problems of updating the content of the school informatics program" in the experimental group, we will reuse the Mann-Whitney test, which will allow us to reveal the reliability of the existing differences between the control and the experimental groups.

To do this, we formulate the working hypotheses.

H_0 - the level of motivation of future teachers to select the content of informatics education in the control group is equal or higher than in the experimental group.

H_1 - the level of motivation of future teachers to select the content of informatics training in the control group is significantly lower than in the experimental group.

Thus, we need to determine whether the difference between the points can be considered significant.

3. Results

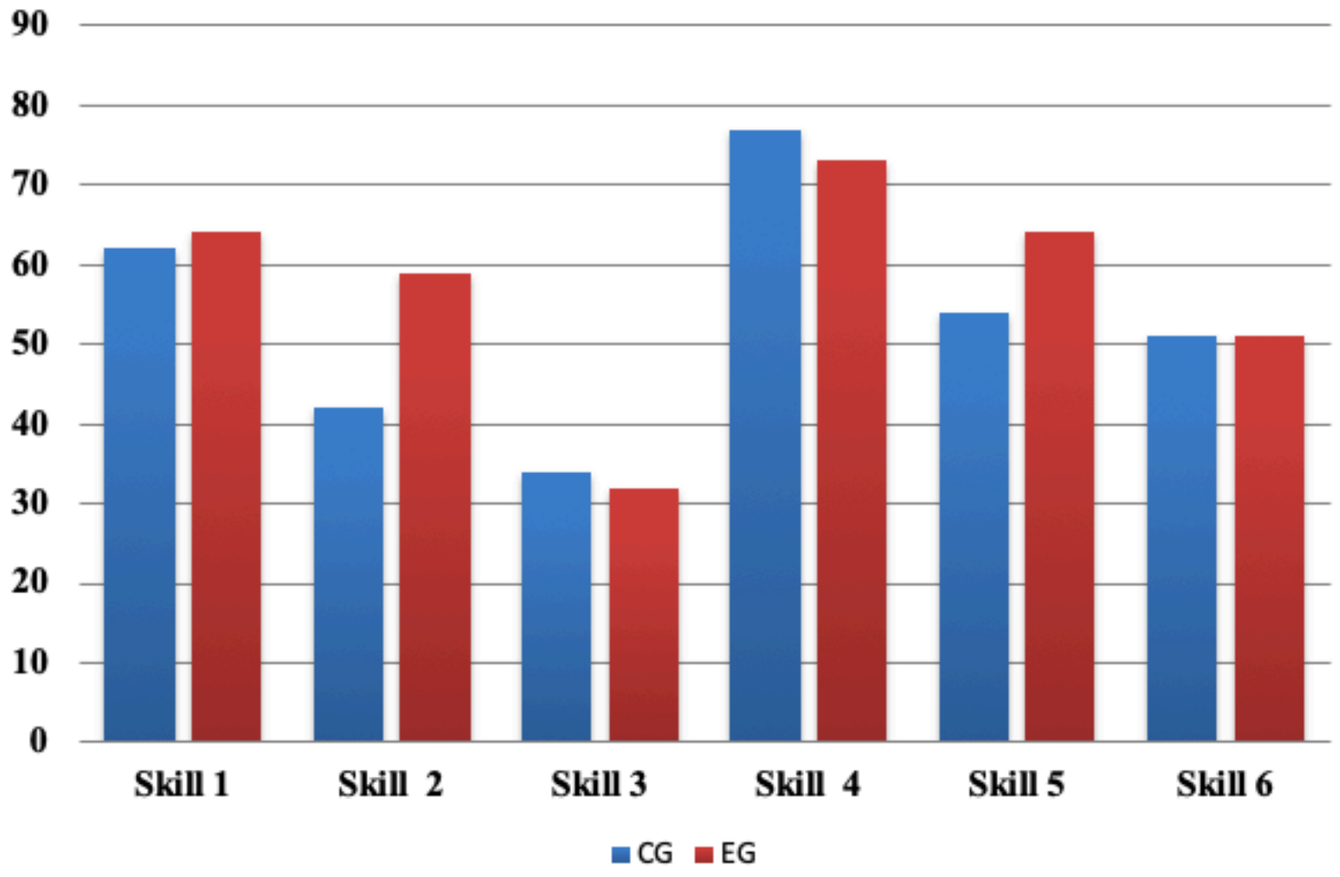
To implement the experimental part of the study, we chose two groups of bachelors. During the ascertaining stage of the study, we conducted a questionnaire on these two groups, in order to determine the level of formation of the above-mentioned skills among future informatics teachers. The average value of the results of the survey of skills of the control and the experimental groups at the ascertaining stage of the study are presented in Table 1.

Table 1
The results of the survey among students
of the control and experimental groups

Groups	Skill 1	Skill2	Skill 3	Skill 4	Skill 5	Skill 6
	1 score	2 scores	2 scores	1 scores	1 score	3 scores
Control group	0.62	0.85	0.69	0.77	0.54	1.54
Experimental group	0.64	1.18	0.64	0.73	0.64	1.54

For a more visual presentation of the obtained results, we construct the histogram (see Fig. 1).

Fig.1
The results of the survey of students of the CG and the EG at the ascertaining stage



To assess the existing differences between the two groups on the formed skills, we use the Mann-Whitney criterion, and rank the results in Table 2.

Table 2
Ranking of student skills

№	Control group, $n_1 = 60$		Experimental group, $n_2 = 60$	
	Level of readiness to update the content of the course of informatics	CG rank	Level of readiness to update the content of the course of informatics	EG rank
1	0.62	2	0.64	4
2	0.85	9	1.18	10
3	0.69	6	0.64	4
4	0.77	8	0.73	7
5	0.54	1	0.64	4
6	1.54	11.5	1.54	11.5
Sums:		37.5		40.5

$$U_{emp} = 6 \cdot 6 + \frac{6(6+1)}{2} - 40.5 = 16.5$$

According to the Mann-Whitney table, we find that

U_{cr} for $n_1 = 6$ and $n_2 = 6$

U_{cr} (0.05) = 7, as U_{emp}= 16.5>U_{cr}= 7 (p = 0.05), then we accept the null hypothesis, differences in sample levels can be considered not significant.

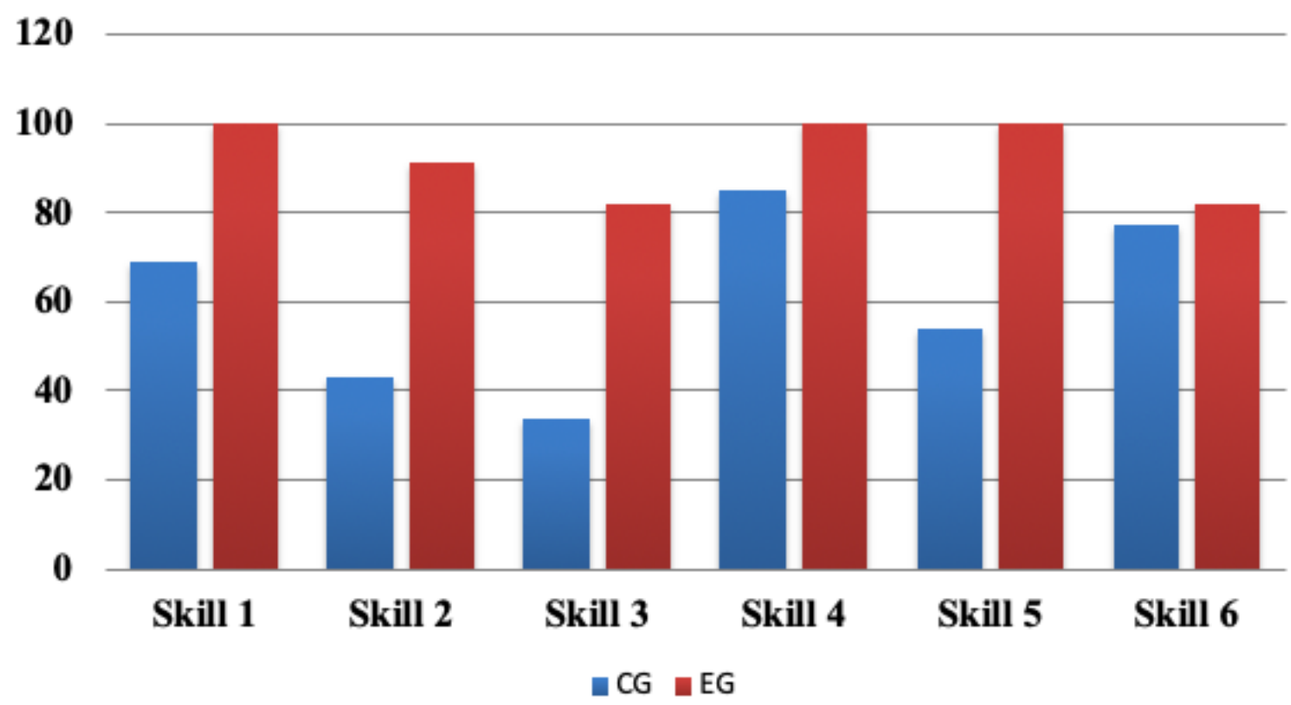
We present the summarized results of the survey of the experimental and the control groups at the formative stage of the study in Table 3.

Table 3
Results of the survey among students of the control and the experimental groups at the formative stage

Groups	Skill 1	Skill2	Skill 3	Skill 4	Skill 5	Skill 6
	1 score	2 scores	2 scores	1 score	1 score	3 scores
Control group	0.69	0.85	0.77	0.85	0.54	1.54
Experimental group	1	1.82	1.64	1	1	2.45

For a more visual presentation of the obtained results, we construct the histogram (see Fig. 2).

Fig.2
The results of the survey among students of the CG and the EG at the formative stage



To verify the reliability of the results after the implementation of the work program developed by us for the discipline “Problems of updating the content of a school course of informatics” in the experimental group, we will reuse the Mann-Whitney test. This criterion will reveal the veracity of the existing differences between the control and the experimental groups in Table 4.

Table 4
Student skills ranking after the implementation of the work program developed by us for the discipline “Problems of updating the content of a school course of informatics”

№	Control group, $n_1 = 6$		Experimental group, $n_2 = 6$	
	Level of readiness to update the content of the course of informatics	CG rank	Level of readiness to update the content of the course of informatics	EG rank
1	0.69	2	1	7
2	0.85	4.5	1.82	11
3	0.77	3	1.64	10
4	0.85	4.5	1	7
5	0.54	1	1	7
6	1.54	9	2.45	12
Sums:		24		54

$$U_{emp} = 6 \cdot 6 + \frac{6(6+1)}{2} - 54 = 3$$

According to the Mann-Whitney table, we find that

U_{cr} for n_1 = 6 and n_2 = 6

U_{cr} (0.05) = 7, as U_{emp}=3 <U_{cr}= 7 (p = 0.05), then we accept the first hypothesis, differences in sample levels can be considered significant.

The hypothesis that we formulated that the preparation of teachers for the planning of learning situations that ensure the actualization of the content of the informatics course will increase the motivation of future teachers to select the content of teaching informatics was confirmed.

The results of the survey showed that the students of the control group at the ascertaining stage had the second and the third skills formed at an insufficient level. The average score of the level of formation of the second skill among the students of the control group is 0.85, which is 42% - this is significantly below the average value, the level of the formation of the third skill is 34%, which indicates a low level of value. At the high level, students have the fourth skill: to determine the role of updating the content of the informatics course in the development of universal learning activities - this indicates a high level of preparedness in the field of informatics teaching methods.

In the experimental group at the ascertaining stage, the ability of students to establish the correspondence between the content of the subject of informatics and the innovations in the field of information technologies is not sufficiently developed. The average score of the third skill level is 0.64, which is 32% - this is significantly below the average. At the high level, students have the fourth skill: to determine the role of updating the content of the course of informatics in the development of UCD, which is 73%.

`At the formative stage of experimental work, after studying the discipline "Methods of Informatics Teaching" among students of the control gr`
The students of the experimental group at the formative stage of the experiment increased the values of all the formed skills, by studying the discipline "Methods of Informatics Teaching" with elements of the program "Actualization of the content of the school course of informatics" developed by us.

4. Conclusions

The most overt increase in the level of readiness to update the content of the informatics course at the formative stage is observed among the students of the experimental group who studied the discipline "Methods of teaching informatics" with elements of the program "Actualization of the content of the school course of informatics" developed by us.

The results of the study allow us to consider the preparation of teachers for the planning of learning situations that ensure the actualization of the content of the informatics course as an important component of the process of increasing the motivation of future teachers to select the content of informatics education.

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