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Increasing Professional Competencies in Students of Pedagogical Universities

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Abstract: In this article we are talking about a pedagogical experiment, using the questionnaire method, conducted by us in 3 pedagogical universities of Uzbekistan, in order to check the availability of professional competencies of 3rd - 4th year students of the direction: "Physics and Astronomy". The purpose, objectives of the pedagogical experiment and its conclusions are described.
Keywords: Pedagogical experiment, questionnaire, professional competencies, Fischer criterion method.

Relevance of the topic: One of the most important components of successful pedagogical higher education of future teachers in physics and astronomy is their possession of professional competencies after graduation.

At the first stage, the 2020-2021 academic year, we conducted a pedagogical experiment, it was conducted in order to assess the availability of professional competencies that were formed among students of the 3rd – 4th year, the direction of "Physics and Astronomy" of three pedagogical universities.

At the second stage, during 2021, a search pedagogical experiment was conducted, covering students of the 3rd and 4th courses of the direction "Physics and Astronomy" of three pedagogical universities. The task of the pedagogical experiment is to test the knowledge of the presence of professional competencies by students of the 3rd – 4th courses;

At the third stage, the 2021-2022 academic year, a teaching pedagogical experiment was conducted with students of the direction "Physics and Astronomy" of three pedagogical universities, according to the methodology proposed by us for improving and developing professional competencies [5].

After the introduction of a new methodology for improving and developing professional competencies into the educational process, pedagogical universities conducted a control pedagogical experiment with 3rd – 4th year students of the same direction. The pedagogical experiment was attended by students, a total of 480, of the following educational institutions: Tashkent State Pedagogical University named after Nizami, Kokand State Pedagogical Institute named after Mukimiy, Jizzakh State Pedagogical Institute named after Abdullah Kadiri.

The professional competence of a teacher is a complex characteristic of a particular teacher, provides the opportunity to carry out pedagogical activities in teaching students with the implementation of high–level labor functions defined in the standard for Higher Education.

We have formed 10 professional competencies, which we presented to 3rd – 4th year students in the form of a questionnaire question.

The questionnaire belongs to the specific methods used in pedagogy. The method is based on a survey of people, designed for large-scale data collection. On the basis of the hypothesis, the questionnaire questions are formed, its orientation is determined to clarify the most significant aspects of the studied phenomena [1]. We have attached information to the questionnaire for students about the goals and objectives of the questionnaire.

In accordance with the definition of the concept of "professional competence" [4], the assessment of the level of pedagogical competence of future teachers in physics and astronomy can be carried out using three criteria:

1. Possession of modern pedagogical technologies, and their application in professional activity.
2. Willingness to solve professional problems in the subjects.
3. The ability to control their activities in accordance with the accepted rules and regulations.

Then competencies will be expected and measurable achievements that will be able to determine how the trained person can manifest himself in the educational process and in its end [9].

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Professional competencies of 3rd – 4th year students in the specialty "Physics and Astronomy" are formed during the study of various disciplines, for example: "Pedagogy", "Psychology", "Theoretical physics", "Astronomy course", "Methods of teaching astronomy", etc.

Checking the knowledge that is formed by professional competencies of students of the 3rd – 4th courses of the direction "Physics and Astronomy" in pedagogical universities:

1. Are you ready to realize the social significance of your future profession, do you have motivation to carry out professional activities?
2. Are you able to carry out training, upbringing and development taking into account the age, psychophysical and individual characteristics of students, taking into account the educational needs of students?
3. Are you ready to implement educational programs in academic subjects: physics and astronomy in a comprehensive school, in accordance with the requirements of educational standards?
4. Are you able to plan your professional growth and personal development?
5. Are you ready to use theoretical and practical knowledge of physics and astronomy to formulate and solve research problems in these sciences in the field of education?
6. Are you able to direct the educational and research activities of students of secondary schools and academic lyceums?
7. Can you use modern teaching methods and technologies?
8. Are you ready to interact with participants in the educational process (director, teacher, subject teachers, students of educational institutions)?
9. Are you able to design educational programs in general education schools in the subjects: Physics and astronomy?
10. Are you able to use the opportunities of the educational environment to achieve personal learning outcomes and thereby ensure the quality of the educational process with the help of visual aids in the subjects of physics and astronomy?

These questions on professional competencies for 3rd – 4th year students could be answered in three ways: Yes, no, I find it difficult to answer.

According to the pedagogical experiment on the assimilation of professional competencies by students of the 3rd – 4th courses of pedagogical universities, the following results of our pedagogical experiment were obtained, which are shown in the table.

When analyzing the results of the ascertaining pedagogical experiment, by means of a questionnaire on the presence of professional competencies in 3rd – 4th year students of pedagogical universities, we used the method of mathematical statistics, the Fisher criterion [3].

On average, the number of positive answers among students of pedagogical universities ranges from 44% to 70%, the percentage of negative answers ranges from 11% to 25%, but there is also a category of answers when a future specialist in physics and astronomy doubts or does not understand the meaning of the question about their professional competencies, and in this category it varies from 17% to 31% of the responses of all students.

The large percentage of positive correct answers of students on the 7th and 8th question averages 70%, which explains that future teachers of physics and astronomy feel ready to use modern teaching methods and technologies in their future work at school, and are ready to interact with participants in the educational process.

The most difficult question, out of the above 10 questions on professional competencies, turned out to be the question of the ability of future teachers of physics and astronomy to design educational programs in secondary schools in the subjects of physics and astronomy, – 44% of all 480 people had the right answers.

There is a need to change the teaching methodology and the content of the discipline "Designing physics and astronomy", which is studied in the 4th year by students of the direction "Physics and Astronomy" in pedagogical universities.

We have also developed a methodology for improving and developing the professional competencies of future teachers in physics and astronomy:

1. The use of competence–oriented situations of professional orientation motivates students to study the discipline of the astronomy Course, promotes the assimilation of knowledge, analysis of educational material in which there are different professional situations.

2. The professional competencies of future teachers in physics and astronomy also include reflection, as a special type of activity for understanding and analyzing their own pedagogical activity, which contributes to improving professional competence. Future teachers of physics and astronomy can demonstrate their knowledge, skills and abilities in theoretical classes, and they will be aimed at solving common pedagogical tasks: organizational skills, information and didactic, developmental and research skills [8].

3. Independent work contributes to the development of thinking skills and abilities, presuppose the manifestation of initiative and creativity of students in the classroom on the Course of astronomy in the process of mastering new material [6]. Independent work performed by students in the Course of astronomy is one of the significant components of the educational process, and an important link in the formation of professional competencies.

4. Application of innovative methods and technologies in teaching bachelors in the field of Physics and Astronomy [7].

5. The use of 3 D technologies and computer astronomical programs in lectures and laboratory classes in the Course of Astronomy, etc. [10].

The results of a teaching pedagogical experiment to improve and develop the professional competencies of future teachers in physics and astronomy were conducted on the same questionnaire questions as in the ascertaining experiment.

Evaluation of the effectiveness of the methodology developed by us was carried out in various ways. The number of correct answers of students was quantified by the presence of their professional competencies. The results of pedagogical experiments were evaluated in a qualitative way, on the students'

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understanding of the Physics and Astronomy direction of questions on professional competencies [2].

Based on the results of correct answers to questions of professional competencies, future teachers of physics and astronomy in Figure No. 1, a diagram is presented in which the percentage of correct answers as a result of a ascertaining pedagogical experiment is indicated in blue, and the percentage of correct answers of students is indicated in red, after the introduction of methods and recommendations for improving and development of professional competencies.

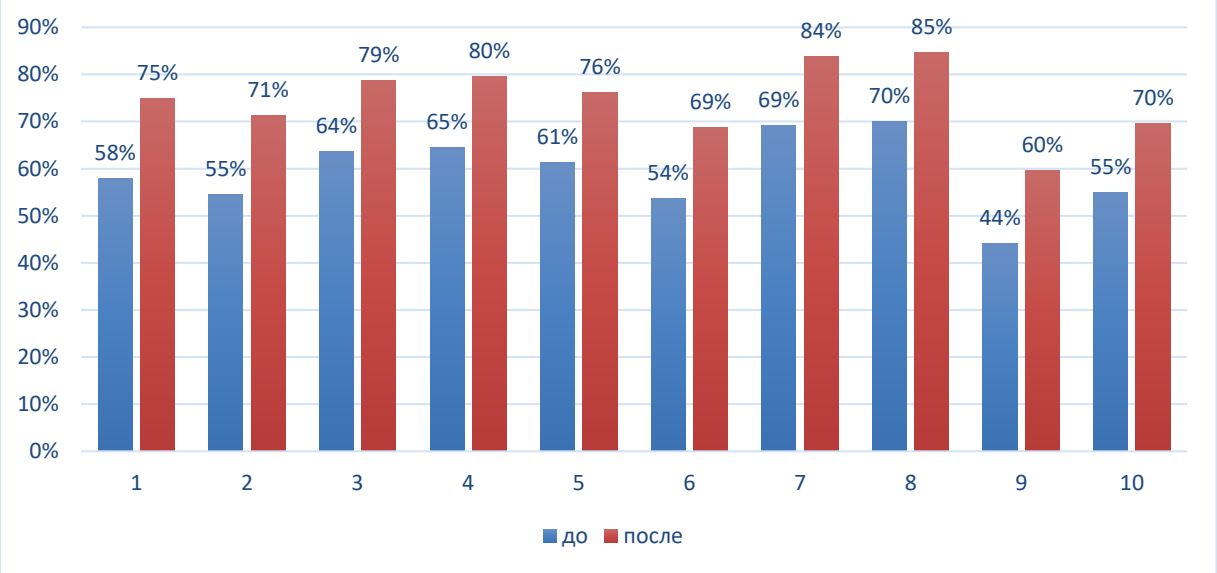

Fig. No. 1 Correct answers of students of all 3 universities before and after the pedagogical experiment

We can conclude from the results of pedagogical experiments that the students of the experimental groups have a higher level of knowledge on all the issues proposed by us compared to the students of the control groups.

We can also assume and conclude that the methodology we have developed will be effective in the study of other natural and mathematical disciplines, when repeating and generalizing educational material in classes on disciplines in pedagogical universities:

1. The degree of proficiency in professional competencies, future teachers in physics and astronomy has been revealed.
2. A methodology is proposed that can improve the professional competencies of future specialists of a pedagogical university in physics and astronomy.

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