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HOW TO IMPROVE THE QUALITY OF TRAINING FUTURE SCIENCE TEACHERS AT A PEDAGOGICAL UNIVERSITY

CUM ÎMBUNĂȚĂȚIM CALITATEA FORMĂRII VIITORILOR PROFESORI DIN DOMENIUL ȘTIINȚELOR LA O UNIVERSITATE PEDAGOGICĂ

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Abstract. The article is devoted to the problems of improving the quality of natural science teacher training at a pedagogical university. After posing the problems, the author sets out his vision of solving them. His proposals and conclusions are based on his own experience as a teacher at school, on his scientific research, and on many years of teaching at the Institute of Postgraduate Pedagogical Education and Pedagogical University.

Keywords: teacher, quality of training, training, education, innovations, pedagogical university, school.

Rezumat. Articolul este dedicat problemelor de îmbunătățire a calității formării viitorilor profesori din domeniul științelor la universitatea pedagogică. Autorul își expune viziunea proprie privitor la soluționarea problemelor formulate. Propunerile și concluziile sale se bazează pe propria experiență în funcția de profesor practician, dar și pe rezultatele cercetărilor sale științifice și activitatea de predare la Institutul de Educație Pedagogică Postliceală și Universitatea Pedagogică.

Cuvinte-cheie: profesor, calitatea formării, formare, inovații, universitate pedagogică, școală.

„People believe that a sheikh should show miracles and demonstrate his education.
Meanwhile, the teacher is only required to possess everything that the student needs.”

Ibn Arabi

The problem of improving the quality of teacher training at a pedagogical university not only continues to remain important. It is becoming increasingly relevant and requires solutions. The reason for this is changes in the demands of modern school education. And who, if not the teacher, is obliged to react to this.

At the same time, it is necessary to take into account some of the extremes that we saw during the implementation of previous reforms in the education system.

One of them was that experienced teachers were slow to respond to innovations. They hoped that a certain part of them did not pass experimental testing and would be canceled as useless, or even harmful.

The second extreme was that teachers sharply abandoned everything that had proven positive in many years of teaching practice, and took on faith everything that was proposed by the reformers. Again, quite often this new thing also did not have any scientific basis and was not tested during a pedagogical experiment. The result was negative, but no one understood its reasons. New education organizers appeared who proposed the following reforms of the industry... Let us at least remember how they changed the age at which children had to start studying at school and the duration of study at it. It's also worth remembering how many times student projects, as well as group teaching methods, were introduced into the educational process. However, how is it different for students to work in brigades, groups or teams? But every next time it was presented as an innovation. It's good that this is not observed in the fundamental sciences. After all, the ratio of the opposite side to the adjacent side in a right triangle was originally called the tangent, and no one else dared to propose another name for this trigonometric function, presenting himself to the whole world as a new "outstanding" mathematician.

It is possible that after reading these discussions, someone may think that I am an inveterate conservative who does not accept any pedagogical innovations. In this regard, I will try to give a short note. For more than ten years I worked as a physics teacher in rural and several urban schools. It was at that time that I carried out scientific research, which ended with the defense of my Ph.D. dissertation on the topic "Experimental tasks as a means of increasing the level and quality of students' knowledge in physics" [4]. I defended my doctoral dissertation while working in higher education institutions. Its topic: "Theoretical and methodological foundations for the development of students' creative abilities in the process of teaching physics" [5]. The results of this research have been introduced into

pedagogical practice: on my initiative, the country's Ministry of Education and Science established the annual All-Ukrainian tournament of young inventors and innovators.

If I managed to protect myself from the emergence of thoughts in anyone regarding my possible conservatism, then I will return to my previous reasoning. Although now I will talk about positive aspects in the development of education. Schools and universities received a lot of equipment that is still being successfully used today. We are talking about laboratory and demonstration equipment, as well as technical teaching aids, which have now given way to computer technology. The best remains of the teaching techniques and methods developed (usually by the teachers themselves). And it must also be said that pedagogical educational institutions trained good teachers. I dare say that a positive role in this regard was played by the fact that there were competitions for admission to such universities. The reason for this was the prestige of the teaching profession.

To continue, I will quote a text from Cyril Northcote Parkinson's book "Parkinson's Laws". At the same time, please take into account that the book was first published in 1958 and immediately became a bestseller in business circles in the UK and the USA and around the world. "A male teacher in the United States," writes the author of this work, "is the man who remains with women and children when other men of his tribe go to work or to war. ... Having devoted himself to his half-childish profession, he learns "how to teach" without knowing the meaning of the subject." In the same paragraph, his thought is further developed: "Those who can teach teach, those who cannot teach teachers how to teach other teachers the art of teaching. This brotherhood of methodological scientists is a kind of state within a state, where people who have devoted themselves to the study of Nothing have gathered" [7].

This work is written in the genre of subtle intellectual satire, but its content sometimes leads to reflection... Therefore, I will move on to the stated topic of the speech. My reasoning is based not only on my experience as a physics teacher at school, but also on my long (since 1990) work at the Institute of Postgraduate Pedagogical Education, as well as part-time work at T.H. Shevchenko National University "Chernihiv Colehium". Communication with students of the Faculty of Physics and Mathematics, and later with them, but as teachers, allows to draw appropriate conclusions, on the basis of which I have the opportunity to make a number of proposals related to the topic of my speech. Although, I want to warn you that this is my personal opinion and does not claim to be the absolute truth.

The first thing I would do is to recruit school graduates who have the inclination to work with schoolchildren to study at pedagogical educational institutions. We see applicants

with such inclinations during their studies at school. Other children are drawn to them, with whom they enjoy communicating. They are able and willing to explain the material being studied or the solution to a problem. They have excellent knowledge of relevant academic subjects. By adding other characteristics, you can create the image of a future applicant to a pedagogical university. It would not be bad if the school at which he studied supported him in this regard.

Second. During the preparation of a future teacher, I would suggest teaching all psychological and pedagogical subjects when the student feels the need for it. And this needs to be brought to a conclusion.

These subjects should take into account all the achievements of psychology and pedagogy, and not be based on what they came to in the times of John Amos Comenius, Johann Heinrich Pestalozzi and others. Let us remember at least one of the principles of teaching - visibility. Students are told that about 80% of information a person receives through the organs of vision. From this the conclusion was drawn about the dominant role of visibility. The more it is, the better it is for the perception of educational material, current teachers also claim. As a result, we got the fact that the child immediately looks for a picture in a book or other manual. There are memes everywhere, emoticons everywhere... Children don't want to bother reading, which requires thinking. At the same time, the famous psychologist Lev Semenovich Vygotsky wrote the following in 1935: "It turned out that such a teaching system, which is based solely on visualization and excludes from teaching everything related to abstract thinking, not only does not help the child overcome his natural disadvantage, but also perpetuates this deficiency, accustoming the child exclusively to visual thinking and drowning out in him those weak beginnings of abstract thinking..." [3]. It should be noted that in this case we were even talking about teaching children with mental retardation.

In our country, without visualization, which includes computer presentations made in the ppt program, only physical education classes are conducted. And even then not always. At the same time, we complain that our children have poorly developed abstract thinking, forgetting that it, like everything else, needs to be developed.

I would like to draw attention to the teaching process itself in a pedagogical educational institution. If we intend to expect pedagogical excellence from a future teacher, then we must demonstrate it in our lectures. The future teacher expects this from the teacher, considering

him a role model. However, we often act differently: we read the same lecture text, safely hiding behind the pulpit and holding it with both hands.

If we talk about training a future teacher of natural and mathematical subjects, then during lectures and practical classes on them, the teacher must demonstrate what the teacher will need to work at school. This includes the ability to see the unusual in the ordinary, the ability to formulate a hypothesis for a potential study, choose research methods, apply a creative approach to solving a problem, draw appropriate conclusions, and the like. Ion Botgros, Viorel Bocancea and Nikolae Constantinov wrote physics textbooks for grades VII and VIII that contain research laboratory work [1]. The author of this text is also developing similar research works [6]. This was done independently of each other (we didn't know each other then). In schools in several countries, the idea of involving students in research activities directly in physics lessons has been put into practice. This idea later extended to students completing educational projects. As it turned out, all this was later united by STEM education.

I would also like to say something about creative STEM projects. During my studies at the pedagogical institute, we were asked to make various models and working technical devices. Future chemistry teachers made models of molecules, mathematicians made models of three-dimensional figures, and we (physicists) assembled various electronic devices - switches for oscilloscopes, radios, audio frequency generators and much more. Then it all stopped. As a result, the future, and then the current physics teacher, began to be afraid of the soldering iron, wrench and screwdriver. This was at a time when students were being asked to create various technical devices to participate in various national and international competitions. Of course, physics teachers such as Victor Ciuvaga (IPLT "C. Stere", mun. Soroca, Moldova), Andrey Shariy, Yuriy Krasnovid (Chernihiv region) and others were in an advantageous position. For example, the installation of sundials made from scrap materials in the courtyard of a rural school aroused great interest (Figura 1). A well-known device, but with an original quadrant (scale).



Figura 1. Sundial with original quadrant

The clock shows the time of lessons, breaks, lunch, etc. Of course, children are interested in learning from a teacher like Yuri Krasnovid. The developments of his students are annually awarded with diplomas at All-Ukrainian exhibitions of technical creativity. Of course, the pedagogical experience of such teachers should become the property of all future and current physics teachers.

A pedagogical university must not only carry out licensed programs, but also introduce future teachers to all pedagogical innovations. To do this, it is necessary to invite leading teachers to conduct master classes. It would be bad if a young teacher learns about STEM education [2], tournaments for young inventors [5], Intel-Techno competitions and other things not while studying at a pedagogical university, but upon coming to work at school.

Based on the above, we can conclude that high-quality training of future teachers of *natural* sciences can only be carried out by a pedagogical university whose teachers will be role models for students, when the material they teach will be based on modern scientific research, when they will be introduced to pedagogical innovations.

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