

## GOTOWOŚĆ STUDENTÓW DO KORZYSTANIA INNOWACJE W PRZYSZŁEJ DZIAŁALNOŚCI PEDAGOGICZNEJ

W artykule podano wyniki eksperymentu pedagogicznego przeprowadzonego wśród studentów z obszaru szkolenia 6.040203 Fizyka \* (III i IV lat) i specjalności 8,04020301 Fizyka \* (VI roku - magisterskich) na wielu wyższych pedagogicznych placówkach oświatowych Ukrainy w sprawie zamierzają gotowości nauczycieli fizyki do wykorzystania innowacji pedagogicznych w procesie ich przyszłej działalności zawodowej. Podano wyniki przetwarzania kwestionariusze uczniów, rozmowy ze studentami i nauczycielami fizyki, oraz wyniki obserwacji uczniów za procesem szkolenia i praktyki analizowaną specjalnością.

**Słowa kluczowe:** innowacje, innowacje pedagogiczne, gotowość nauczyciela, działalność zawodowa.

## STUDENTS' READINESS FOR USING INNOVATIONS IN THE FUTURE PEDAGOGICAL ACTIVITY

The article deals with results of pedagogical experiment conducted among students of training area 6.040203 Physics\* (III and IV years) and speciality 8.04020301 Physics\* (VI year – Master degree) of a number of higher pedagogical educational establishments of Ukraine concerning intending Physics teachers readiness to use pedagogical innovations in the process of their future professional activity. The results of processing students' questionnaires, interviews with students, Physics comprehensive schools and university teachers and observing the students of the above mentioned training area and speciality practice process are analyzed.

**Keywords:** innovation, pedagogical innovation, readiness of teacher, professional activity.

## ГОТОВНІСТЬ СТУДЕНТІВ ДО ВИКОРИСТАННЯ ІННОВАЦІЙ У МАЙБУТНІЙ ПЕДАГОГІЧНІЙ ДІЯЛЬНОСТІ

У статті подаються результати педагогічного експерименту, проведеного серед студентів напряму підготовки 6.040203 Фізика\* (III та IV курси) і спеціальності 8.04020301 Фізика\* (VI курс - магістри) ряду вищих педагогічних закладів України відносно перевірки готовності майбутніх учителів фізики до використання педагогічних інновацій в процесі майбутньої професійної діяльності. Аналізуються результати обробки студентських анкет, бесід зі студентами і вчителями (викладачами) фізики в загальноосвітніх і вищих навчальних закладах, а також результати спостережень за процесом проходження педагогічної практики студентами вказаних напрямів підготовки і спеціальності.

**Ключові слова:** інновації, педагогічні інновації, готовність учителя, професійна діяльність.



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General setting the problem and its connection with the important scientific and practical tasks. The current education system is responsive to the progress in science, technology and social spheres, economic crisis, environmental, demographic and political phenomena. The result of this reacting is forming exacerbation of sufficiently educated younger generation able to quickly navigate the environment, to think independently and to be free from stereotypes.

A typical situation for modern pedagogy is losing effectiveness of traditional teaching methods of education, content and organization of the educational process on the whole. In our opinion, the essence of the problem consists in the inability of comprehensive schools to form student's coherent identity because of partial lack of individual approach to student's personality, taking into account his/her age, biological and psychic features.

Generally recognized tendency of modern education is changing general educational aspects to the personal scope of student, using active forms and methods of teaching, the most appropriate for given direction. One of the ways of solving these contradictions is the use of innovative technologies in the teaching process. This was reflected in a number of laws and programs: the Law of Ukraine «On Education», National Doctrine of Ukraine in the 21st century, the state program «Teacher», Bologna Declaration, etc.

Creating effective system of education guaranteeing the development of innovation culture of school graduate, creating connections to personality, society and state needs, must become the result of these programs and legislation. Thus, the use of innovative teaching methods is one of the ways to solve these conflicts by enhancing general educational process on the whole.

The importance of innovation is evidenced by the fact that governments of different countries are investing heavily in research and innovation (fig. 1).

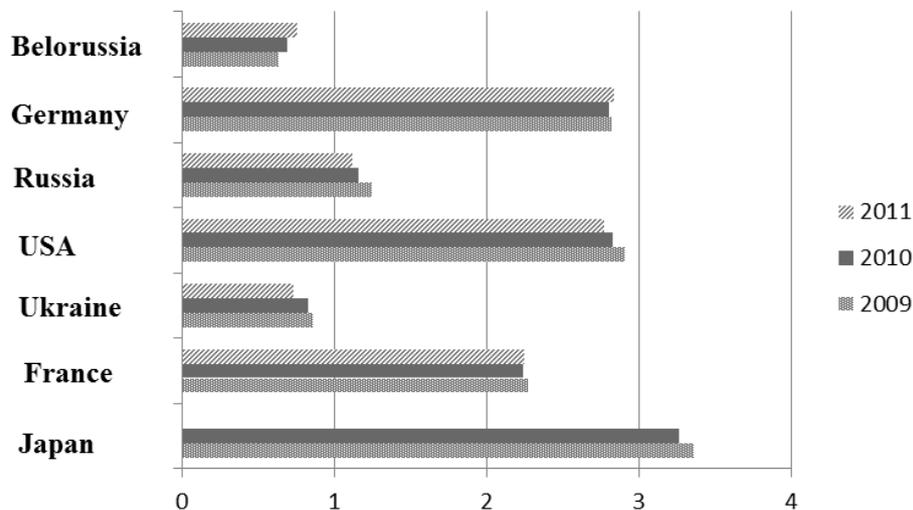


Fig.1. Investments into scientific researches and innovative activity in separate countries by data of World Bank (% of GDP) [4]

The term «innovation» was first used in the economic sphere, namely in the Austrian scientist Joseph Schumpeter's work «Theory of Economic Development» (1912). Further development of the economic sector caused the emergence of related terms «innovating», «innovation», which are often identified, although there are some differences.

The word «innovation» is derived from Latin «inovatis» (*in* – in, *novus* – new) – introduced innovating providing quality increasing effective processes or products required by market. There are a number of interpretations of the term «innovation»:

– socio-techno-economic process, which creates through the practical use of ideas and inventions the best in quality products, technologies and makes a profit (in the case where

innovation is focused on economic benefits), its appearance on the market can provide additional benefits [5];

- set of production, technical and commercial activities leading to the emergence on the market of new and improved industrial processes and equipment [3];
- introducing something new in relation to the organization or its direct environment, as a special case of a process of change in the organization [7];
- process in which ideas or inventions gain economic content [8];
- newly created (applied) and (or) improved competitive technologies, products and services as well as organizational and technological solutions of industrial, administrative, commercial or otherwise character, which significantly improve the structure and quality of production and (or) social services [1].

Innovation in the pedagogical process means introducing new objectives, contents, methods and forms of training and education, organizing joint activities of the teacher and students. Teacher's applying innovations is seen as a process of purposeful, systematic and consistent practical use of original, innovative methods, teaching techniques, tools, covering holistic learning process beginning with defining its purpose and ending with the expected results.

The most important general pedagogical innovations include: 1) the theory and practical technology of optimizing the educational process involving the system of pedagogical science and teaching practice; 2) humanistic pedagogy in the totality of its theoretical concepts and practical technologies; 3) approaches to teaching organization and management processes based on new ideas; 4) technologies based on the use of new ideas and means of informatization, mass communication.

As the need for innovation usage in modern educational environment is proven, there is a contradiction between the need for active innovation in the teaching process, on the one hand, and the willingness of teachers to such activities on the other.

**Forming the aims of the article (setting the tasks).** The target of the article is the analysis of intending Physics teachers' readiness to use innovative technologies in their future educational activities.

In the period of 2006-2009 the pedagogical research in several pedagogical higher educational establishments of Ukraine and in several schools of Sumy, Chernihiv and Kyiv regions in order to test the readiness of Physics teachers to use innovations in their professional pedagogical activity was conducted.

To avoid formalizing the information, the group evaluation method as the most appropriate in handling such information was selected. The expert group included teachers of Physics of comprehensive schools, lecturers of Physics and Mathematics and informatics education chair of Oleksandr Dovzhenko Hlukhiv national pedagogical university who evaluated the questionnaire for students and teachers.

Gathering information on the research topic was both during the academic year and in the process of conducting by students of III, IV and VI (Master degree) years of different practices: educational computing and educational practices in summer rest camps - the third year; pedagogical practices in higher educational establishments of I - II levels of accreditation, high schools, colleges and other educational establishments of the new type - the fourth year; research practices «Managing higher educational establishments of I - IV levels of accreditation, other educational institutions of the new type»; educational and scientific practice «At the teacher's workplace» (for simplicity the term «*teaching practice*» will be used further).

Assessment of the validity of the questionnaires was carried out by group evaluation method. The experts were asked to express their views on introducing 12 indicators to the questionnaire for students and 7 indicators to the questionnaire for teachers. Key figures included in the questionnaire were determined by the pilot study.

Methods of questionnaire survey revealed attitudes of Physics teachers in comprehensive schools, students training area Physics 6.040203\* (III and IV years) and specialty 8.04020301\*

Physics (Masters degree, later - VI year) of a number of higher educational institutions of Ukraine to intending Physics teachers readiness to use pedagogical innovations in their professional pedagogical activity. The survey results were used to correct planning the pedagogical practice of students in the relevant field of study and developing methods of forming the basic skills of intending teachers of Physics in this type of professional activity.

By decision of the working group validity was set which makes 0,63 ( $Y = 0,63$ ). Questionnaire validity was calculated by the formula:

where  $n$  – index number in questionnaire;  $a_1, a_2, a_3, a_n$  – percentage correlation of experts number who supported including  $i$ -index into the questionnaire. The formula can be used as every value  $a_i > 50\%$ .

Evaluation of the questionnaire survey for students was conducted six times. The mean validity of the questionnaire was 0.82. The same evaluation was conducted for the survey questionnaire for teachers (mean validity was 0.86). Since the validity of the obtained values is greater than the threshold ( $Y = 0.63$ ), these parameters can be entered in the questionnaire for further research and methodological research.

Using questionnaires and observations the output level of readiness of students to the use of innovations at school was investigated. The results of diagnosis were used to correct planning of pedagogical practice for students of relevant field of study and develop methods of forming the basic skills of future teachers of Physics in this type of their professional activity.

In the survey 115 students of III, IV, VI courses in specialty «Physics» took part. The questionnaire included a number of questions aimed at revealing:

- reasons for admission to higher educational institution;
- attitude to the teaching profession;
- awareness in educational terminology «humanistic education», «innovation», «innovative activity», «optimization of the educational process», «project», «educational project», «web quest» etc.
- the level of students activity in research and creative work of the department (faculty);
- the level of using by teachers (lecturers) of Physics the pedagogical innovations in the classes and extracurricular activities;
- the level of students' using pedagogical innovations in the process of pedagogical practices in comprehensive schools.

Responses were evaluated by the 9-point scale (1 to 3 points - low level; 4 to 6 - average level; 7 to 9 – high level).

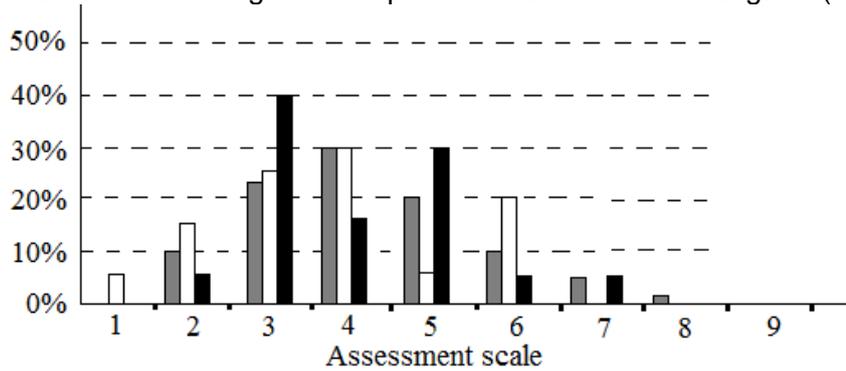
Analysis of students' responses showed students insufficient interest to be a teacher of Physics (5%), which in its turn is an extremely low rate of the teaching profession prestige. The rest 92% of respondents get higher education in the nearest to their home place, 3% because by the results of independent testing they failed to gain the other (desired) profession. The latter datum defines attitudes towards the teaching profession on the whole as a profession «of last resort» in case of the absence of alternatives.

Information on the level of innovation using by teachers in teaching students Physics is also interesting. Thus, according to students, observation and analysis of lessons conducted by subject teachers the low level of innovating was indicated, namely 3% of teachers use modular technology of the teaching process in Physics; 70% of teachers using computer and multimedia technology (including 70% in the classroom using a laptop or stationary computer, 54% to the same use multimedia projector, 15% - multimedia board, 4% - camera 2% - Web camera); 23% of teachers in their work using the method of projects; 3% of teachers use a method of web quests. We have listed not all the possible innovations that can be used by teachers.

Outcomes of innovation usage in the teaching process in Physics by intending teachers is still worse, because the vast majority of intending teachers in the course of the excitement tried to simplify to a minimum all the elements of the lesson, including equipment that could be used in the classroom. The latter, in our opinion, must be the natural process of forming and professional

development of the teacher of Physics.

Some results of our investigation are presented in the form of diagram (fig. 2, 3).

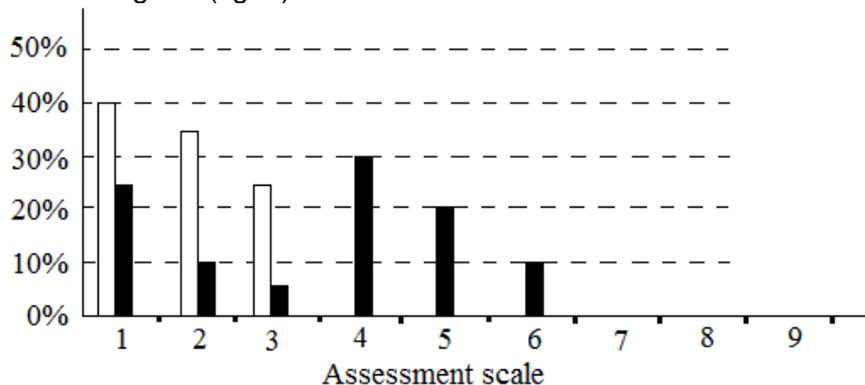


■ - III year students, □ - IV year students, ■ - VI year students (Master's degree)

Analysis of the distribution of students according to the scale of activity in the learning process (fig. 2) shows that most of the students are on the average level of activity in the learning process (3 - 5 points on a scale of assessment). One reason for the low activity is, in our opinion, the lack of skills of independent work, which leads to weak using creative potential of each student by teachers. Thus, according to students testify, 37% of them have at least a rough plan of action for self-education and 30% have no interest and aptitudes to this type of work.

Analysis of the questionnaire study shows that students are more often involved in research and creative work in preparing term papers and essays (40% of all students). It must be taken into account that this activity is required according to curriculum and is largely mandatory, not dependent on the willingness of students. The other important factors include interest of students to proposed research topic. This factor of attracting students to research and creativity was marked by 18% of students. Graduate students admitted their interest to topics offered to them (32%) and performing diploma (12%) among the main reasons leading them to creative activity.

Lack of activity of students in the learning process can be further traced in the teaching practice (fig. 3). As the third-year students are not active in teaching practice, the diagram presents information on IV and VI year students. As it can be seen, the results are worse than in the previous diagram (fig. 2).



□ - IV year students, ■ - VI year students (Master's degree)

**Fig. 3. Distributing students by level of innovation usage in the process of pedagogical practice**

Among the pedagogical innovations used in course of teaching practice, the main place is occupied by: using computer and multimedia equipment (60% of students of IV year and 78% of VI year students used a laptop or stationary computer in their classes, 40% of IV year students and 90% of VI year students used multimedia projector, 10% of students of IV year and 45% of VI year used multimedia board); using the method of projects was 30% of students of the fourth year

and 15% of students of the sixth year; using web quests made 2% for the students of the fourth year and 5% for the sixth year students.

The role of pedagogical innovations actively used by students in the course of pedagogical practice during IV and VI years was played by research projects and web quests; because the basis of these methods is the development of cognitive and creative skills of students, skills to independently construct their knowledge, to navigate the information space, to critically think.

In many cases the low indicators of the fourth year students of the interactive whiteboard and other computer equipment are due to the poor base of schools, where students had their teaching practice. The percentage of using laptops in class would have been even lower if intending teachers did not bring their own devices to class. The percentage of used in the learning process specified technical training courses by VI year students was higher because of higher level of material resources of the higher educational establishments which differs significantly from schools.

Conclusion according to the research results and perspectives of further investigations in the area. General trends of the society development- computerization, automation and technologization in all the spheres of human activity significantly affect the development of comprehensive school, require creating and implementing innovative technologies of teaching Physics and training intending teachers of Physics, capable to design and use these technologies. The traditional system of teacher training in Physics, despite significant achievements and accomplishments require substantial upgrading due to high technology level of educational process in the secondary and higher education, a significant increase in students independent learning, creating possibilities for the use of computer technologies in teaching Physics.

Experimental results proved that the willingness of intending physics teachers to use innovative technologies in the learning process is rather low. The latter requires the organization of the educational process in the higher pedagogical educational establishment providing intensive forming knowledge and skills of students and of use methodical research work in the educational process at comprehensive schools, that would objectively create opportunities for personality oriented training of students not only for using innovative technologies of teaching Physics in comprehensive school, but also for the designing such technologies and their experimental science-based testing in the real learning process in Physics.

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