DOI 10.31489/2022Ped4/83-87

UDC 614.23:(5772-575)-371.3

Zh.K. Yermekova, E.K. Kozhabekova, G.E. Sagyndykova

L.N. Gumilyov Eurasian National University, Astana, Kazakhstan
(yermekova_zhk@enu.kz)

The role of innovative technologies in increasing the level of professional competence of the future physics teacher

Modern pedagogical science states that the new concept of education of the XXI century is being developed through the prism of improving the culture of the personality of the future teacher, which should include a set of knowledge, skills and, most importantly, the cultural and moral values accumulated by mankind, which are necessary for the formation and development of a competent personality, its professional maturity. The article deals with the problem of training teachers for innovative activities in the context of distance learning. The necessity of this component of professional training of teachers is substantiated, the features of an innovative approach to the organization of the educational process are described, the essence of the innovative orientation of pedagogical activity is revealed. The authors believe that the primary, main, but long–term goal is the formation of a competent personnel potential of teachers of a new formation, justifying the quite obvious: the direct dependence of the quality of the education system on the quality of teachers working in it. Proposed solutions to the problems of training highly qualified, competent physics teachers of a new formation who are able to work in distance learning, create high-quality electronic resources for students on the basis of innovative technologies and who are ready to effectively implement them in the pedagogical system.

Keywords: physics teachers, educational process, new formation, innovative technologies, competence, educational program, distance learning, intersubject connections.

Introduction

Since 2020, in the face of the threat of the spread of coronavirus infection, all universities, colleges and secondary schools have decided to switch to distance learning.

Due to the state of emergency in the country due to the coronavirus pandemic and the transfer of students to distance learning, remote rural areas without the Internet and with poor communication are faced with a new problem. There are remote rural areas where students do not have access to the Internet and mobile communications, and therefore were cut off from studies [1].

There are distinctive features of distance learning technologies.

Distance learning technologies are based on the following methods of information transfer:

- Electronic textbooks and reference books;
- Two-way communication using internet connections.

Electronic textbooks are becoming more and more popular every year due to their much wider possibilities. Let's name the main advantages of electronic textbooks:

- Quick search function. The ability to quickly and accurately find the information you need for any request.
- Multimedia functions. The ability to use in educational material not only illustrations, but also video materials, animations.
- Interactive simulation. Students have the opportunity to conduct many virtual experiments, especially in physics.
- An interactive self-test system, which allows the student to assess the level of his knowledge in a convenient form, to prepare more thoroughly for tests and exams.

The need to use high-quality electronic textbooks is becoming today's requirement for distance education.

Students need electronic teaching aids, textbooks, problem books, virtual laboratory works, tests for self-examination of knowledge, etc. which can be used without access to the Internet. Here the following question arises: are there enough highly qualified, competent teachers with innovative education who are able to create high-quality electronic resources for students and are ready to effectively implement them in the pedagogical system? It is well known that it takes years to develop a competent, creative human resources. How is the problem of training competent teaching staff — teachers of a new formation solved?

The theoretical understanding of the term “competence” led to the following conclusions:

firstly, competence requires constant updating of knowledge, mastering of information for optimal use in specific conditions, i.e. possession of operational and mobile knowledge;

secondly, competence is not just the mastery of knowledge (in such cases, we can talk about erudition), it is rather a willingness to solve problems with knowledge of the matter, therefore, competence includes both content (knowledge) and procedural (skill) components, then there is a competent person who should not only know the essence of the problem, but also be able to solve it, and flexibly applying adequate methods;

thirdly, a competent specialist must have critical thinking that allows him to make accurate decisions based on an independent assessment of the problem [2].

By virtue of the above, the competence-based approach, reflecting the ideas about the professionalism and business qualities of a modern physics teacher, is able to have a positive impact on the development of innovative processes in the pedagogical education system. Universities should train highly qualified, competent physics teachers of a new formation, capable of working in distance learning, create high-quality electronic resources for students on the basis of innovative technologies and who are ready to effectively implement them in the pedagogical system.

New conceptual approaches involve the development of such schools and universities that will be able to effectively influence the positive socio-economic advancement of society, they focus on the development of the individual, his thinking in the emotional-aesthetic, volitional, intellectual spheres, the disclosure of a person's creative potential, his political socialization, qualities that should manifest themselves in any sphere his professional activity.

Let's consider the goals and objectives outlined in the state program of education reform of the Republic of Kazakhstan:

– – updating the content and structure of education;
– – improvement of educational, methodological and scientific support of the educational process;
– – integration of education, science and production;
– – strengthen the environmental training of students;
– – introduction of new pedagogical and information technologies;
– – improving the social status of teaching professions, etc.

Experimental

As is well known, since 2015, the South Korean government has abandoned paper textbooks. The South Korean Department of Education announced that they are ready to change school textbooks, testing, etc. into electronic format. The Intellectual Nation program has been operating in Singapore since 2015. 4D virtual labs, interactive maps and other innovations are being introduced. Finland is considered the most advanced state in Europe in the field of e-learning. Its progressive education system is accepted as the basic model in many countries. Due to innovations in education, the country without any natural resources has acquired the status of the leading one in the EU for two decades [3].

According to the results of participation in the PISA (Program for International Student Assessment) studies, an international study initiated by the OECD (Organization for Economic Cooperation and Development), Estonia is in first place in reading and science, and in mathematics — in second, behind only Japan. Primary informatization in Estonian schools began in the 1990s, and already in 1997, a project was developed to connect all schools to the Internet, implemented by 2006. Since 2002 there has been an e-School system that provides quick access to all electronic educational information, all of them are electronic textbooks. united into a single educational platform Opiq – “Library of educational materials” for grades 1-12 in all subjects. The advantage of such a system, among others, is the provision of intersubject connections. For example, in the 8th grade textbook on geography on the topic “Water resources”, information is given through hyperlinks where you can find the necessary material in other textbooks — not only for grade 8, but also subsequent ones. Opiq can be accessed from anywhere with an Internet connection and from any device. Estonian educational technologies are now being introduced in Kazakhstan [3].

But the problem is, how can they use such unified educational platforms for students who do not have access to the Internet and mobile communications?

An analysis of empirical data obtained in the course of a survey of teachers shows that teachers use some elements of electronic resources in pedagogical practice for distance education, but there are also teachers who have no idea of creating electronic textbooks. At the same time, practicing teachers realize the need to solve the problem of teachers' innovative competence.

The nature of competence is such that it, being a product of training, does not directly follow from it, but rather is a consequence of the self-development of the individual. As a result, the professional training of future teachers seems to be a personality-oriented educational process, i.e. ensuring the maximum demand for the personal potential of the future teacher in the implementation of pedagogical tasks.

The analysis of the structure of the competence of future teachers has scientific, theoretical and practical significance. This problem lies at the junction of the structuring of personal and pedagogical culture. Unfortunately, the practice of higher education, as a rule, demonstrates the results of a not very high level of professional training of future teachers.

According to the work [4], the problems of teachers' competence in the use of information technologies in online classes during the pandemic were identified. The Ministry of Education has allowed the use of messengers, e-mail and special e-learning programs. For students of remote Kazakh villages, it was planned to keep attending classes in a regular mode with two shifts of training.

Results and Discussion

It should be noted that in our country, in order to maintain and raise the education system to a higher quality level, in the current difficult socio-economic conditions, a lot of positive things are being done. For those who have decided to work in rural schools, the state allocates housing, "lifting", etc. are allocated.

Since January 2020, the Law "On the status of a teacher republic of Kazakhstan" has come into force in the country, which is purposefully aimed at supporting the profession of school teachers and increasing the prestige of teaching. There are a lot of innovations in this law that cover the social and financial well-being of Kazakhstani teachers.

The dependence of the quality of education on the quality of teacher training is proved by a multitude of both statistical data and practice [5, 6].

On the agenda of the present day, the problem of training physics teachers of a new formation, who can quickly respond to changing conditions of education and implement innovative teaching technologies in physics lessons, is still urgent.

Due to the situations, we believe that it is first of all necessary to maintain and update the training of teachers of computer physicists.

Firstly, it solves the problem of teacher training in related subjects for the integrated study of subjects, since one of the distinctive features of the updated content of education, which has been introduced into the general education system of our country, is the improvement of the pedagogical skills of teachers in the use of "cross-cutting themes", which will most effectively organize intersubject connections in the classroom. In turn, interdisciplinary connections, arousing interest in knowledge, activate the student's mental activity. According to the updated content of education, the role of a modern teacher is the organization of independent cognitive activity of students.

Currently, graduates do not view their professional activities as an integrated process; do not know how to adapt to changing technical and technological environments. Western experts state that today science and technology are developing so rapidly that there is no time after graduation to "finish their studies" and "reach" the current level of development of high-tech production, it is necessary to engage in intensive scientific activities with a focus on future professional employment already on the "university bench" [7].

Secondly, distance education is becoming an integral part of current education, so it is necessary to think about training physics teachers with knowledge of computer science. The main goal of universities in teacher training is not a simple set of knowledge, skills and abilities, but personal, social and professional competence based on them — the ability to independently extract, analyze and effectively use innovative technologies in a rapidly changing world, especially in online-learning.

As the authors [8] note, during online classes, in connection with COVID-19 for a number of educational institutions, the investments that have been made recently have paid off. However, every teacher has to solve other current problems with teaching online courses.

Conclusion

In view of the above, the content of the concept of competence includes the following main features: the mobility of knowledge, flexibility of the method of problem solving and critical thinking. The relevance of this approach is due to the need to bring the results of education to the parameters demanded by modern society: teacher mobility, his ability to respond quickly to changing conditions and social realities, the humanistic orientation of his behavior.

The consequence of this is the accelerated renewal of the means and conditions for obtaining education and the expansion of opportunities for obtaining continuous education, the use of distance education tools allows the creation of competitive educational services and the formation of a single education market.

The competence-based approach, reflecting the ideas of professionalism and business qualities of a modern teacher, is able to have a positive impact on the development of innovative processes in the system of pedagogical education. In addition, the following should be attributed to the principles of the competence approach: diagnosticity, i.e. orientation towards achieving the diagnosed result, manifested in behavior and thinking; complexity, interdisciplinarity — taking into account both educational and external, environmental factors and influences; multifunctionality: competence cannot be characterized by one skill or property; it is the ability to solve a set of tasks.

At the L.N. Gumilyov ENU, the training of future physics teachers according to the educational program 6B01510 – "Training of physics teachers" is carried out at two levels of education, bachelor's and master's degree. To train competent teachers of computer-physicists, the university has the necessary pedagogical and scientific personnel. There is a certificate of primary international accreditation of the educational program 6B01510 – "Training of Physics Teachers" (bachelor's degree) by an independent agency for quality assurance in education (IQAA). Since in the city of Astana, physics teachers are trained only at our university and receive a high-quality education that meets international standards, more than 95 % of graduates of this educational program work in their specialties. We believe that for the training of teachers of a new formation who are able to quickly respond to changing conditions and social realities, who are ready to effectively implement innovative technologies within the framework of updating the content of secondary education in the Republic of Kazakhstan, teachers of computer-physicists, our university has all the necessary resources.

It is also obvious that today, and in the future, there will be an increasing demand for specialists with a broad general erudition, who show in their professional activities not only functional literacy, but also knowledge of the basic fundamental laws of the existence and development of Nature, knowledge formed during the study of natural science disciplines mainly physics – the fundamental science of Nature, the leader of modern Natural Science.

A teacher has no right to lag behind the modern level of science, and a scientist should not forget about the need to prepare a shift and create "his own school".

References

1 https://rus.azattyq.org › kazakhstan-countryside-distance-learn...

2 Стукаленко Н.М. Компетентностный подход как ведущая стратегия развития высшего образования в Казахстане при интеграции в мировое образовательное пространство // Н.М. Стукаленко, Ж.К. Ермекова // Вестн. Евраз. нац. Ун-та им. Л.Н. Гумилева. — 2011. — № 5(84). — С. 30–33.

3 https://vlast.kz › obshchestvo › 38612-kak-pandemia-per...

4 Саурамбаева А. Трудности перехода на дистанционное образование: кейс Казахстана [Электронный ресурс]. / А. Саурамбаева // Central Asian Bureau for Analytical Reporting. – 2020.

5 Борбер М. Как добиться стабильно высокого качества обучения в школах / М. Борбер, М. Муршед // Вопросы образования. — 2008. — № 3. — С. 16–18.

6 Ковалева Г.С. Актуальные исследования и разработки в области образования / Г.С. Ковалева //Вопросы образования. — 2008. — № 1. — С. 197,198.

7 Ермекова Ж.К. Подготовка будущих учителей к развитию познавательного интереса учащихся при обучении фундаментальным наукам на примере физики : моногр. / Ж.К. Ермекова, Н.М. Стукаленко. —2-е изд., доп. — Астана: ЕНУ им. Л.Н. Гумилева, 2012. — 225 с.

8 Francisco Delgado. Teaching Physics for Computer Science Students in Higher Education During the COVID-19 Pandemic: A Fully Internet-Supported Course / Delgado Francisco // Retrieved from https://doi.org/10.3390/fi13020035. — 2021.

Ж.К. Ермекова, Э.К. Қожабекова, Ғ.Е. Сағындықова

Болашақ физика мұғалімінің кәсіби құзыреттілік деңгейін көтеруде инновациялық технологиялардың маңыздылығы

Қазіргі заманғы педагогикалық ғылым XXI ғасырдағы білім берудің жаңа тұжырымдамасы болашақ мұғалімнің тұлғалық мәдениетін арттыру призмасы арқылы мүмкін екендігін, оған білім, білік және дағдылар жиынтығы, сонымен қатар ең бастысы, құзыретті тұлғаны қалыптастыру мен дамыту үшін адамзаттың жинаған мәдени және адамгершілік құндылықтарының маңыздылығы оның кәсіби жетіліп қызмет етуіне ықпалы зор екендігін нақтылайды. Мақалада қашықтықтан оқыту жағдайында қазіргі заманғы мұғалімдерді инновациялық қызметке даярлау мәселесі қарастырылған. Болашақ физика

мұғалімдерін кәсіби даярлауда осы инновациялық компонентінің қажеттілігі мен маңыздылығы негізделген, білім беру үдерісін ұйымдастырудағы инновациялық тәсілдің ерекшеліктері сипатталған, педагогикалық қызметтің инновациялық бағытының мәні мен маңыздылығы ашылған. Қашықтықтан оқыту жағдайында нәтижелі жұмыс жасай алатын, жоғары білікті, кәсіби құзыретті, инновациялық технологиялардың негізінде білім алушыларға арналған сапалы электронды ресурстарды дайындауға және оны педагогикалық жүйеде тиімді жүзеге асыруға қабілетті, жаңа формациядағы физика мұғалімдерін дайындау мәселелерінің оңтайлы шешімдері ұсынылған. Адамның әлеуметтік әлемге еніп, оның осы әлемде бейімделіп және өнімді қызмет атқаруын қамтамасыз ету мәселесін білім беруді неғұрлым жеке және әлеуметтік интеграцияланған нәтижемен қамтамасыз ету қажеттілігін алдын ала анықтап, негізгі мәселе екенін түсіну қажет екені белгілі болды.

Кілт сөздер: физика мұғалімдері, білім беру үдерісі, жаңа формация, инновациялық технологиялар, құзыреттілік, білім беру бағдарламасы, қашықтықтан оқыту, пәнаралық байланыстар.

Ж.К. Ермекова, Э.К. Кожабекова, Г.Е. Сагындыкова

Роль инновационных технологий в повышении уровня профессиональной компетентности будущего учителя физики

Современная педагогическая наука констатирует, что новая концепция образования XXI века разрабатывается через призму повышения культуры личности будущего педагога, которая должна включать комплекс знаний, умений и навыков, и, что самое главное, накопленные человечеством культурно-нравственные ценности, которые необходимы для формирования и развития компетентной личности, ее профессиональной зрелости. В настоящей статье рассмотрена проблема подготовки педагогов к инновационной деятельности в условиях дистанционного обучения. Обоснована необходимость данного компонента профессиональной подготовки педагогов, описаны особенности инновационного подхода к организации образовательного процесса, раскрыта сущность инновационной направленности педагогической деятельности. Первоочередной, главной, но долгосрочной целью авторы полагают формирование компетентного кадрового потенциала педагогов (учителей) новой формации, обосновывая вполне очевидное: прямую зависимость качества системы образования от качества учителей, работающих в ней. Предложены решения проблем подготовки высококвалифицированных, компетентных учителей физики новой формации, способных работать в условиях дистанционного обучения, создавать на основе инновационных технологий качественные электронные ресурсы для обучающихся и готовых эффективно реализовывать их в педагогической системе. Становится очевидным, что глобальная задача обеспечения вхождения человека в социальный мир, его продуктивной адаптации в этом мире, предопределяет необходимость постановки вопроса обеспечения образованием более полного личностно и социально интегрированного результата.

Ключевые слова: учителя физики, образовательный процесс, новая формация, инновационные технологии, компетентность, образовательная программа, дистанционное обучение, межпредметные связи.

References

1 https://rus.azattyq.org › kazakhstan-countryside-distance-learn...

2 Stukalenko, N.M., & Ermekova, Zh.K. (2011). Kompetentnostnyi podkhod kak vedushchaia strategiia razvitiia vysshego obrazovaniia v Kazakhstane pri integratsii v mirovoe obrazovatelnoe prostranstvo [Competence-based approach as a leading strategy for the development of education in Kazakhstan during integration into the global educational space]. *Vestnik Evraziiskogo natsionalnogo universiteta imeni L.N. Gumilyova — Bulletin of the L.N. Gumilev Eurasian National University,* 5 (84), 30–33 [in Russian].

3 https://vlast.kz › obsshestvo › 38612-kak-pandemia-per...

4 Saurambayeva, A. (2020). Trudnosti perekhoda na distantsionnoe obrazovanie: keis Kazakhstana [Difficulties of transition to distance education: case of Kazakhstan]. *Central Asian Bureau for Analytical Reporting* [in Russian].

5 Borber, M., & Murshed, M. (2008). Kak dobitsia stabilno vysokogo kachestva obucheniia v shkolakh [How to achieve a consistently high quality of education in schools] // *Voprosy obrazovaniia — Education issues*, 3, 16–18 [in Russian].

6 Kovaleva, G.S. (2008). Aktualnye issledovaniia i razrabotki v oblasti obrazovaniia [Current research and development in the field of education] // *Voprosy obrazovaniia — Education issues*, 1, 197, 198 [in Russian].

7 Ermekova, Zh.K., & Stukalenko, N.M. (2012). Podgotovka budushchikh uchitelei k razvitiiu poznavatelnogo interesa uchashchikhsia pri obuchenii fundamentalnym naukam na primere fiziki [*Preparation of future teachers for the development of students' cognitive interest in teaching fundamental sciences on the example of physics*.]. (2nd ed., expanded). Astana: Evraziiskii natsionalnyi universitet [in Russian].

8 Delgado, Francisco (2021). Teaching Physics for Computer Science Students in Higher Education During the COVID-19 Pandemic: A Fully Internet-Supported Course / Delgado Francisco // Retrieved from https://doi.org/10.3390/fi13020035.