ИННОВАЦИОННЫЕ ПЕДАГОГИЧЕСКИЕ ТЕХНОЛОГИИ В ОБРАЗОВАНИИ

INNOVATIVE PEDAGOGICAL TECHNOLOGIES IN EDUCATION

Development of information culture of students when teaching equations of mathematical physics in the conditions of informatization of education

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Abstract. *Problem and goal.* In modern conditions, specialists in various subject areas who have an information culture and are able to solve complex professional problems using modern information and communication technologies are in demand. Currently, specialists in the field of applied mathematics are required, which plays an important role in the development of human civilization. Therefore, in the process of teaching various academic disciplines of applied mathematics at the university, including the discipline "Equations of mathematical physics", attention should be paid to the development of students' information culture. *Methodology.* When teaching students the discipline "Equations of mathematical physics", it is extremely important that the teacher knows not only the content of teaching this discipline of applied mathematics, but also has practical experience in solving equations of mathematical physics by computer means. Such qualities of the teacher will allow him to successfully conduct training sessions in the conditions of informatization of teaching mentioned discipline. At the same time, it ought to be clearly understood that the use of computer technologies in teaching the discipline "Equations of mathematical physics" must be correct. The necessity to develop and implement in practice a variety of methodological approaches that allow students to develop an information culture in training sessions on that discipline is obvious. *Results.* The use of advanced pedagogical technologies in training sessions on the discipline "Equations of mathematical physics", where computer technologies are used, will allow students to develop an information culture. *Conclusion.* Computer technologies that students use in the process of solving educational problems require them to have certain skills and abilities to identify their broad capabilities. Students are aware of the role of computer technologies in conducting applied scientific research, understand the role of computer modeling methodology and computational experiment in studying the world around them.

Keywords: teaching applied mathematics, information culture, informatization of education, student

Развитие информационной культуры студентов при обучении уравнениям математической физики в условиях информатизации образования

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Аннотация. *Проблема и цель.* В современных условиях востребованы специалисты разных предметных областей, обладающие информационной культурой и умеющие решать сложные профессиональные задачи с использованием современных информационных и коммуникационных технологий. Сегодня необходимы специалисты в области прикладной математики, которая играет большую роль в развитии человеческой цивилизации. Поэтому в процессе преподавания в вузе различных учебных дисциплин прикладной математики, в том числе дисциплины «Уравнения математической физики», должно уделяться внимание развитию информационной культуры студентов. *Методология.* При обучении студентов дисциплине «Уравнения математической физики» крайне важно, чтобы преподаватель знал не только содержание обучения этой дисциплине, но и имел практический опыт решения уравнений математической физики компьютерными средствами. Подобные навыки позволят преподавателю успешно проводить учебные занятия в условиях информатизации обучения. Вместе с тем нужно отчетливо понимать, что использование компьютерных технологий при обучении упомянутой дисциплине должно быть корректным. Очевидно, что нужно разрабатывать и реализовывать на практике разнообразные методические подходы, позволяющие развивать у студентов информационную культуру на учебных занятиях по данной дисциплине. *Результаты.* Использование передовых педагогических технологий на учебных занятиях по дисциплине «Уравнения математической физики», на которых применяются компьютерные технологии, позволит студентам развить информационную культуру. *Заключение.* Компьютерные технологии, к которым обращаются студенты в процессе решения учебных задач, требуют от них определенных умений и навыков для выявления их широких возможностей. Студенты осознают роль компьютерных технологий в проведении научных прикладных исследований, понимают роль методологии компьютерного моделирования и вычислительного эксперимента при изучении окружающего мира.

Ключевые слова: обучение прикладной математике, информационная культура, информатизация образования, студент вуза

Problem statement. The ability of specialists in various subject areas to effectively use modern computer technologies to solve scientific and industrial problems in their professional activities clearly demonstrates the existence of an information culture.

The phenomenon of information culture from the positions of theoretical, methodological, pedagogical, psychological, worldview, philosophical approaches, identifying its historical and social conditionality, forming its theoretical foundations and conceptual and terminological apparatus is the subject of research by many scientists.

Among them are the works of such authors as A.A. Volgusheva, M.G. Vokhrysheva, I.N. Gaidareva, N.I. Gendina, A.P. Yershov, A.M. Ivanov, N.B. Kirillova, T.S. Koval, O.V. Krasnova, L.I. Kushtanina, E.A. Medvedeva, T.I. Polyakova, B.Ya. Smirnova and other (see, for example, [1–8]).

Scientists in their research reveal the multifaceted meaning of the concept of information culture, which expresses the system education and integration of knowledge about the person and the culture of mankind. According to experts, information culture as a structure contains a number of components, including communicative, lexical, intellectual, information technology, ideological, moral and other components.

For example, M.G. Vohrysheva believes that information culture is an area of culture and is associated with the functioning of information in society and the formation of information qualities of the individual [2]. T.S. Koval considers information culture as a system education that reflects the integration of knowledge about a person and the culture of mankind [8].

Information culture, according to experts, includes literacy and competence in understanding the ongoing information processes and relationships, as well as creativity in information behavior and social and informational activity. An important element of human information culture, according to experts, is knowledge of information resources and the ability to effectively search, process and store the information received.

A role in the development of information culture of students of higher education, which is taught by a discipline of applied mathematics "Equations of mathematical physics", playing modern computer technology, using which is possible to implement computer simulation in the study of applied problems and a computational experiment to justify the correctness of the investigated problem for equations of mathematical physics (see, e.g., [9–15])[1].

Method of research. Modern information technologies, including various multimedia technologies, computer mathematical packages and tools, and other information technologies are used in teaching the theory and mathematical methods for solving equations of mathematical physics (see, for example, [16; 17]). The use of modern multimedia technologies allows the teacher to use a visual demonstration method of teaching during lectures: on interactive whiteboards, it is possible to quickly demonstrate analytical and approximate solutions of educational mathematical problems, two-dimensional and three-dimensional graphs

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[1] *Federal State Educational Standards of Higher Education of the Russian Federation.* (In Russ.) Available from: https://fgos.ru/ (accessed: 15.09.2020).

of their solutions, tables, drawings and fragments of the educational material presented.

Conducting practical classes using computer technologies allows students not only to explore various mobile problem statements for mathematical physics equations, but also to develop an information culture.

In the course "Equations of mathematical physics", students are taught to use a variety of computer technologies to find solutions.

The use of computer technologies in laboratory classes on mathematical physics equations allows students to avoid certain difficulties in finding their solutions. Students can find both analytical and approximate solutions to problems for equations of mathematical physics as a result of sequential execution of the corresponding commands.

The use of computer technologies in teaching the discipline "Equations of mathematical physics" contributes to the formation of students' skills of applied analysis of the results obtained using computer tools.

Results and discussions. Conducting training sessions on the discipline "Equations of mathematical physics", where students are introduced to the theory and methods of solving equations, it is necessary to implement pedagogical technologies that allow:

– integrate both humanities and natural science knowledge, which will allow students to gain deep scientific knowledge and evaluate the humanitarian, scientific and educational potential of applied mathematics;

– implement such pedagogical technologies that allow students to develop mathematical creativity, a scientific outlook, acquire professional competencies, skills and abilities for successful research of various mathematical models, followed by analysis of scientific results and logical conclusions about the new scientific information received;

– identify the scientific and cognitive potential of teaching the discipline "Equations of mathematical physics", which clearly demonstrates to students the need and effectiveness of mathematical models in research of the environment;

– use computer technologies to teach students to find solutions to mathematical physics equations. The use of such computer technologies in the classroom allows students to develop their information culture.

Conclusion. Using computer technologies to find solutions to mathematical physics equations, students gain experience in mobile research of various applied problems, as well as in identifying the capabilities of computer technologies in solving such problems. Students are aware of the role of computer technologies in conducting applied scientific research, understand the role of computer modeling methodology and computational experiment in studying the world around them.

The use of multimedia and computer technologies by the teacher in lectures when presenting theoretical material on the discipline "Equations of mathematical physics" allows implementing a visual demonstration method of teaching. Students can watch on interactive whiteboards a demonstration of the stages of research of mathematical models, the theorems of existence, uniqueness and stability of their solutions, and the results of numerical solutions of such problems.

The use of computer technologies allows students to independently implement their research and cognitive activities, develop their information culture in laboratory classes.

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