



Model of increasing the efficiency of the differential equations section in higher educational institutions

Suyunjon KHALIKOV ¹

Navoi State Pedagogical Institute

ARTICLE INFO

Article history:

Received February 2021
Received in revised form
20 February 2021
Accepted 15 March 2021
Available online
15 April 2021

Keywords:

differential equation,
case study,
information technology,
practical guide,
maple,
blitz survey,
brain-ring.

ABSTRACT

This article presents a model for increasing the effectiveness of teaching the department of differential equations in higher education institutions and offers suggestions and recommendations for its use.

2181-1415/© 2021 in Science LLC.

This is an open access article under the Attribution 4.0 International (CC BY 4.0) license (<https://creativecommons.org/licenses/by/4.0/deed.ru>)

Oliy o'quv yurtlarda differensial tenglamalar bo'limining samaradorligini oshirish modeli

ANNOTATSIYA

Kalit so'zlar:

differensial tenglama,
case-study,
axborot texnologiyalari,
amaliy dastur,
maple,
blits so'rov,
breyn-ring.

Ushbu maqolada oliy ta'lim muassasalarida differensial tenglamalar bo'limini o'qitish samaradorligini oshirish modeli keltirilgan va undan foydalanishga oid taklif va tavsiyalar berib o'tilgan.

¹ Basic doctoral student of Navoi State Pedagogical Institute, Navoi, Uzbekistan.

Модель повышения эффективности раздела дифференциальных уравнений в ВУЗах

АННОТАЦИЯ

Ключевые слова:

дифференциальное уравнение, case-study, информационные технологии, приложение, maple, блиц-опросник, brain-ring.

В данной статье представлена модель повышения эффективности преподавания на кафедре дифференциальных уравнений в высших учебных заведениях и даны предложения и рекомендации по ее использованию.

INTRODUCTION

Improving the methods of teaching mathematics in higher education today, increasing the effectiveness of teaching on the basis of modern innovative technologies, using the potential of didactic materials on the subject. Therefore, in order to form students' mathematical thinking and develop their creative thinking in higher education institutions, it is necessary to use a variety of methods to prove theorems in a variety of ways, non-standard, logical, practical examples and problems.

LITERATURE REVIEW

Improving the effectiveness of teaching the subject through the study of information and communication technologies in the teaching of mathematics in higher education institutions. Researches can be mentioned by scientists such as D.N. Ashurova, J.B. Ergashev, D. Mahmudova, G.A. Artikova, I.Sh. Laktaeva, N.M. Mukhitdinova, M. Tojiev, D. Yunusova, G.N. Goibnazarov, M.S. Berdibayev, A.J. Khurramov, Z.Kh. Siddikov, L.P. Martirosya, F.K. Matsur, O.A. Aryukova, J.M. Nurmukhamedova, I.I. Bondarenko, A.A. Ermakova, I.V. Kuznetsova, Zh.I. Zaitseva, F.A. Ikhsanova, A.S. Bezruchko, M.M. Minshin, L.V. Juk, Brad Rankin, Fernando Reggianini, Hong Yuan, Christopher T. Stripling, and Elizabeth Ackerman-Hicks.

The analysis of the research shows that in our country, in the Commonwealth of Independent States and abroad, pedagogical research work on the application of information technology tools and modern educational technologies in the teaching of mathematics, "Mathematics", "Algebra" research has been conducted to improve the teaching methods of "Mathematics Teaching Methods" and "Mathematical Analysis".

At the same time, although the research was carried out by scientists such as D. Mahmudova, E.O. Sharipov, P.M. Aslanov, Y.N. Bibikov, I.S. Novikova, N.V. Sycheva, L.P. Kuzmina on the methodology of teaching the department of differential equations in our country and the Commonwealth of Independent States, examples and methods of solving problems on it, in their research lectures and practical training in the teaching of the department of differential equations, as well as in the organization of independent learning, specialization in the organization of information technology and information technology is not studied. Therefore, it is necessary to eliminate a number of problems in the use of information and communication technologies and teaching technologies, in

particular, the use of CASE-STUDY technology in the teaching of differential equations in higher education institutions.

RESEARCH METHODOLOGY

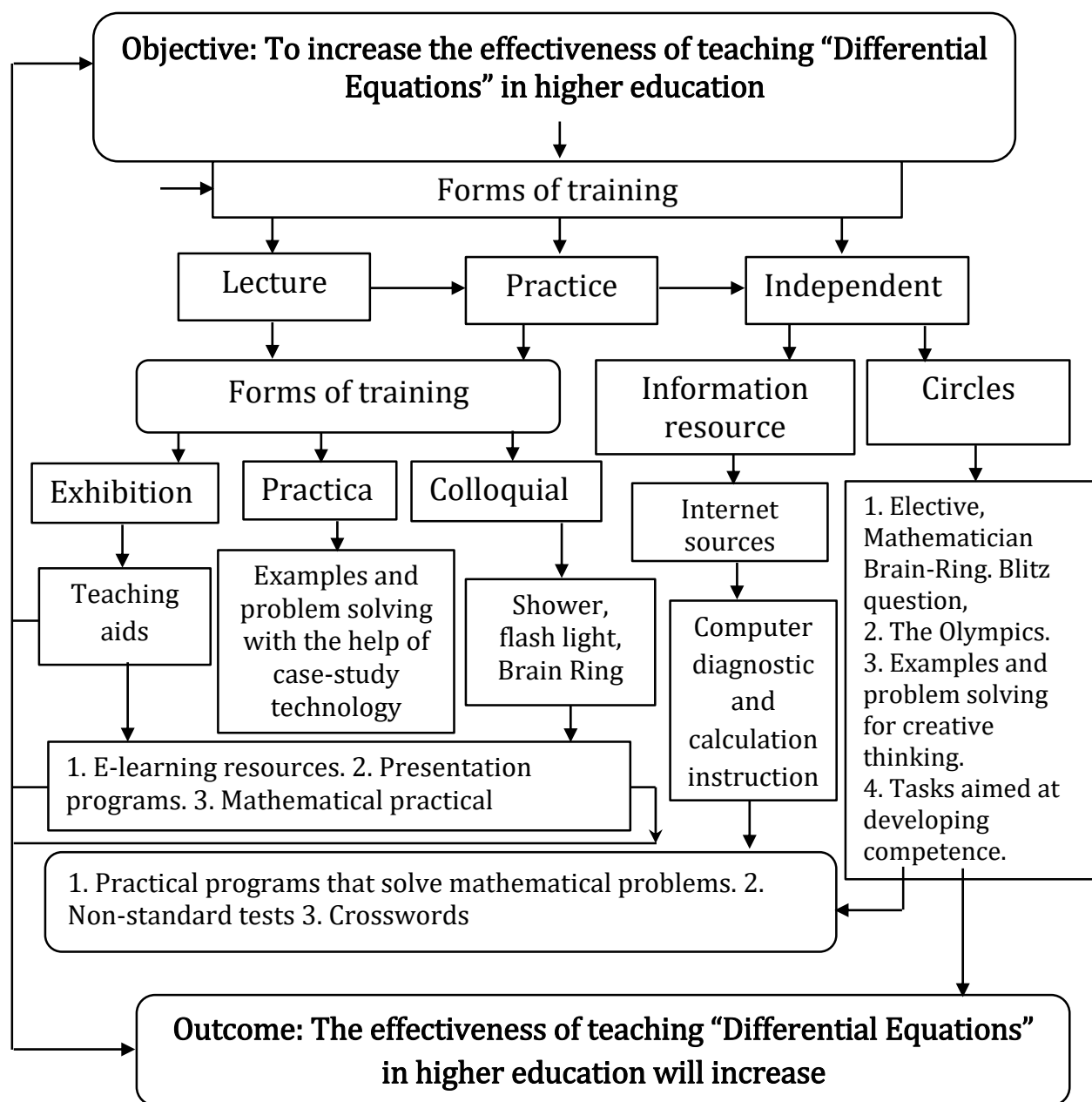
Creating challenging situations for students in the teaching of mathematics, especially in the department of "Differential Equations" on the basis of teaching technologies in higher education institutions, it is important to express different opinions, analyze, synthesize, compare and generalize the problem in different situations, as well as to identify general, specific, typical cases, to draw conclusions. At the same time, it is necessary to create a learning environment in which the teacher is able to ask specific questions, ask questions about the situation, the solution of tasks. This can be done with the use of modern information technology tools and teaching technologies [1]. Therefore, as part of the study, we developed a model for increasing the effectiveness of teaching in the section "Differential Equations" using modern information technology tools and teaching technologies, including Case-Study technology (see Figure 1).

Today, due to the improvement of the computer and its practical programs, it is necessary to use the tools of information technology to increase the effectiveness of teaching subjects in the field of mathematics, in particular, lectures on the topic of "Differential Equations". One of such methods is the use of multimedia practical manuals and mathematical practical packages in the course of computer science and information technology in the teaching of "Differential Equations" [2]. Improving the mechanism of using computer practical programs and mathematical practical packages in the teaching of "Differential Equations" is explained by the development of students' creative thinking and the formation of competence [3]. Practical programs and mathematical practical packages play an important role in solving examples and problems of differential equations and analyzing their solutions, because the proof of theorems on differential equations is visualized in the teaching of examples and problem solving [4]. Through such practical manuals and mathematical practical packages, it is possible to effectively convey topics to students in the section "Differential Equations" [5]. Therefore, it is recommended to use the method of demonstration and practical training in the organization of lectures in the section "Differential Equations". It is recommended to use e-learning resources (e-textbooks, e-learning materials), presentation programs and mathematical practical packages when using the demonstration teaching method.

At the same time, it is recommended to use Case-Study technology in solving examples and problems in practical classes in the section "Differential Equations". It teaches students to work independently and make independent decisions by creating challenging situations. As a result, students develop the competence to solve examples and problems on differential equations.

In addition to the organization of lectures and workshops on the section "Differential Equations", attention should be paid to independent learning. This is because more hours are devoted to independent study than lectures and practical classes. Therefore, it is necessary to improve the form of organization of independent learning in the section "Differential Equations". In improving the mechanism of independent learning on differential equations, the use of information resource centers and science circles is considered expedient. In information resource centers, it is advisable to use computer diagnostic and computational software for self-assessment of students. That is, it is

necessary to use computer diagnostic software tools (problem-solving software, non-standard tests and crossword puzzles). In the circles, it is recommended to use the method of oral teaching, i.e. explanation, blitz survey, Brain-Ring game technology. Students will also be taught examples and problem-solving techniques to help them think creatively and develop their competencies [6].



Blitz survey – game technology is aimed at teaching students to organize the sequence of actions, to think logically and creatively, to choose the right information. This technology is aimed at directing students to independent thinking in solving the problem.

Brain-Ring game technology is the development of students' knowledge and creative abilities, the ability to think independently and develop intellectual abilities. This game technology creates the following opportunities: broadens students' worldview in mathematics; teaches students to prove, explain and defend their ideas; contributes to the development of cognitive interest in the subject; develops the ability and skills to work in

a team; forms a sense of collectivism and healthy competition; development of initiative and activity; encourages perseverance to achieve goals.

It is advisable to conduct the brain-ring as a repetition and generalization lesson or control lesson. In this case, it is taught in the classroom by a professor on a specific topic.

ANALYSIS AND RESULTS

Experimental work was carried out to determine the level of effectiveness of the model of training efficiency (shown in Figure 1), developed in the framework of the study, that is, the section "Differential Equations". Experimental work was conducted among students of pedagogical higher education institutions in the field of "Methods of teaching mathematics." Using the Student-Fischer criterion, we conduct a mathematical-statistical analysis of the level of efficiency of experimental work. Using this criterion, the formulas

for the appropriate mean values, $\bar{X} = \frac{1}{n} \sum_{i=1}^4 n_i X_i$, scattering coefficients, $D_n = \sum_{i=1}^4 \frac{n_i (x_i - \bar{X})^2}{n-1}$, variance of the standard deviation, $\tau_n = \sqrt{D_n}$, and reliable deviations $\delta_n = \frac{\tau_n}{\bar{X}}$ of the

estimates were used for the sample $\Delta_n = t_{kh} \cdot \frac{D_n}{\sqrt{n}}$. According to the results of the calculation, the average mastering rate of the experimental group was higher than that of the control group, i.e increased by 8%.

CONCLUSIONS AND SUGGESTIONS

Applying the use of computer mathematical packages to increase the effectiveness of teaching science subjects in the department "Differential Equations" will significantly improve the quality of mathematical training of specialists. This is usually achieved by significantly reducing the amount of time spent learning simple and homogeneous examples and problem-solving techniques.

Based on the results of our research, we came to the conclusion that it is expedient to use the Maple mathematical practical package in the numerical solution of examples and problems on differential equations in the conduct of lectures. It is known that the solution of differential equations is not always obvious, so it is important to develop methods for solving approximate equations and to use the capabilities of mathematical packages in this regard. In the approximate solution of the differential equation, that is, in finding a solution that satisfies the initial or other condition, the question arises as to how to obtain clarity before the student to obtain the graph of the solution sought.

It is possible to solve problems on differential equations using the Maple mathematical practical package. The use of the Maple Mathematical Practical Package significantly reduces the process of students solving high-order differential equations. Also, the Maple Mathematical Practice Package allows you to solve a typical class of problems using motion-appropriate procedures. Such procedures are reflected in the reference book of the Maple mathematical practice package. The Maple Mathematical Practice Package is an effective tool for graphically representing the results of differential equations. This is especially true when solving practical problems in lectures or practical classes.

It can be concluded that when using the Maple Mathematical Practical Package, there is no need to separate the approximate and analytical solutions of differential

equations. The solution in the Maple Mathematical Practice Package, that is, the visualization of the results of the calculations, is quite diverse, and students get rid of redundant calculations and significantly reduce the time. As a result, differential equations create an opportunity to analyze the properties of their solutions, to develop creative activity and creative thinking.

REFERENCES

1. Bezruchko A.S., Teaching methodology for solving differential equations of future mathematics teachers based on the use of information technologies// Dissertation for the degree of candidate of pedagogical sciences. - Moscow, 2014. - 231 p.
2. Danilkevich A.V., Methods of teaching multimedia technologies to future specialists in the field of aesthetic and humanitarian management in the field of professional education//Dissertation for the degree of candidate of pedagogical sciences. - Volgograd, 2013. - 175 p.
3. Kapustina T.V., Theory and practice of creation and use in the pedagogical university of new information technologies on the basis of the computer system Mathematica (Faculty of Physics and Mathematics)//Dissertation for the study of the degree of Candidate of Pedagogical Sciences. - M., 2001. - 254 p.
4. Nirenburg T.L., Methodical aspects of the application of the means of Derive in the secondary school//Dissertation for the study of the degree of candidate of pedagogical sciences. - SPb, 1997. - 168 p.
5. Ergashev J. B., Improving the content of professional training of future mathematics teachers on the basis of an integrated approach // Author's abstract of Doctor of Philosophy (PhD) in Pedagogy. - Tashkent, 2018. - 48 p.
6. Dyachenko S.A., Application of the integrated symbolic system of Mathematics in the study of the course of advanced mathematics in higher education//Dissertation for the study of the degree of candidate of pedagogical sciences. - Orel, 2000. - 164 p.