Summaries of scientific publications of Assistant PHD Ivan Nikolaev Dushkov, Department of Primary School Pedagogy,
Faculty of Science, Education and Arts,
Sofia University "St. Kliment Ohridski ",
submitted for participation in the competition for the academic position of associate professor
on 1.3. Pedagogy of training in… (Pedagogy of training in information technology in primary school), published in the State Gazette, issue. 96 of 19.11.2021

MONOGRAPHS (2):

Показател Г5	1. Dushkov, Iv. Integration of information and communication technologies in the teaching of geometry in primary school, Sofia, Veda Slovena, 2021, p., ISBN 978-954-8846-76-9

Abstract: The monograph examines the problem related to the integration of information and communication technologies in mathematics education related to the geometric content in primary school. A set of author's educational multimedia presentations is presented, the use of which aims to determine whether their use will increase the results of students in mathematics education.

The first chapter presents the following main points:

- An in-depth theoretical analysis of the problem related to the integration of information and communication technologies in education and in particular in the teaching of mathematics related to the geometric material in primary school. The analysis is based mainly on the theories of prominent Bulgarian and foreign authors;

- Types of educational software are defined according to their specifics;

- The need for integration of ICT in the teaching of mathematics in primary school was emphasized;

The second chapter describes the theoretical-experimental and organizational parameters of the study. The author's set of educational multimedia presentations used for the purposes of the research is presented. The following are formulated: hypothesis, goal, subject, tasks and methods for collecting empirical-diagnostic data. The content of the individual topics planned for implementation by the experimental and control group during the experiment is presented in detail.

In the third chapter a statistical analysis of the results of the survey is made. The obtained data are presented in the form of tables, graphs and charts. In conclusion, conclusions, recommendations and contributions are formulated and the results of the study are summarized.

Показател В3

1. Dushkov, Iv. Multimedia presentations - mistakes, omissions and guidelines for overcoming them in future primary teachers, Sofia, Veda Slovena, 2021, p., ISBN 978-954-8846-77-6

Abstract: The monograph deals with the problem related to the creation of multimedia presentations for training purposes. Based on a study, the common mistakes made when creating a multimedia presentation are derived. These errors are classified according to their frequency. Ways to overcome them when creating a multimedia presentation are suggested.

The first chapter presents the following main points:

- A theoretical analysis of the problem related to the integration of information and communication technologies (ICT) in education;

- Both the benefits of integrating ICT in training and the harms are presented;

- "Strategy for effective application of information and communication technologies in education and science of the Republic of Bulgaria (2014 - 2020)";

- The choice of the application for creating multimedia presentations used for the purposes of the research is justified

The second chapter describes the organization and methods of the study. Frequent mistakes in creating multimedia presentations are typed. For each component of a multimedia presentation, rules for its proper use are presented. Guidelines for overcoming common mistakes when working with presentation software are provided.

The third chapter presents a statistical analysis of the results of the study. The data are presented in the form of tables and diagrams. In conclusion, the obtained results are summarized and the relevant conclusions are made.

СТАТИИ И ДОКЛАДИ, ПУБЛИКУВАНИ В НАУЧНИ ИЗДАНИЯ, РЕФЕРИРАНИ И ИНДЕКСИРАНИ В СВЕТОВНОИЗВЕСТНИ БАЗИ ДАННИ С НАУЧНА ИНФОРМАЦИЯ

Показател Г6

1. Lalchev, Z., Varbanova M., Vutova I., Dushkov I., Euler-Venn diagrams or MZ-maps in primary school mathematics, Mathematics and Informatics, 2016, 143 - 169, Ref. Web of Science, ISSN 0204-4951

Abstract: The subject of the study is the construction of mathematical models of problem situations caused by additive operations (unification, intersection and addition) with finite sets in primary school mathematics. A comparative analysis of two methodological approaches for modeling and solving problems of additive operations with sets and natural numbers. We are talking about the already well-known method of "Euler-Venn diagrams" and the innovative method of "MZ-maps".

Показател Г6

1. Ivan Dushkov, Jordanov, I. P., Vitanov, N. K., Numerical Modeling of Dynamics of a Population System with Time Delay 2018, *Mathematical Methods in the Applied Sciences*, WILEY, NJ USA, Ref. Web of Science

Abstract: Mathematical models of interacting populations are often constructed as systems of differential equations, which describe how populations change with time. Below we study such a model connected to the nonlinear dynamics of a system of populations in presence of time delay. The consequence of the presence of the time delay is that the nonlinear dynamics of the studied system become more rich, eg, new orbits in the phase space of the system arise, which are dependent on the time-delay parameters. In more detail, we introduce a time delay and generalize the model system of differential equations for the interaction of 3 populations based on generalized Volterra equations in which the growth rates and competition coefficients of populations depend on the number of members of all populations. Then we solve numerically the system with and without time delay. We use a modification of the method of Adams for the numerical solution of the system of model equations with time delay. By appropriate selection of the parameters and

initial conditions, we show the impact of the delay time on the dynamics of the studied population system.

Показател Г6

2. Ivan N. Dushkov, I. P. Jordanov, N. K. Vitanov, NUMERICAL Study of Nonlinear Dynamics of a Population System with Time Delay 2017, *Mathematical Methods in the Applied Sciences*, WILEY, NJ USA, Ref. Web of Science

Abstract: Mathematical models of interacting populations are often constructed as systems of differential equations, which describe how populations change with time. Below we study one such model connected to the nonlinear dynamics of a system of populations in presence of time delay. The consequence of the presence of the time delay is that the nonlinear dynamics of the studied system become more rich, e.g., new orbits in the phase space of the system arise which are dependent on the time-delay parameters. In more detail we introduce a time delay and generalize the model system of differential equations for the interaction of three populations based on generalized Volterra equations in which the growth rates and competition coefficients of populations depend on the number of members of all populations [4],[5] and then numerically solve the system with and without time delay. We use a modification of the method of Adams for the numerical solution of the system of model equations with time delay. By appropriate selection of the parameters and initial conditions we show the impact of the delay time on the dynamics of the studied population system.

СТАТИИ И ДОКЛАДИ, ПУБЛИКУВАНИ В НЕРЕФЕРИРАНИ СПИСАНИЯ С НАУЧНО РЕЦЕНЗИРАНЕ ИЛИ ПУБЛИКУВАНИ В РЕДАКТИРАНИ КОЛЕКТИВНИ ТОМОВЕ

Показател Г7

3. Dushkov, I., Jordanov, I., NUMERICAL MODELING OF DYNAMICS OF ECONOMIC SYSTEMS WITH TIME-DELAY, 566 –

569, *6 TH INTERNATIONAL CONFERENCE ON APPLICATION OF INFORMATION AND COMMUNICATION TECHNOLOGY AND STATISTICS IN ECONOMY AND EDUCATION (ICAICTSEE – 2016*), DECEMBER 2-3 RD , 2016, UNWE, SOFIA, BULGARIA, ISSN 2367-7643 (online), ISSN 2367-7635 (print)

Abstract. The equations with time delay are a generalization of ordinary differential equations. In the study of real systems with after-effect in quality of output an approximation it is assumed that the delay is kept constant. Such consideration represents a kind of step forward compared to the "ideal" process, which is obtained assuming that "tripping" is not derived instantaneously. In other cases, such an assumption describes a process of partial approximation. Mostly complete analysis shows that in rare cases important to real systems, the continued depends not so much of the time, but also by themselves requested features, as well as their derivatives. In some cases, naturally implies that this dependence does not a determinant. In this paper we discuss a system of three interacting agent systems for the cases with time delay. Many processes in economy are described by the system of ordinary differential equations. Such models are effective in the study of the evolution of economic systems over long periods of time. We know that delay the introduction of information into dynamic models change their properties. The theoretical conclusions are illustrated with well-known economic model DimitrovaVitanov, which introduce a time delay. The system of model equations for this case is a system of three ordinary differential equations with time-delay. When time delays are introduced in these model equations, the resulting system describes the influence of delay on the respective evolution processes. We will show how use a modification of the method of Adams for the numerical solution of the system of model equations with time delay. Keywords. Time delay, economic systems with after-effect, method of Adams, Dimitrova-Vitanov model.

Показател Г7

4. Dushkov, I., Mladenov, V., INTEGRATION OF ICT IN TEACHING MATHEMATICS CLASSES FOR EXTRACURRICULAR ACTIVITIES (POISSON PROBLEM), *Proceedings of the 6th International Conference on Application of Information and*

Communication Technology and Statistics in Economy and Education (ICAICTSEE-2016), Publishing Complex – UNVE, Sofia, Bulgaria, 575 – 579 2016 г., ISSN 2367-7643 (online), ISSN 2367-7635 (print)

Abstract. In 21 century defined by many as the century of information technologies, increasingly is felting the need for adequate and modern education. An excellent solution for thisis information and communication technology. It contributed to find the necessary balance in schools, to hold the interest of students and to experience the spirit of the new multimedia lessons in the modern educational process. 10 years ago in FNPP it was started working on the implementation of ICT in education in elementary schools with the launch of a Master program " Information Technology in elementary school" led by Prof. Zdravko Lalchev /then Associate Professor/ [3, 4]. The program launched theoretical and applied research on the topic "Computer teaching presentations in the teaching of mathematics in primary schools". The present report presents an idea to integrate such presentations in classes for extracurricular activities in mathematics through problem Poisson. Keywords. Information technologies, ICT in education, computer teaching presentations, classes for extracurricular activities.

Показател Г7

5. Душков, Ив., EXPLORING THE RESULTS FROM THE INTEGRATION OF MULTIMEDIA IN TEACHING MATH IN ELEMENTARY SCHOOL, 514-517, *Proceedings of International Conference on Application of Information and Communication Technology and Statistics in Economy and Education*, 2015, УНСС, ISSN 2367-7643 (online), ISSN 2367-7635 (print)

Abstract: In today's electronic internet world, web services, cyber technology, electronic communications sites for virtual learning and educational portals there is an increasing need of adequate education. In the 21st century, multimedia is an important mechanism in education which contributes the integration of ICT in other school subjects. Its potential is in motivating students, presenting the learning content in attractive way. This paper presents the results of integrating

multimedia presentations in mathematics education. Keywords: Multimedia, mathematics education, effectiveness of learning process.

Показател Г7

6. Dushkov, I., Jordanov, I., MATHEMATICAL MODELING OF THE DYNAMICS OF ECONOMIC SYSTEMS WITH TIMEDELAY, 518-521, *Proceedings of International Conference on Application of Information and Communication Technology and Statistics in Economy and Education*, ISSN 2367-7643 (online), ISSN 2367-7635 (print)

Abstract. Many processes in economy are described by the system of ordinary differential equations. Such models are effective in the study of the evolution of economic systems over long periods of time. We know that delay the introduction of information into dynamic models change their properties. Widely known are specific economic models (model of business cycles Goodwin, Kaldorian macro dynamic model augumented with Kaleckian investments lag and oligopoly model Cournot), illustrating that with delays more complex dynamics can occur. In this article we will show that these two models (without delay) generate the same dynamics, if the delay is small enough. However, this is not true if the delay is greater. The theoretical conclusions are illustrated with well-known economic model Dimitrova-Vitanov, which introduce a time delay. Keywords. Evolution of economic systems, economic agents, Dimitrova – Vitanov model, time delays.

Показател Г7

7. Dushkov, Iv., Yoradnov, Iv., DYNAMIC SYSTEMS WITH TIME DELAY, 66-72, Proceedings of the National Scientific Conference "Application of Mathematics, Statistics and Information Technology for Modeling Economic and Business Processes, 2015, Sofia, UNWE

Abstract: Many of the processes in complex systems, such as economic and social systems, can be described using a system consisting of a large number (albeit finite number) of ordinary differential equations (where the independent variable is time). In this article, we will show a method to reduce the dimensionality of such systems. Such models describe a number of important cases of the evolution of economic and social systems over longer periods of time.

Mathematical modeling of processes with different time scales allows reducing the number of corresponding equations with the help of the so-called quasi-stationary approximation. In accordance with the terminology of QSSA - Tikhonov's theorem, we consider two types of variables - "fast", thus the corresponding kinetic equations form a system attached to the system of "slow" variables.

Показател Г7

8. Ivan Dushkov, Jordanov, I. P., Vitanov, N. K., Numerical Modeling of Dynamics of Generalized Population Systems with Time Delay, *Biomath Communications*, 2016

Abstract: The mathematical models of are often expressed in terms of differential equations, which describe how populations change with time. We investigate a nonlinear dynamics of a system of populations in presence of time delay. The delay leads to an enrichment of the nonlinear dynamics of the system which is demonstrated by a discussion of new orbits in the phase space of the system, dependent on the time-delay parameters, as well as by an investigation of the influence of the delay. In more detail we introduce a time delay and generalize a system of population dynamics model PDEs and then numerically solve the system with and without time delay. We use a modification of the method of Adams for the numerical solution of the system of model equations with time delay. By appropriate selection of the parameters and initial conditions we show the impact of the delay time on the dynamics of the studied population system.

Показател Г7

9. Ivan N. Dushkov, I. P. Jordanov, N. K. Vitanov, E. V. Nikolova, Comparison of NDT techniques for elastic modulus determination of laminated composites, 45-46, *Proceedings of 11th Annual Meeting of the Bulgarian Section of SIAM*, 2016

Abstract: The aim of this study is to develop a procedure for the selection of collective variables for metadynamics simulations of large biomolecules based on criteria reflecting the specifics of the investigated objects and processes. In particular, we assess the possibility of using the spatio-temporal multistage consensus clustering method (SMCC) as a guideline in this selection procedure. The SMCC method identifies compact groups of amino acid residues forming semi-rigid domains.

Показател Г7

10. Kirova, G., Aleksieva, L., Dushkov, Iv., Zafirova, L., Hristova, G., Measuring the results of mathematics education at the end of the fourth grade (10-11 year old students), Shumenski Yearbook Bishop Konstantin Preslavski University, VOLUME 21 D, 2017 856 - 874, ISSN 1314-6769

Abstract: This article presents part of the results of the third phase of a research project "Exploration of learning outcomes in mathematics and science education in primary school", funded by National Research Fund. During this phase, the authors' research instrument (19-item test) created in the previous stages of the project, was implemented in five schools to measure the learning outcomes in mathematics at the end of fourth grade. A total of 306 10-11 years old students took part in this study, conducted at the end of 2016/2017 year. Their results were assessed using traditional and not traditional approaches and they showed generally high mathematical learning outcomes. Yet some weaknesses were identified in certain topics of the curricula, which will be discussed at the end of this paper.

Показател Г7

11. Dushkov, I., Common mistakes when using text in multimedia presentations created with the Power Point application, *KNOWLEDGE - International Journal*, 2021, 347 – 352, ISSN 2545-4439

Abstract: At the present time, there is a growing need for adequate education. Due to the extraordinary circumstances in which we find ourselves, teaching takes place entirely in a distance form. The use of information and communication technologies (ICT) in education is not only

necessary but also mandatory. If we want this process to be successful, it needs to be carried out accurately and clearly. For this purpose, a model should be developed to detect and minimize the possible mistakes that are often made when using multimedia in teaching and in particular when working with presentation software. Through the use of a computer presentation, the information quickly reaches the audience. In essence, a multimedia presentation engages the two main channels for information processing, namely the auditory and visual ones, thus maintaining attention and ensuring its full perception. A good presentation is one in which the multimedia components are properly combined. It is a well-known fact that the effect of a multimedia presentation of information depends largely on the proper use of its components. Whether the listener (viewer) will have an additional or permanent interest in the topic or will be left with only initial and vague impressions and will lose interest depends entirely on the presentation. Creating a multimedia presentation may seem a very simple computer skill but this is certainly not the case. In teaching, we often observe presentations that not only do not facilitate, but moreover even complicate the learning process. For this reason, this article systematizes the most common mistakes associated with the use of text when working with a software for creating multimedia PowerPoint presentations. Examples are offered to reveal some of the common mistakes. Appropriate solutions are also discussed. The more time and attention the presenter gives to their presentation, the stronger they will influence their audience and the closer they will get to their pre-set goal.

Показател Г7

12. Dushkov, Iv., Multimedia presentations on entertaining mathematics in primary school (Perelman's Geometric Method), 309-320, collection Education and Arts: Traditions and Perspectives, Second Scientific and Practical Conference, 2021, ISSN 2738-8999

Abstract: This article presents a short study that aims to determine the impact on the quality of learning in integrating information and communication technologies in learning, using multimedia presentations created with the PowerPoint application in entertaining mathematics in the primary grades. For this purpose, Perelman's geometric method was used to solve Poisson's problem of fluid overflow. The multimedia presentation used in the experiment is author's, and it presents an example of using this method. For the purpose of the research, a laboratory pedagogical experiment was conducted with four classes of fourth grade students at a Sofia school divided into

two groups - control and experimental. The classes were grouped according to the average grade based on the grades obtained in mathematics so far. The two classes with lower average success were purposefully selected for the experimental group. In the control group the training was conducted in the traditional way, while in the work of the experimental group the previously prepared multimedia presentations were used. The obtained results are presented in the form of diagrams. The results obtained from the experiment show the higher results obtained by the students in the experimental and control groups.

Показател Г7

13. Dushkov, Iv., Common Mistakes in Creating Multimedia Presentations with PowerPoint, 410-420, Collection Education and the Arts: Traditions and Perspectives, Second Scientific and Practical Conference, 2021, ISSN 2738-8999

Abstract: The computer presentation is an effective tool through which the information quickly and easily reaches the audience. A good presentation, in which the multimedia components are combined, optimally engages two channels for information processing (respectively auditory and visual), which holds the attention and ensures its full perception. It is known that it depends on the presentation, to a large extent, whether the listener (viewer) will have additional interest in the presented topic, as a result of which he will continue with its more in-depth study or will remain only with initial and vague impressions and will finally lost interest in the topic. At first glance, creating a presentation seems like a simple computer skill. But is that so? In educational practice, we often observe presentations that not only do not facilitate, moreover even complicate the learning process. It is for this reason that this article systematizes the most common mistakes when working with the software for creating multimedia Power Point presentations. Problems that may arise when working with the components of a multimedia presentation, namely: text, image, animation, design, sound and video. Examples are presented that illustrate some of the common mistakes, as well as opportunities for their elimination.

Показател Г7

14. Dushkov, Iv., Diagnosis of the results of computer modeling training at the end of the fourth grade, YEARBOOK OF THE UNIVERSITY OF SHUMEN "BISHOP KONSTANTIN PRESLAVSKI" Vol. XXV D, 2021, pp. 346-354, IS9

Abstract: Computer modelling in primary school is a new subject introduced in the curricula approved by the Ministry of Education and Science in Bulgaria for third and fourth grade of primary school in 2018. The introduction of this new subject aims to build the skills of young students to work in a digital environment, as well as to stimulate and develop their logical thinking. Nowadays, information technology must be used not only as an environment, but as a learning tool. This article presents a study conducted at the end of the 2019/2020 school year in the fourth grade, which covers four groups of students, or 76 students in total, from a school in the city of Sofia. The obtained results are analyzed and presented in the form of diagrams.

Показател Г7

15. Dushkov, Iv., Comparative analysis of the curriculum of the textbooks adopted by the Ministry of Education and Science in the subject Computer Modeling for fourth grade, YEARBOOK OF THE UNIVERSITY OF SHUMEN "BISHOP CONSTANTINE PRESLAVSKI" Vol. XXV IS - 355 6769, 2021

Abstract: The subject Computer Modeling is the newest subject included in the curriculum for primary school in the 2018/2019 school year. The article presents a comparative analysis of the content of the five school textbooks in Computer Modeling for third grade, approved by the Ministry of Education and science in Bulgaria. For the purposes of the research, the curriculum was used, which has been in force since 2018. The curriculum is divided into seven cores. The analysis includes:

- the ratio of topics according to their type (for each textbook separately)
- the generalized ratio of the types of lessons in accordance with the category to which they belong (lessons for new knowledge, exercises and summary and negotiation) for all of the study sets.

Показател Г7

16. Dushkov, Iv., Comparative analysis of the curriculum according to the type of lessons in the textbooks adopted by the Ministry of Education and

Science in the subject Computer Modeling for third grade, PEDAGOGICAL AND SOCIAL RESEARCH, 2021

Abstract: The subject "Computer Modeling" is included in the curriculum for primary school from the school year 2018/2019 in third grade in accordance with the Law on Preschool and School Education. The article provides a quantitative analysis of the lessons according to their type (for new knowledge, for exercise, for summary and revision), contained in the five textbooks on "Computer Modeling" for third grade, approved by the Ministry of Education and Science in Bulgaria. For the purposes of the research, the curriculum, which has been in force since 2018, was used. The curriculum is divided into seven cores. The analysis made includes

- ✓ the ratio of the topics according to their type (for each textbook separately)
- ✓ the generalized ratio of the types of lessons in accordance with the category to which they belong (lessons for new knowledge, exercises and summary) for all textbooks.

Показател Г7

17. Dushkov, Iv., Development of a product related to the topic "PENTAMINO, Student Research Session, University of Ruse, pp. 9 -13, 2015 (section report)

Abstract: Pentamino is a topic of etc. entertaining mathematics. A logical game, which develops as memory and logical thinking, imagination and creative talents of students in elementary school. The report presents original product made of the program MS Power Point, showing how through the use of ICT could facilitate the work of the teacher, to increase the interest of students, as well as much better to visualize certain topics.

Показател Г7

18. Dushkov, Iv. Information Technologies in the Teaching of Mathematics in Primary Schools, Education and Technology Magazine, Burgas, Education and Technology Association, pp. 121 - 124, 2010, ISSN 1314-1791, http://itlearning-bg.com/magazines/Spisanie2010/

Abstract: The topic of the report discusses some possibilities for integrating ICT in mathematics education in order to improve the quality of education. Some basic WINDOWS software applications are discussed. A site that could help the teacher is considered.

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