XII International Conference on Mathematics, Science and Technology Education: conference report

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Abstract. This article[1] represents the XII International Conference on Mathematics, Science and Technology Education (ICon-MaSTEd 2020) held at the Kryvyi Rih State Pedagogical University, Ukraine, 15–17 October 2020. Background information and the organizational structure of the meeting, a summary of the papers, and acknowledgements of the contributions of the many people who made the conference a success are presented.

Keywords: ICon-MaSTEd, Mathematics Education, Biology Education, Chemistry Education, Physics Education, Astronomy Education, Earth Science Education, Computer Science and Computer Science Education, Integrated Science Education, Technology Education, Educational Technology

1. Background

The International Conference on Mathematics, Science and Technology Education (ICon-MaSTEd) is a peer-reviewed international conference, which covers research on mathematics, science and technology education, along with technology-enhanced learning, including blended learning, E-learning, ICT-based assessment, mobile learning etc.

Since 2001, ICon-MaSTEd is the premier interdisciplinary forum for social scientists, academicians, researchers, professionals, policy makers, postgraduate students and practitioners to present their latest research results, ideas, developments, and applications. There is urgent general need for principled changes in mathematics, science and technology education elicited by promising theories, models, tools, services, networks and communications.

The background theme for this ICon-MaSTEd installation was “How learning technology changes science education in the 2020+ era”.

ICon-MaSTEd 2020 topics of interest:

- Mathematics Education

[1]This is an extended and revised version of the ICon-MaSTEd 2020 proceedings preface [18]

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- Biology Education
- Chemistry Education
- Physics Education
- Astronomy Education
- Earth Science Education
- Computer Science and Computer Science Education
- Integrated Science Education
- Technology Education
- Educational Technology

The XII International Conference on Mathematics, Science and Technology Education (ICon-MaSTEd 2020) took place 15–17 October, 2020 at the Kryvyi Rih State Pedagogical University, Ukraine. There were more than 200 attendees from 10 countries at ICon-MaSTEd 2020. The conference featured plenary, invited and contributed talks as well as poster presentations in a wide number of subject areas of active interest to the scientific community. The full program with video record of talks is available at https://easychair.org/smart-program/ICHTML2020/About.html where details of the 2 plenary sessions and 24 parallel sessions, usually headed by one or more invited presentations.

There were 110 submissions selected. Each submission was reviewed by at least 4, and on the average 4.1, program committee members. The program committee decided to accept 76 papers. Most of ICon-MaSTEd 2020 papers were published by IOP Publishing in the Journal of Physics: Conference Series (vol. 1840), and 2 best papers (Trubavina et al. [61], Volkova et al. [67]) were published by Academy of Cognitive and Natural Sciences in the Educational Technology Quarterly journal.

2. ICon-MaSTEd 2020 program committee

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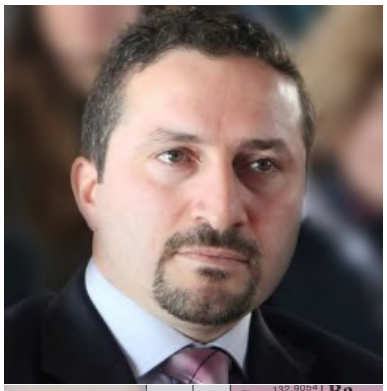

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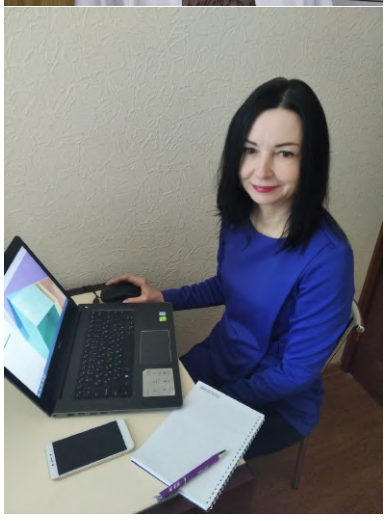

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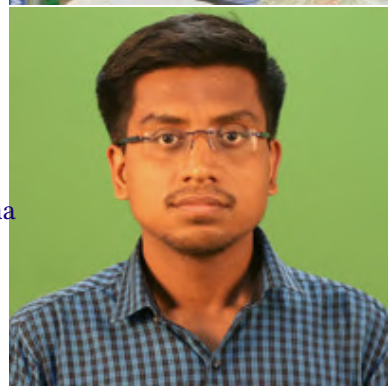

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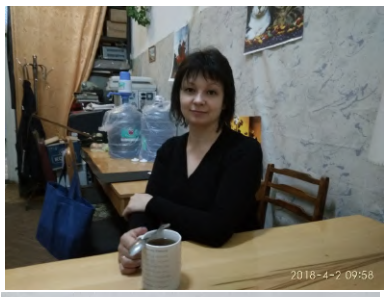

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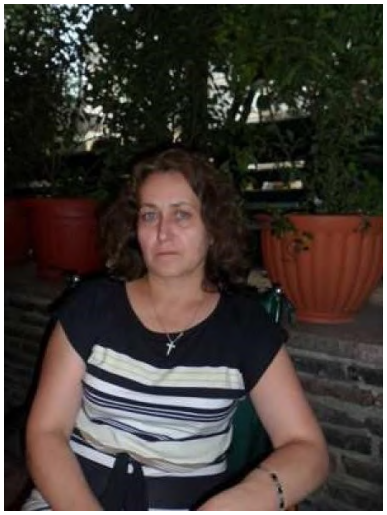

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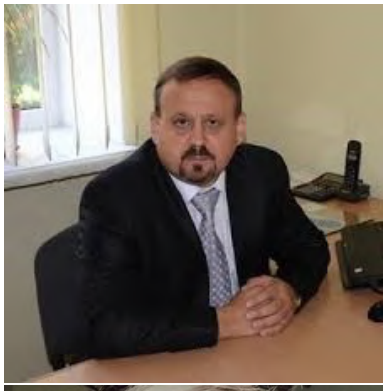

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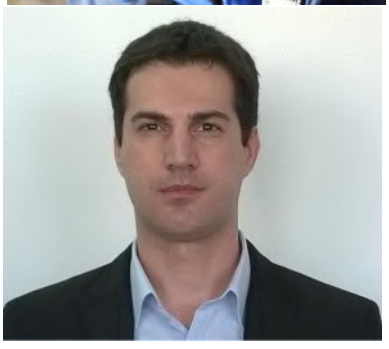

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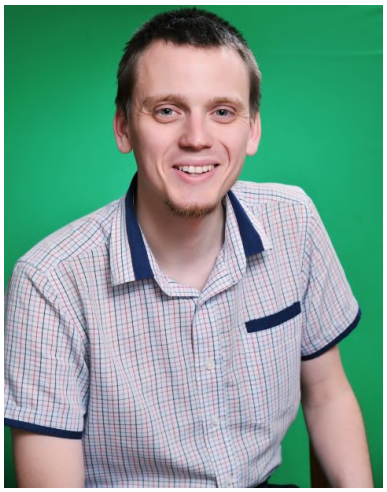

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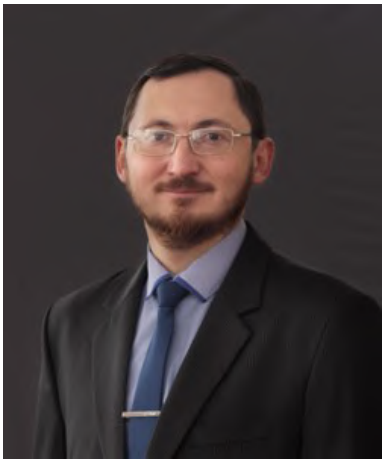

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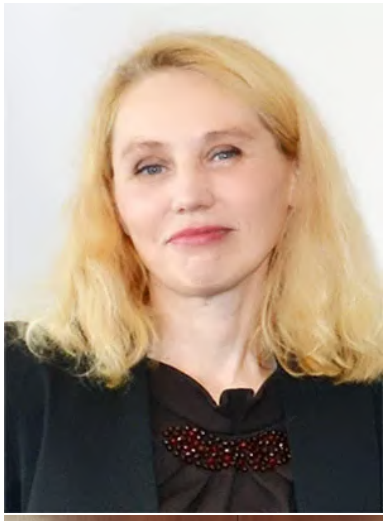

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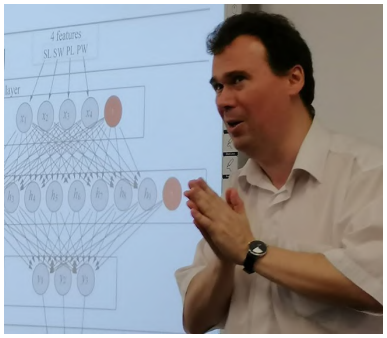

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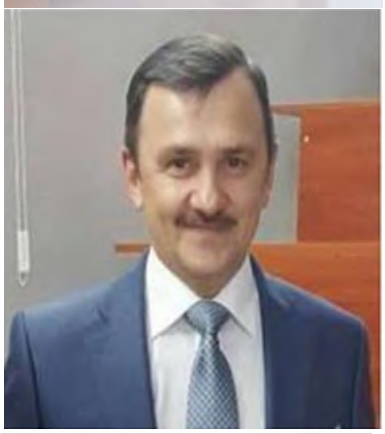

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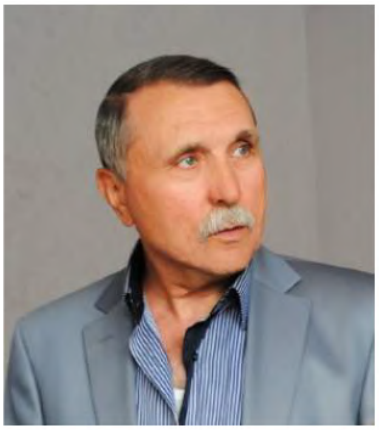

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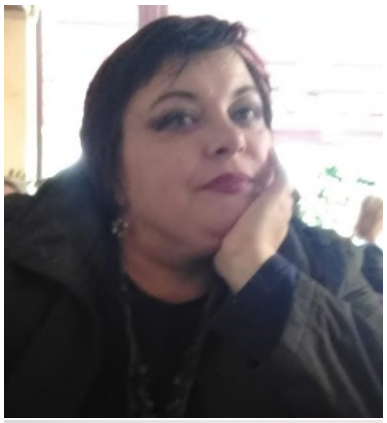

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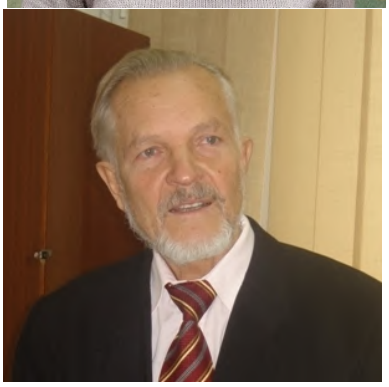

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3. ICon-MaSTEd 2020 overview

3.1. Mathematics Education

The article of Myroslav I. Zhaldak et al "Some applications of cloud technologies in mathematical calculations" [70] discusses some use of cloud technology in mathematical calculations using Remote Desktop Ulteo OVD. To use such technologies, it is enough to have access to the Internet through a suitable browser to access an open virtual desktop on a powerful remote computer and then use the resources of the remote computer (server) to solve their problems in processing various information resources – solving mathematical problems, working out texts, translating from one language to another, help on the interpretation of different terms, their origin and more. The article also examines in detail some examples of the use of the pedagogical software for educational purposes Gran1. In particular, the calculation of the approximate value of the double integral; graphical two-dimensional problem solving, the so-called linear programming problems; two-dimensional problems, including convex programming – finding the smallest value of a convex downward function (or the highest convexity of a function) on a convex set of inequalities (including linear ones). However, the use in the educational process of any technology, including modern information and communication, as well as the content of training, should be pedagogically balanced, which will allow to avoid any negative effects on the formation of personality of a future member of society, his mental and physical development.

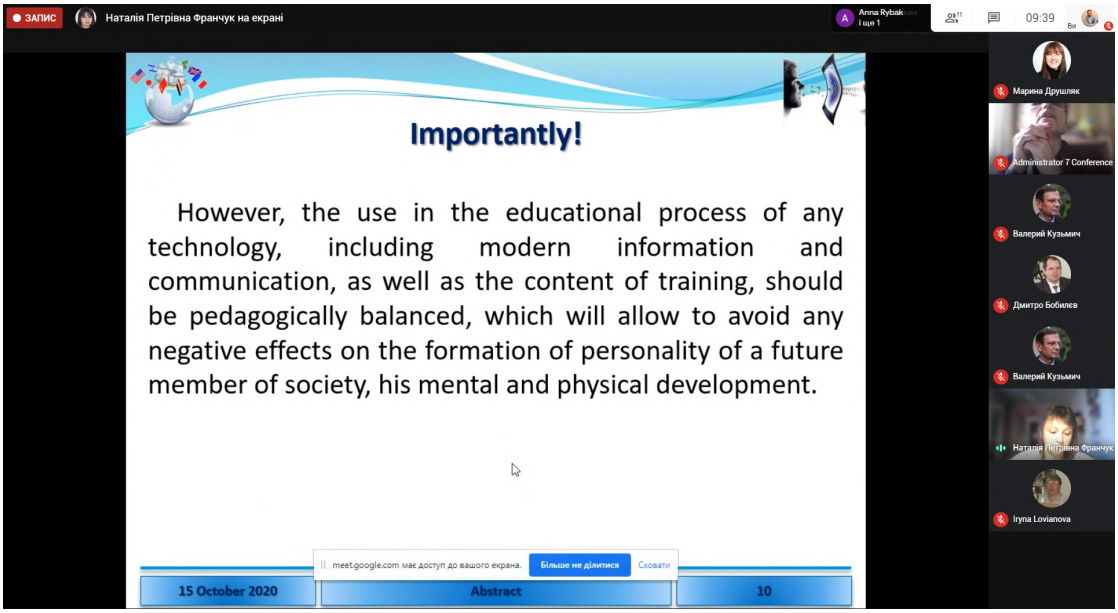


Figure 1: Nataliia Franchuk presents the talk [70].

Dmytro Y. Bobyliev et al in the article "Problems and prospects of distance learning in teaching fundamental subjects to future Mathematics teachers" [6] analyzes experience of implementing the courses Mathematical Analysis and History of Mathematics for future Mathematics teachers in the system of managing electronic academic courses at Kryvyi Rih State Pedagogical University. To create the courses, there is a block-modular approach enabling not only structuring the process of studying fundamental mathematical subjects in the distance form of training, but also controlling the rate and depth of students' mastering the material. There are examples of laboratory works on Mathematical Analysis performed by students independently in the computer mathematics system CoCalc.

István Lénárt in the article "Comparative Geometry in distance education" [26] discuss the educational project called Comparative Geometry. The project is based on teaching and learning plane geometry and spherical geometry simultaneously, mainly through direct experimentation with hands-on tools, and intensive use of discussion between classmates. This work has gravely been affected by the changes that occurred by pandemic, still causing emergencies in many areas of education. In this article, István Lénárt describe how to adapt the work of a university course to an emergency; the methods by which he enabled direct experimentation and personal communication that were not possible in the given situation; his efforts to reduce the drawbacks of the situation and take advantage of the potential benefits.

The article "Elements of non-Euclidean geometry in the formation of the concept of rectilinear placement of points in schoolchildren" [23] of Valerii I. Kuz'mich et al deals with issues of the metric geometry basics. In particular, the concept of rectilinear placement of points is considered, based on the axioms of the distance between two points of metric space. This approach allows forming a modern view of the property of straightness in the pupils. Authors

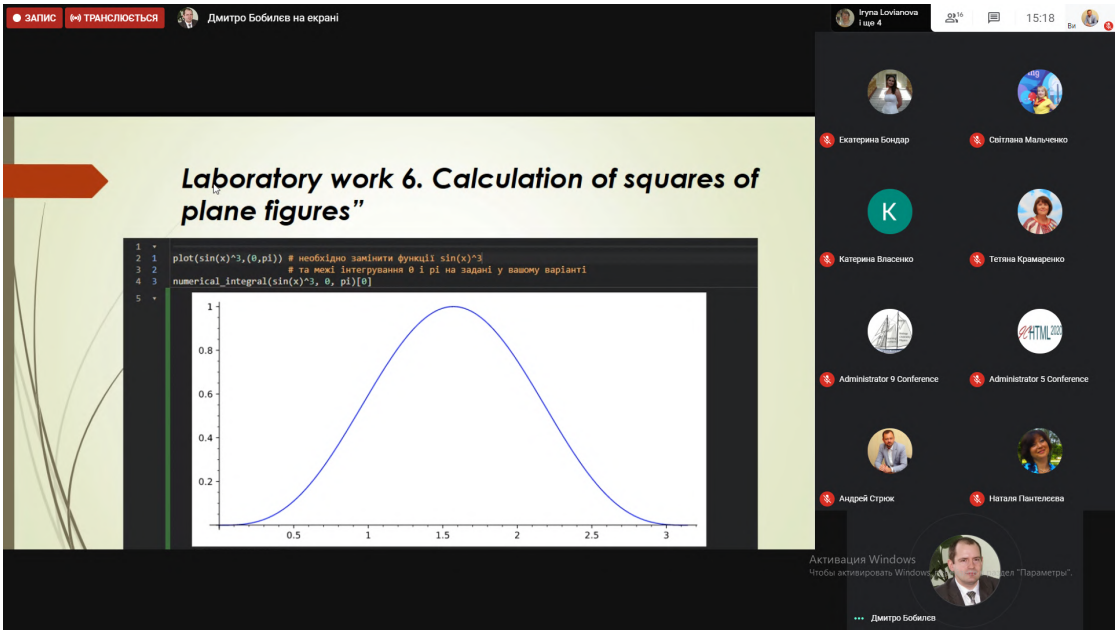


Figure 2: Dmytro Bobyliev presents the talk [6].

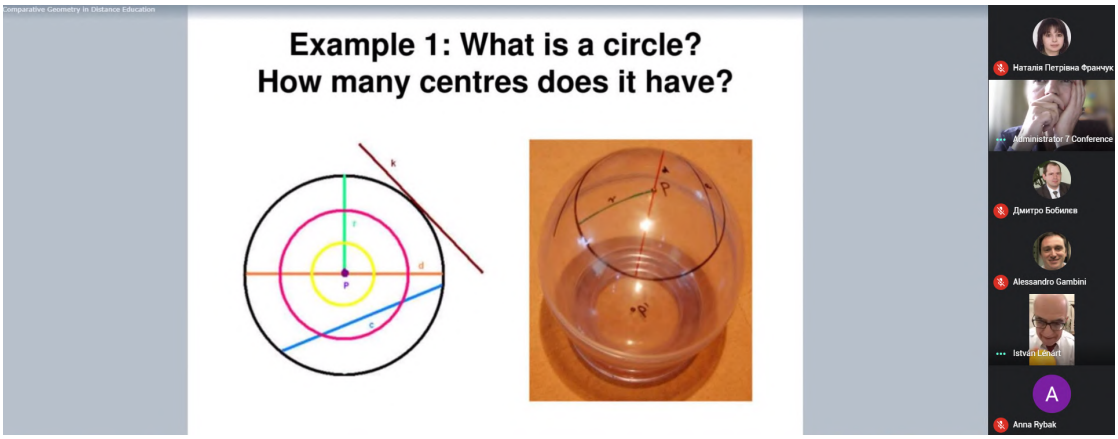


Figure 3: István Lénárt presents the talk [26].

analyzes the content of existing mathematics textbooks for general educational institutions to acquaintance of pupils with the elements of metric geometry. The first part of the artciel provides information about the rectilinear placement of points; it can be used in Geometry lessons in the 7th – 9th grades. Set of linear functions are considered as examples of points of metric space. The similar work was done in the second part of the work for geometric material of the 10th – 11th grades. In addition, some simple examples of metric spaces that may be accessible to pupils of the relevant classes are discussed. The purpose of the work is gradually introduction of pupils to the elements of non-Euclidean geometries, to form a generalized notion

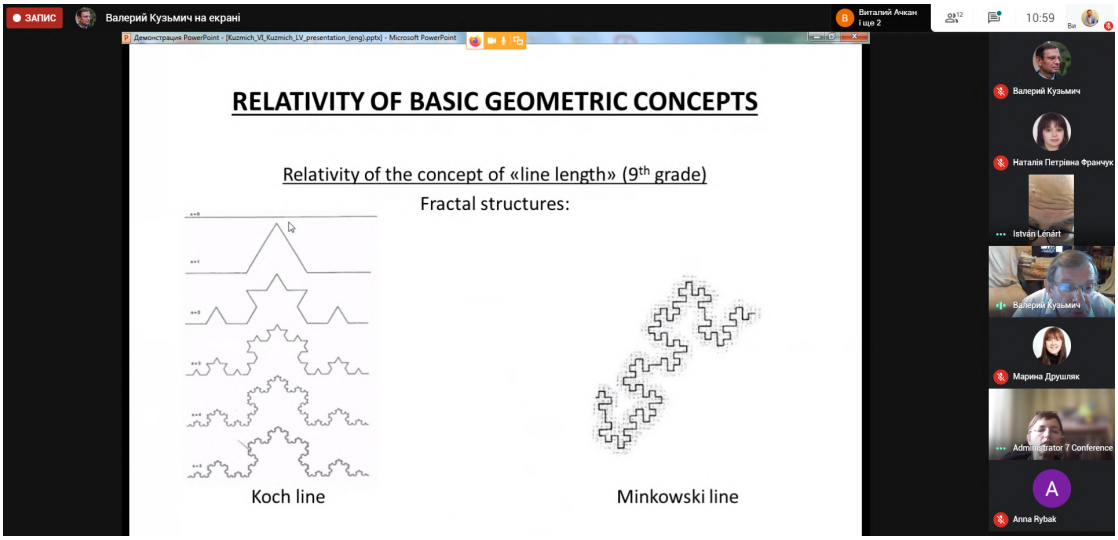


Figure 4: Valerii Kuz'mich presents the talk [23].

of the distance between the points and rectilinear of their placement. The work can be used for Mathematics teaching at school and for retraining of teachers of Mathematics.

Anna Rybak in the article "Learning by experimenting as a good way to effective and student friendly mathematics education – experiences from Young Explorer's Club" [48] describe the experience of Young Explorer's Club as the environment where students can discover knowledge by making experiments. Learning by experimenting, by own activity of learners makes the whole educational process more interesting and less frustrating for students. This also applies to mathematics education. Experiences from mathematical Young Explorer's Clubs established at the Centre for Creative Mathematics Learning at the Faculty of Mathematics University of Bialystok as the possible way to more effective mathematics education is presented in the artciel. Experimenting and using functional strategy of teaching of mathematics is the basic form of activity in the Clubs.

The article "Training pre-service mathematics teacher to use mnemonic techniques" [9] of Marina G. Drushlyak et al reveals the issue of the appropriateness of training pre-service mathematics teachers to use the techniques of mnemonics in professional activities. This issue is caused by the intensification of the educational process, when the amount of information accumulated by mankind is many times greater than the amount of knowledge that can be learned by a particular person. It is established that in the process of teaching mathematics, mnemonics should be used as a way of perceiving new information due to the formation of associative connections using special methods and techniques. The expediency of training pre-service mathematics teachers to use various methods of mnemonics ("Binding", "Transformation", "Amplification") is substantiated. A positive attitude of mathematics teachers towards the use of mnemonics techniques was revealed, as well as a low level of students' understanding of the advisability of using mnemonics techniques in professional activities. The classification of software used to create visual models is presented. A training was developed and introduced

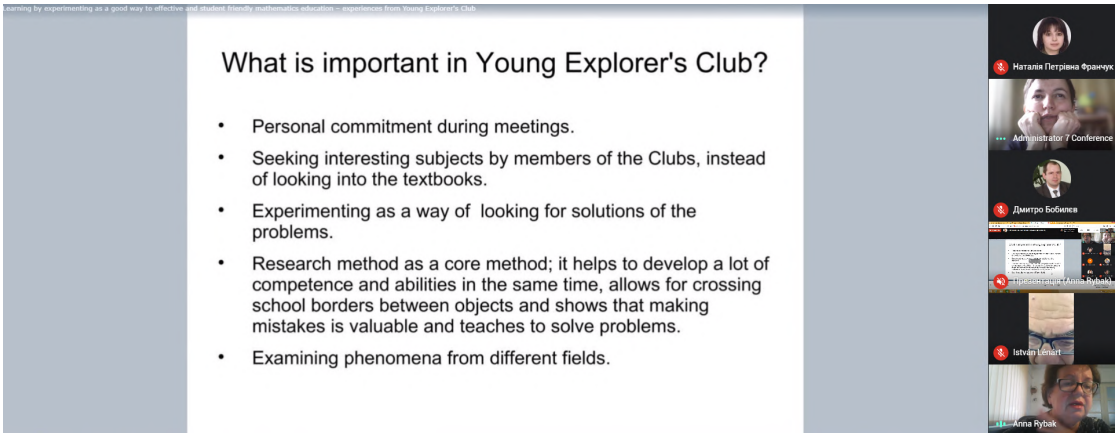


Figure 5: Anna Rybak presents the talk [48].

Figure 6: Marina Drushlyak presents the talk [9].

into the practice of university education on the development of mnemonic techniques for the presentation of educational mathematical material. The prospects of scientific research through the development of methodological support for the training of pre-service mathematics teachers to use the techniques of mnemonics in professional activities are determined.

Kateryna V. Vlasenko et al in the article "The arrangement of on-line training of master students, majoring in Mathematics for internship in technical universities" [66] looks into the issue of online-training of master students, majoring in Mathematics for internship in technical universities. This study is focused on arranging students' learning activities with the help of an on-line course "Methods for teaching Mathematics to students in technical universities". The study considers the issues that students face during the internship in technical universities

Figure 7: Iryna Lovianova presents the talk [66].

and debates a possibility to factor in the students' needs while designing the course content. The present study gives a description of the activities that students do while working with the course materials, requirements, and recommendations on facilitating the learning process through this course. Active participation of students and their contribution to discussing the course, its content and the facilitation of the learning process presume that introduction of the on-line course and its integration into the program of training master students enhances their readiness for internship.

Another article of Kateryna V. Vlasenko et al, "Methods for developing motivational and value-orientated readiness of math students at teacher training universities for implementing educational innovations" [65] considers the issue of developing motivational and value-orientated readiness of Math students at teacher training universities for implementing educational innovations. The method, chosen for the present research is the analysis of the scientists' viewpoints, on-line resources and reports regarding the issue of designing and using Rich Tasks when teaching Mathematics, methods and means for developing students' motivation for implementing educational innovations. This paper describes the methods, aimed at developing in students motivation and ability to systematize, devise, use Rich Tasks in their professional activity and to combine them with other innovational learning methods and means. The analysis of the teacher training internship results and the surveys in the experimental group give ground to make a conclusion about efficiency of the methods offered.

The article "The ICT usage in teaching mathematics to students with special educational needs" authored by Tetiana Kramarenko et al considers the issue of developing motivational and value-orientated readiness of Math students at teacher training universities for implementing educational innovations. The method, chosen for the present research is the analysis of the scientists' viewpoints, on-line resources and reports regarding the issue of designing and using Rich Tasks when teaching Mathematics, methods and means for developing students'

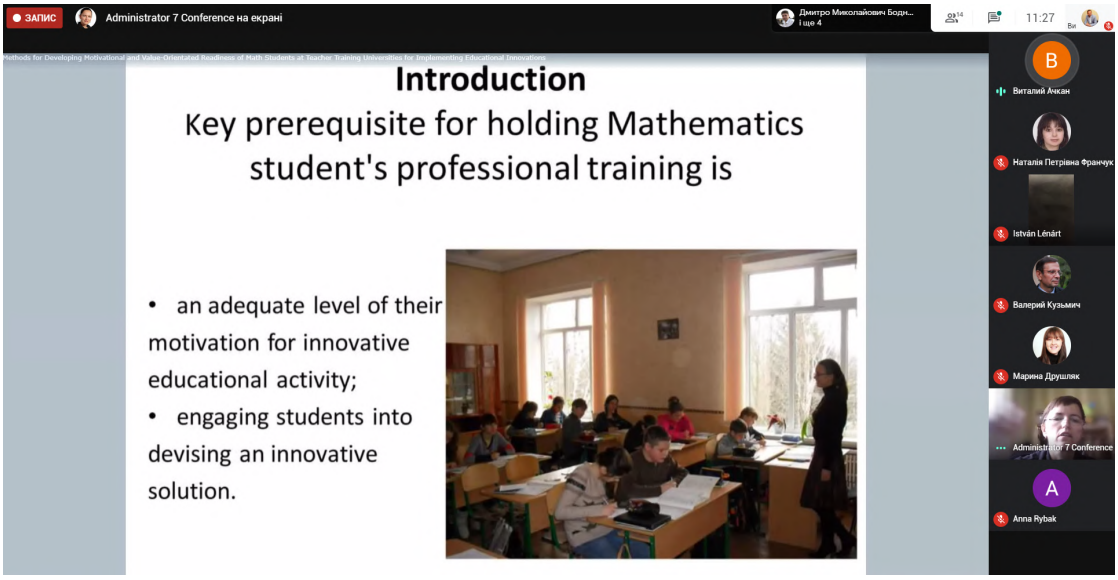


Figure 8: Vitaliy Achkan presents the talk [65].

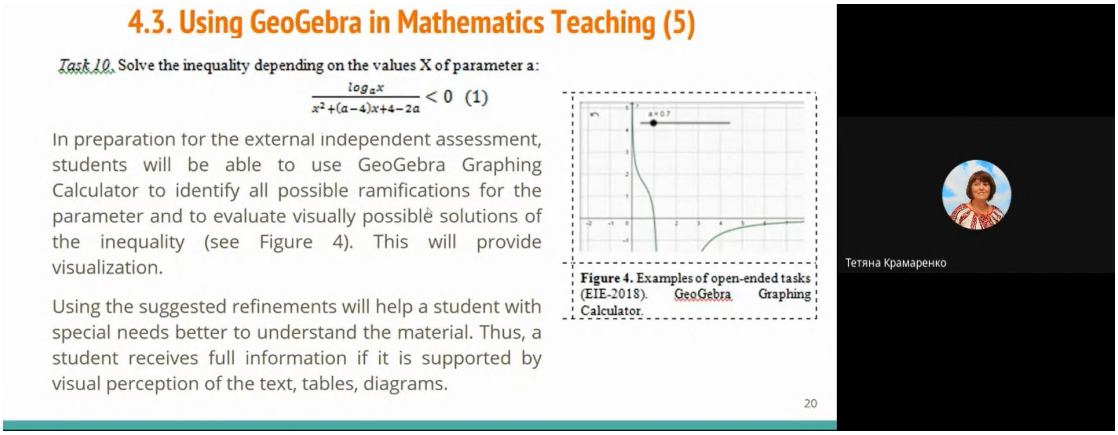


Figure 9: Tetiana Kramarenko presents the talk [21].

motivation for implementing educational innovations. This article describes the methods, aimed at developing in students motivation and ability to systematize, devise, use Rich Tasks in their professional activity and to combine them with other innovational learning methods and means. The analysis of the teacher training internship results and the surveys in the experimental group give ground to make a conclusion about efficiency of the methods offered.

3.2. Biology Education

Elena V. Komarova's article "Replication, pseudoreplication and model experiment in the study of population genetics" [19] is dedicated to the problem of true and pseudoreplication of a

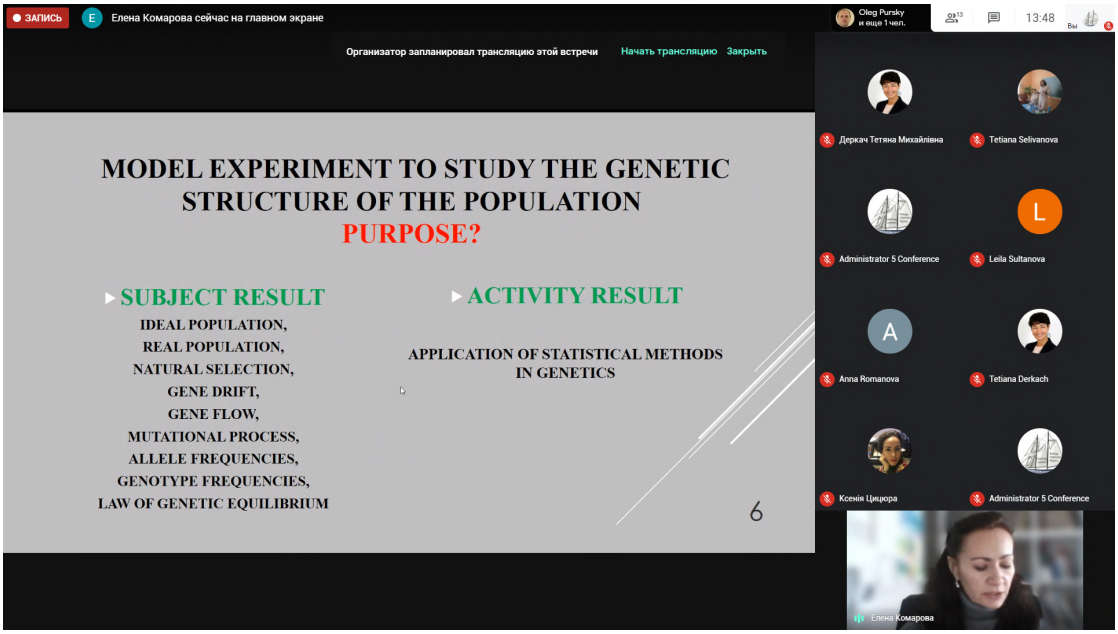


Figure 10: Elena Komarova presents the talk [19].

biological experiment, in particular in the educational process. It was found that this issue is relatively new and actual for the methodology of biological experiments in general. Its solution in science ensures the veracity of the results obtained and the relevancy of the formulated conclusions. In biology teaching methods at school, the problem of true and pseudoreplication of the experiment was not reflected. The author covers an issue of true replication teaching when setting up a model experiment to study genetic-evolutionary processes in populations. The article discloses the experience in evolution of a model experiment and its development aimed at formation of ideas about technical and biological replication by the example of study of the genetic structure of an ideal population in generations. For this purpose, there was developed a web page that allows to automatically implement technical and biological experiment replication. There was described an experience of approbation of the proposed variant of the experiment, and its difficulties and advantages were revealed.

Vasyl Savosko et al in the article "Predictive model of heavy metals inputs to soil at Kryvyi Rih District and its use in the training for specialists in the field of Biology" [49] show the experience of introducing into modern biological education methods of predictive modeling which are based on relevant factual material. Such an actual material may be the entry of natural and anthropic heavy metals into the soil at industrial areas. It is shown that the predictive model development for heavy metals inputs to soils of the industrial region can be used for efficient biological education (for example in bachelors of biologists training, discipline "Computer modelling in biology").

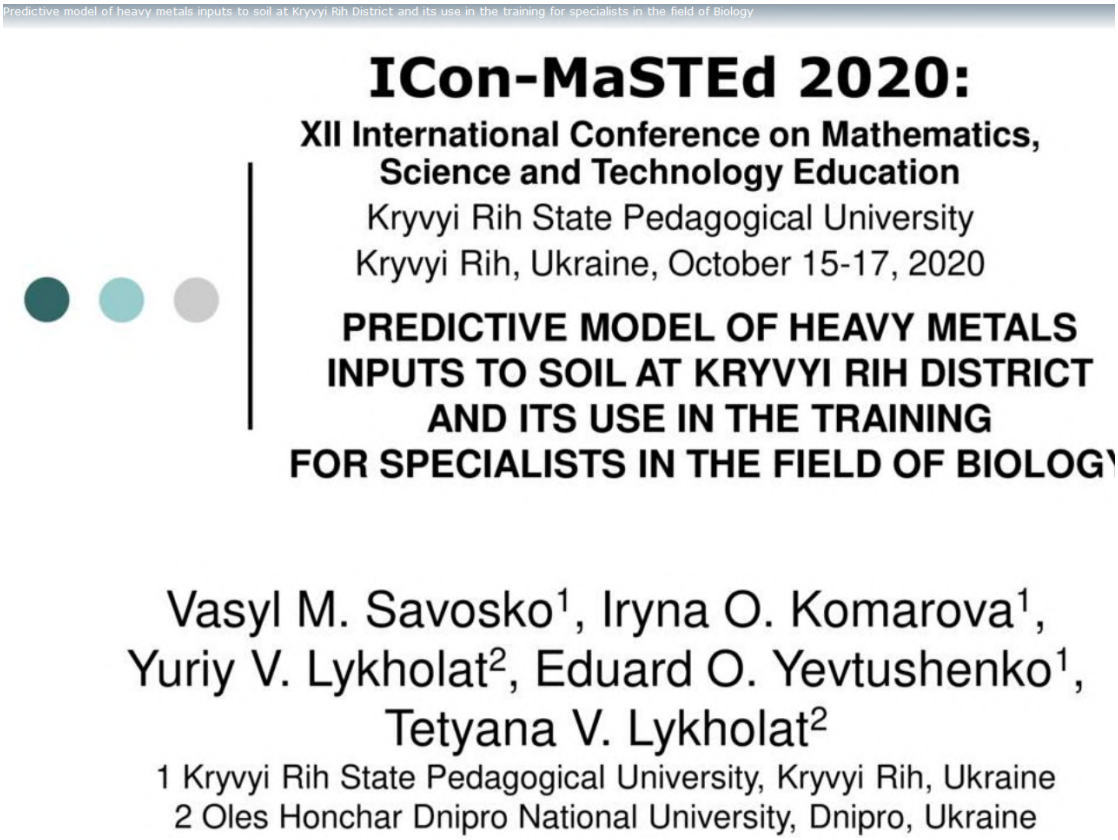


Figure 11: Vasyl Savosko presents the talk [49].

3.3. Chemistry Education

Tetiana M. Derkach in the article "The origin of misconceptions in inorganic chemistry and their correction by computer modelling" [8] analyse the typical mistakes in the learning of the university course of inorganic chemistry, determine the origin of misconceptions and estimate the effectiveness of the use of computer simulations to correct false chemical concepts. Ten problems that are the most typical for students were revealed. One of the leading causes of their occurrence is the failure of many students to form mental relationships between different levels of representation of chemical knowledge – microscopic, macroscopic and symbolic. Other reasons include an insufficient understanding of the material, the incompleteness of the knowledge of the microscopic basis of processes, and inability to work with different models, including misunderstanding of their purpose and constraints. NetLogo programming environment was used for students' self-administering tests to study gas laws. Scope for the usage of NetLogo models was estimated in correcting of incorrectly formed conceptions of the chemical knowledge. Independent work with NetLogo models facilitates the formation of stable relationships between multiple levels of representation of chemical information. It improves an understanding of the studied topic fundamentally, and this holds for all students practically

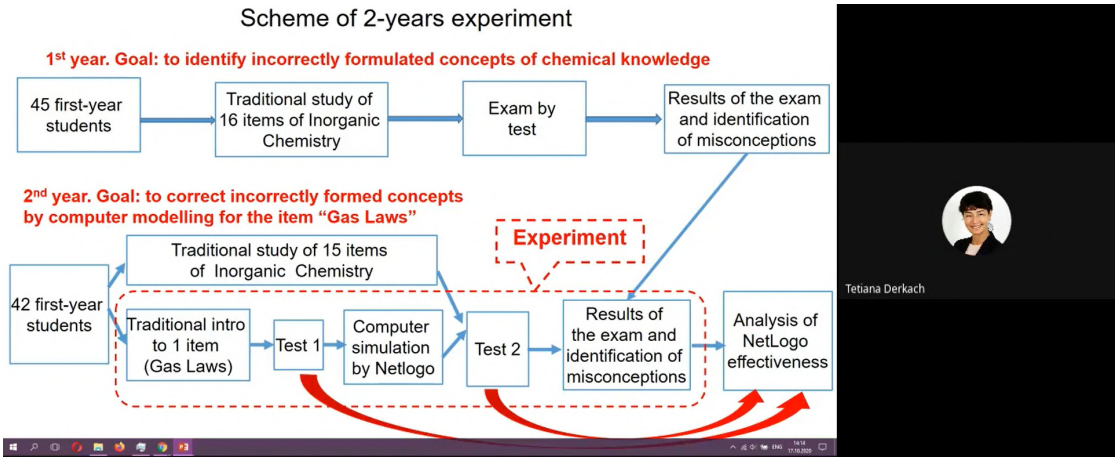


Figure 12: Tetiana Derkach presents the talk [8].

independently of their grounding level in chemistry. The introduction of computer simulation into the practice of teaching chemical subjects shows promise. Still, it requires the solution of several scientific, methodological, logistical and organisational issues.

Liliia Midak et al in the article "Specifics of using image visualization within education of the upcoming chemistry teachers with augmented reality technology" [32] shown the benefits of study chemical disciplines, applying the augmented reality for the upcoming chemistry teachers, as far as the visualisation of the demonstration material in the 3D helps students understand various processes and phenomena, the structure of chemical compounds and the mechanisms of their correlation in a better way. The object of the project is the development of program and printed tools, designed to visualize the education process within chemistry disciplines according to the augmented reality technology. The authors have developed applications, designed for visualisation of the study material with augmented reality. When a mobile phone is pointed on a marker, the image "comes to life", its 3D model appears; it can be manipulated in some way (inversion, enlargement, viewing from different sides) to understand its structure, operating principle etc. better. Applying augmented reality objects gives the teacher an opportunity to explain big amount of theory quickly and effectively, and the students – to memorise it effectively, develops creativity and boosts motivation for study. Applying augmented reality while training the upcoming chemistry teachers gives the ability to prepare them for applying this technology during the education process in the general secondary education establishments.

3.4. Physics Education

The article "Contradictions in the traditional methods of electrodynamics teaching as a determinant of its update" [20] Oleksandr A. Konoval et al deals with the theoretical analysis of the traditional approaches to electrodynamics teaching. The authors pay attention to the contradictions arising in the process of combined application of Biot Savart and Coulomb's laws. The thesis of some limitation of the traditional presentation of the course of electrodynamics is substantiated. In this connection the necessity of updating methodology of electrodynamics

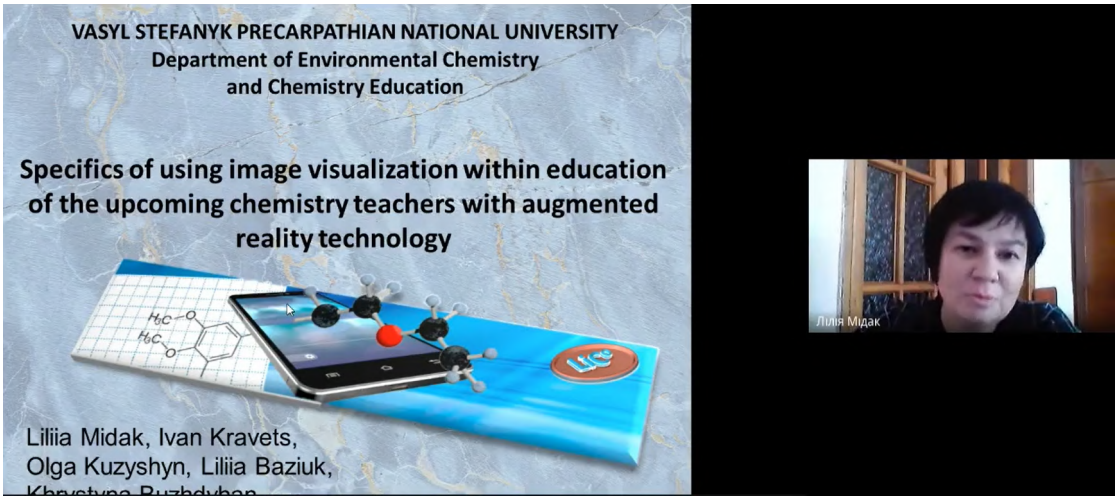


Figure 13: Liliia Midak presents the talk [32].

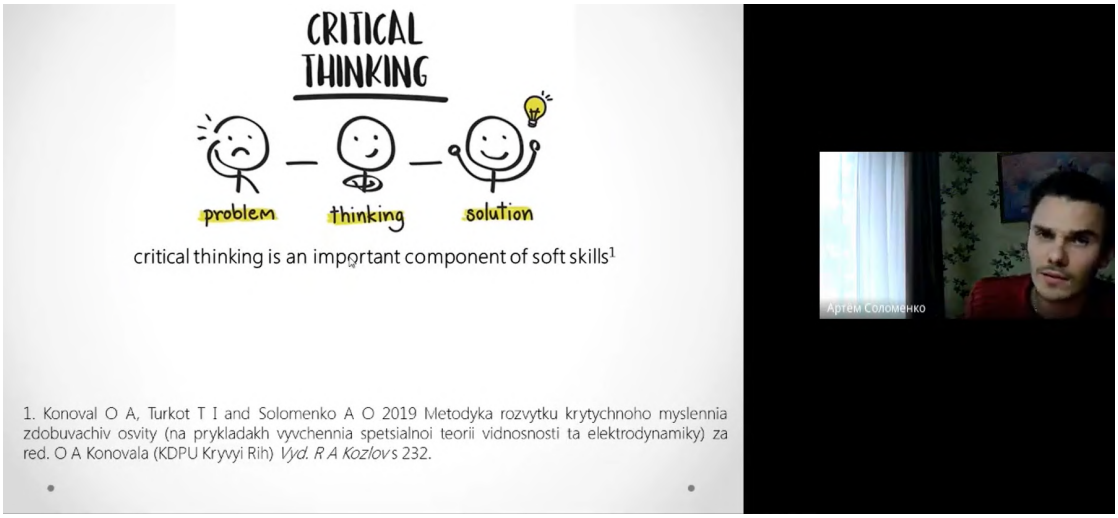


Figure 14: Artem Solomenko presents the talk [20].

teaching is determined. As an innovative approach to solving this problem, it is proposed to analyze and address the existing contradictions of electrodynamics teaching using a specially developed (copyright) methodology – the methodology of the development of students' critical thinking. Using specific examples, the content of each of the stages of the proposed methodology, which can be used in the study of electrodynamics in secondary and higher school, is characterized.

Oleg I. Pursky et al in the article "Computational method for studying the thermal conductivity of molecular crystals in the course of condensed matter physics" [46] presents a computational method for studying the thermal conductivity of molecular crystals that can be used in the

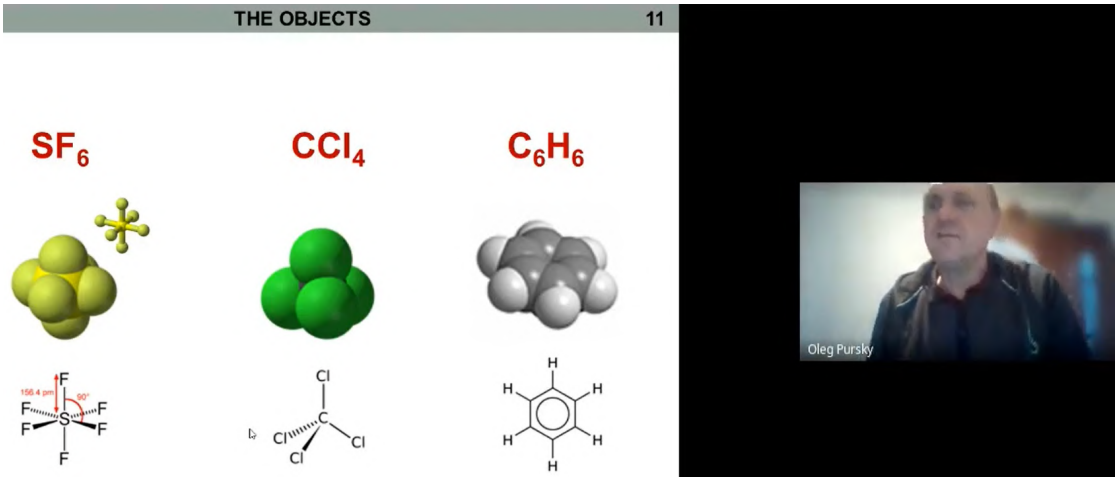


Figure 15: Oleg Pursky presents the talk [46].

educational course of condensed matter physics. This method is based on the Debye model of thermal conductivity in the approximation of the corresponding relaxation times and allows studying the heat transfer processes features in simple molecular crystals at temperatures close to or above Debye temperature. The thermal conductivity is analysed in the framework of modified Debye model in which heat is transferred by low-frequency phonons and above the phonon mobility edge by "diffusive" modes migrating randomly from site to site. The mobility edge ω_0 is found from the condition that the phonon mean-free path cannot become smaller than half the phonon wavelength. The contributions of phonon-phonon, one-, and two-phonon scattering to the total thermal resistance of molecular crystals are calculated under the assumption that the different scattering mechanisms contribute additively. The presented computational method will be useful in pedagogical activities for teaching students of physical faculties.

3.5. Astronomy Education

The method of astronomy homework organization in order to increase students' cognitive activity is described by of Svitlana Malchenko in the article "Organization of astronomy hometasks with the use of informational and communicative technologies for cognitive activity increase" [30], as well as the possibility of individualisation and differentiation of homework is shown. Modern methods offer a lot of techniques and innovative forms of teaching methods in order to improve students' knowledge. These innovations are aimed at applying activity-based and person-centered approaches to learning that will help to intensify students' training activities therefore it will be engaging and productive. Examples of independent practical tasks of different types and use of information and communication technologies are given. The article gives examples of such kinds of work on astronomy classes as: preparation of a textbook, preparation of supporting notes, practical tasks, solution of astronomical problems and creative tasks.

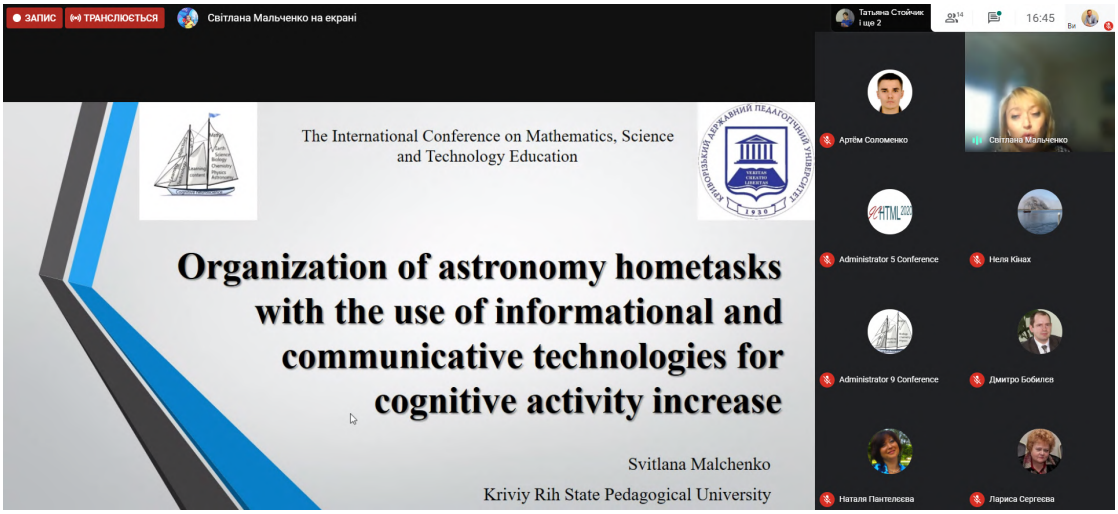


Figure 16: Svitlana Malchenko presents the talk [30].

3.6. Earth Science Education

The article "The application of geographic information systems in schools around the world: a retrospective analysis" [17] of Ihor Kholoshyn et al is devoted to the problem of incorporation geographic information systems (GIS) in world school practice. The authors single out the stages of GIS application in school geographical education based on the retrospective analysis of the scientific literature. The first stage (late 70 s – early 90s of the 20th century) is the beginning of the first educational GIS programs and partnership agreements between schools and universities. The second stage (mid-90s of the 20th century – the beginning of the 21st century) comprises the distribution of GIS-educational programs in European and Australian schools with the involvement of leading developers of GIS-packages (ESRI, Intergraph, MapInfo Corp., etc.). The third stage (2005–2012) marks the spread of the GIS school education in Eastern Europe, Asia, Africa and Latin America; on the fourth stage (from 2012 to the present) geographic information systems emerge in school curricula in most countries. The characteristics of the GIS-technologies development stages are given considering the GIS didactic possibilities for the study of school geography, as well as highlighting their advantages and disadvantages.

The article "Analysis of natural and technogenic factors on the seismicity of Kryvyi Rih" [41] of Petro G. Pihulevskyi et al provide the information on the number of earthquakes in Kryvyi Rih and their parameters for the period 2007–2018. The types of seismic phenomena, the criteria for their identification are considered. The most probable natural and technogenic factors of the epicenters of local earthquakes are established by analyzing their location and sequence in time from the point of view of the tectonic features of the territory and the nature of the technogenic interference in its structure. The necessity of creating a local seismological network in Kryvyi Rih is substantiated. With a view to predict hazardous seismic phenomena, there is a need to continue hydrogeodynamic monitoring of ground water, to introduce seismic gravity monitoring and to conduct microseismic monitoring at mining enterprises. The results of systematic monitoring shall serve as the basis for seismic microzoning of the city. It is

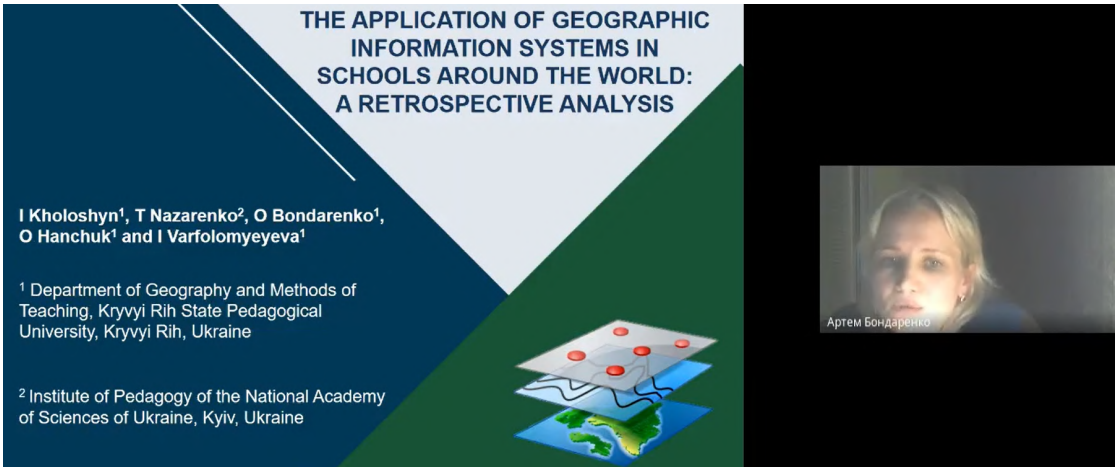


Figure 17: Olga Bondarenko presents the talk [17].

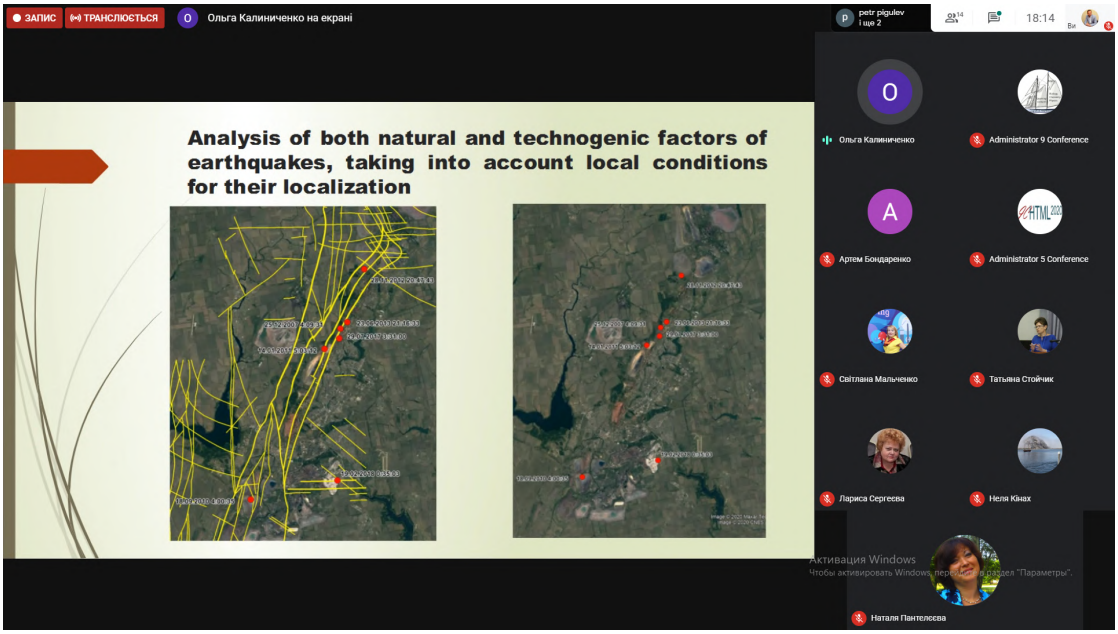


Figure 18: Olha Kalinichenko presents the talk [41].

emphasized that popularization and dissemination of knowledge about the seismicity of mining regions among the population shall play an important role in the implementation of this task. The research materials can be used in the master's degree programme within the framework of higher education system and in advanced training of specialists in the mining industry.

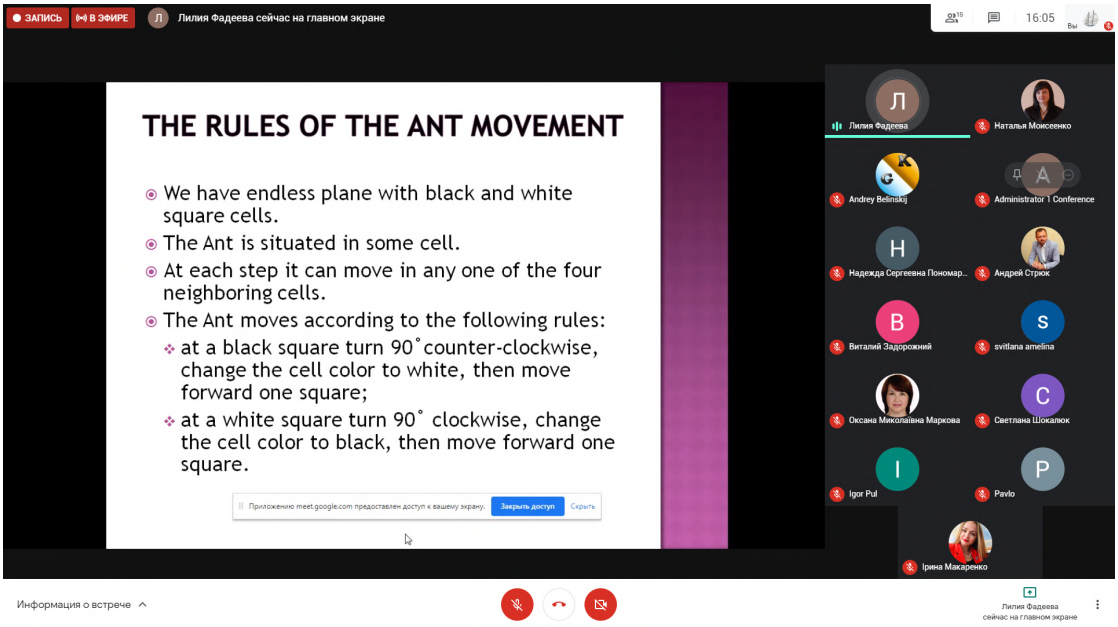


Figure 19: Liliia Fadieieva presents the talk [10].

3.7. Computer Science and Computer Science Education

The article "The turmite-based cryptographic algorithm" [10] presents the novel turmite-based cryptography algorithm has been designed and implemented by Liliia Fadieieva et al. The turmites ability to generate pseudo-random number series makes them promising for cryptographic applications. At the same time, most turmites-related researches concentrate on their mathematical properties and generally don't consider possible applications. Lack of effective implementations of turmites-based cryptographic algorithms makes this research topical. The properties of the proposed algorithm have been examined. The frequency analysis resistance and avalanche criterion have been estimated. The results demonstrate that turmites-based algorithms may be used in cryptography and this application deserves attention and further examination.

The conceptual and mathematical models of the agents' knowledge potential redistribution considering their constituent components are constructed in the article "The dynamics simulation of knowledge potentials of agents including the feedback" [39] of Volodymyr V. Pasichnyk et al. A nonlinear model describing the dynamics of agents' knowledge potentials is developed taking into account the feedback effects (agent – student) on the source of knowledge (teacher / lecturer). In particular, the procedure of constructing a multicomponent two-dimensional array of discrete values of the knowledge potential constituent components for generating procedures to enhance (improve) the professional competences of knowledge sources, is generalized and specified.

Machine learning is now widely used almost everywhere, primarily for forecasting. In the broadest sense, the machine learning objective may be summarized as an approximation

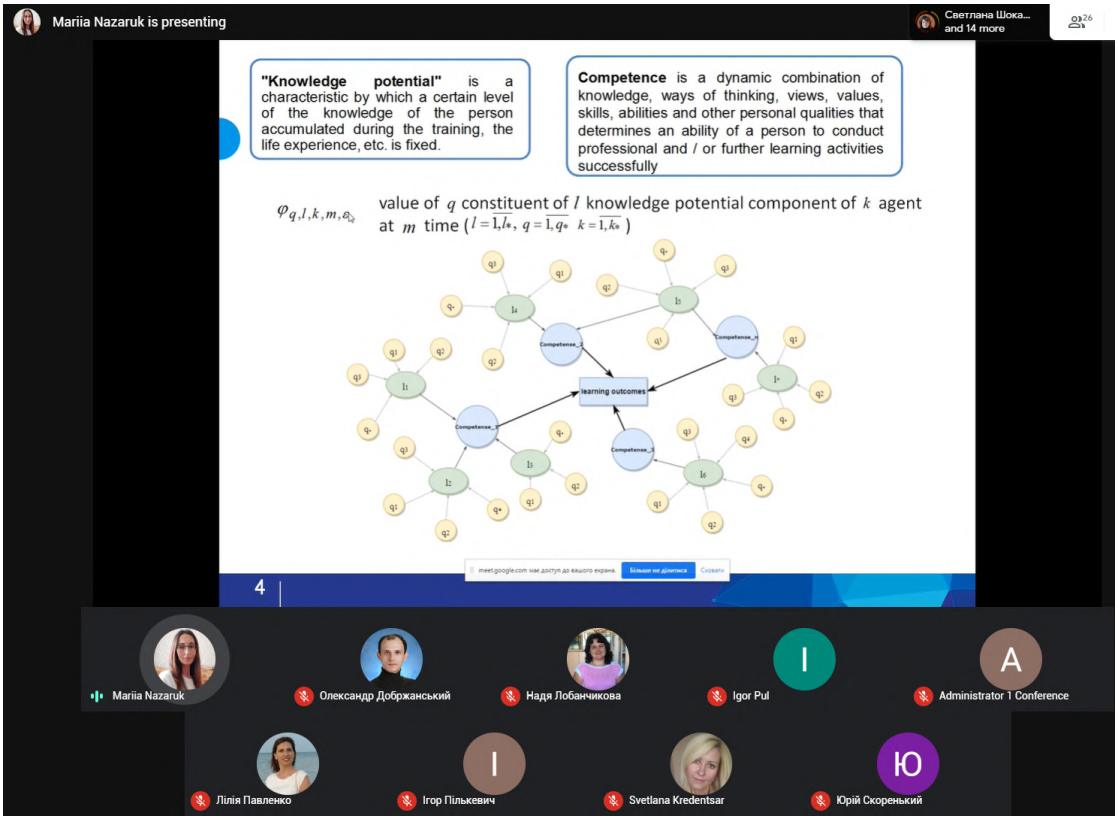


Figure 20: Mariia Nazaruk presents the talk [39].

problem, and the issues solved by various training methods can be reduced to finding the optimal value of an unknown function or restoring a function. At the moment, we have only experimental samples of quantum computers based on classical-quantum logic, when quantum gates are used instead of ordinary logic gates, and probabilistic quantum bits are used instead of deterministic bits. Namely, the probabilistic nature problems that provide for the determination of a certain optimal state from a large set of possible ones on which quantum computers can achieve "quantum supremacy" – an extraordinary (by many orders of magnitude) reduction in the time required to solve the task. The main idea of the article "Comparisons of performance between quantum-enhanced and classical machine learning algorithms on the IBM Quantum Experience" [69] authored by Pavlo V. Zahorodko is to identify the possibility of achieving, if not quantum supremacy, then at least a quantum advantage when solving machine learning problems on a quantum computer.

The main aim of the article "Information technology for mobile perimeter security systems creation" [28] of Nadiia Lobanchykova et al is the creation of information technology for mobile (of rapid deployment) security systems of the area perimeter. This system appears to be a complex of models and methods, information, software, and hardware mean that have interacted with users during decision-making and control of implementation for management solutions. The proposed information technology aimed at improving the protection level for security

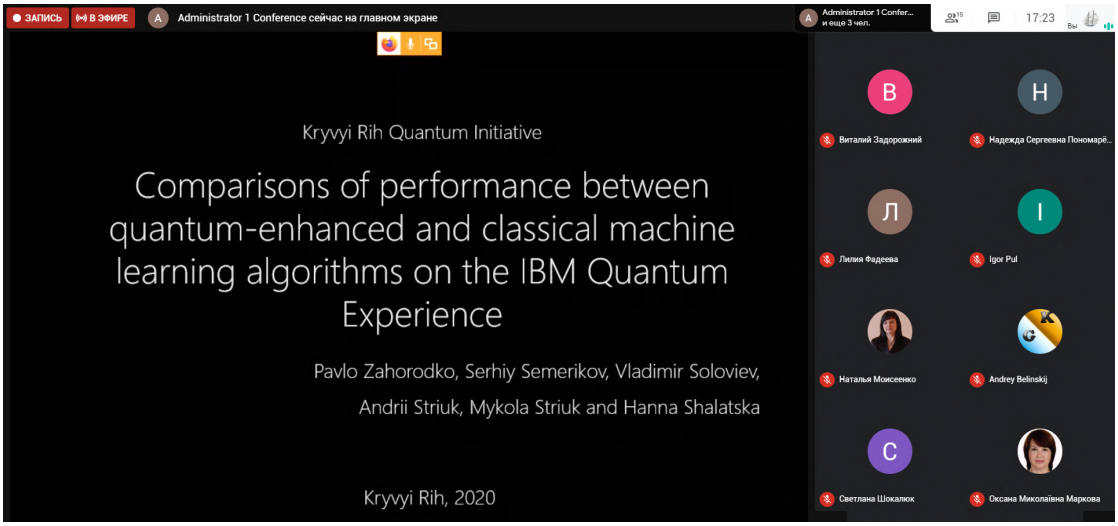


Figure 21: Serhiy Semerikov presents the talk [69].

departments by automating the process of danger detection for perimeters and decision-making for alarm. The structural model of the system, the model of the system's components interaction, and the model of identifying the subjects of emergency threats have been proposed. A method for identifying unauthorized access to the perimeter of the secure facilities, using the production model of knowledge representation, was created. It is a set of linguistic expressions (such as "IF-THEN") and the knowledge matrix. The method of ranking for objects, which are threats of unauthorized access to the perimeter for secure facilities, has been proposed. The practical value of work consists of the possibility of the use of this information technology by perimeter's security systems of various objects. Proposed models are complete and suitable for hardware and software implementation.

The article "Single-rotor integrating gyroscopic gravimeter" [58] of Andrii Tkachuk et al describes the gravity acceleration sensor (GAS) design, the technical characteristics of which provide an increase in the static transfer constant of the GAS, the ability to determine the current static transfer constant of the GAS, reducing the level of noise effects in the output signal of GAS. The acceleration vector components from the side of a moving vehicle add a noise to the gravity vector components. These investigations give an answer how to obtain of GAS's desired metrological features by the developing of new GAS based on pendulous integrating gyroscopic accelerometer. The presented material can be seen as an example of how to explore a gyro system mechanics and how to develop new gyro systems structure. The presented methods and the sequences of expressions can be used in master's and bachelor's disciplines in the field of applied mechanics, instrument development and automatic control.

In the article "Software model for studying the features of wireless connections in Flying Ad-Hoc Networks (FANETs)" [45] of Igor Puleko et al is described a software model that allows you to study the statistical characteristics of mobile networks. The motion of each object (network node) is described using a quaternion model. The software model is developed in the Python. The obtained software model for the given conditions allows to estimate the basic

Figure 22: Nadiia Lobanchykova presents the talk [28].

statistical characteristics of FANET (Flying Ad Hoc Network) and to make recommendations to their construction and application.

The article "Information system of economic and mathematical modelling of pricing in the residential sector of Ukraine" [7] of Varvara Chernenko deals with the development of a web application on forecasting the dynamics of prices in the residential sector of Ukraine. The classification of economic forecasting methods according to which they are divided into formalized, extrapolated, intuitive methods of forecasting the financial state is presented. It has been established that forecasting methods should meet the following requirements: a combination of subjective value and objective significance of estimates; clear application of estimates, which does not allow different interpretations regarding the choice of methods; create the ability to accumulate statistical information and use it for forecasting. The model of standard square collocation for the real estate market is presented. A web-based application for forecasting the dynamics of prices in the Ukrainian housing sector was developed and tested.

The use of augmented reality-enabled scenarios in cybersecurity teaching is proposed by Yuriy Skorenkyy et al in the article "Use of augmented reality-enabled prototyping of cyber-physical systems for improving cyber-security education" [54] to respond to new requirements for the rapid adoption of new technologies and profound knowledge of cybersecurity issues by

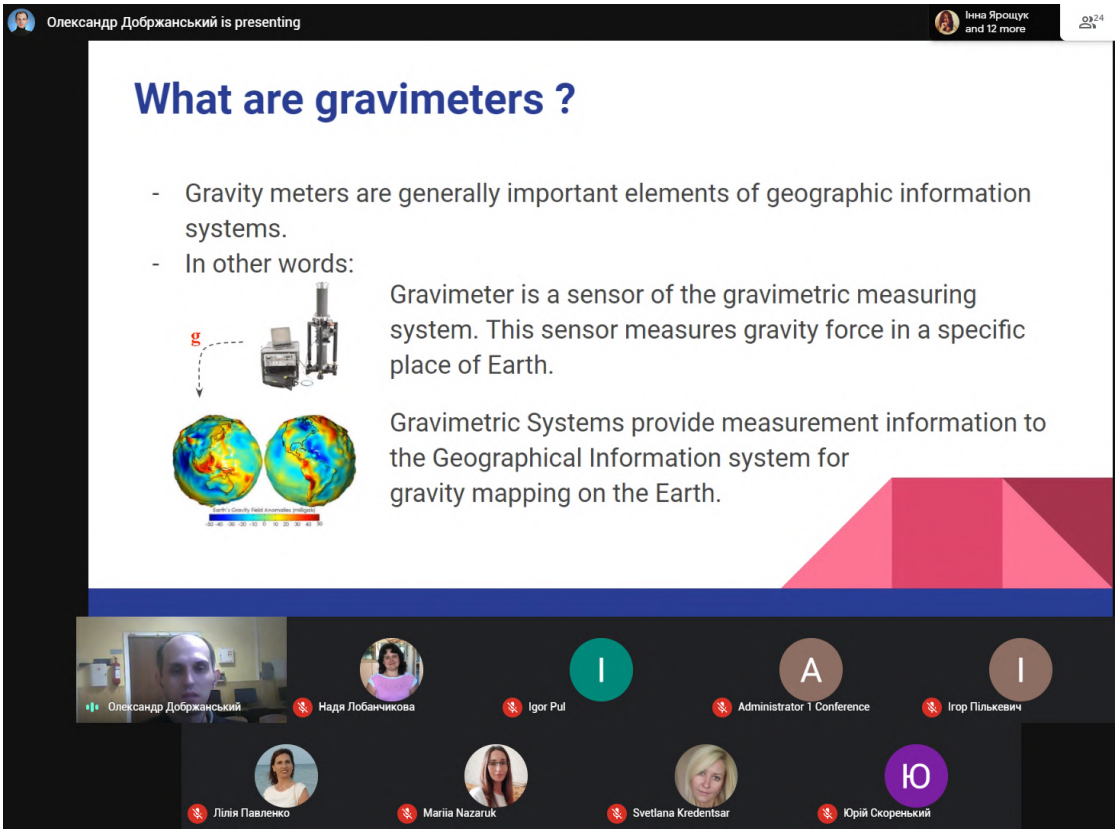


Figure 23: Olexander Dobrzhansky presents the talk [58].

professionals. Implementation of project-type activities based on real cybersecurity issues in application fields of cyber-physical systems is suggested to improve the competence forming. A use-case of agricultural cyber-physical system of systems is discussed as a viable example of augmented reality-enabled prototyping of cybersecurity risk-aware architecture. The necessary steps are analysis of general and business-specific tasks on cybersecurity, creation of a list of competencies, formalized in educational standards and curricula, development of gaming scenarios for the formation of hard and soft skills, development of the scenario management system for augmented reality interfaces. The system using augmented reality tools can be easily adapted to different cybersecurity training activities. Industrial cyber-physical systems may be vulnerable due to insecure wireless connectivity, lack of encryption, inadequate access policy. The project-based learning complex is focused on the implementation of a data acquisition, storage and processing platform for new sensor networks and instruments. Representing all the diverse information on different layers will be greatly improved by use of the developed holographic projection augmented reality tools.

Modernization of the education system and the emergence of innovative learning technologies can improve the educational process. The use of augmented reality technology improves the learning of individual students, their motivation, as well as helps in organizing teamwork, group

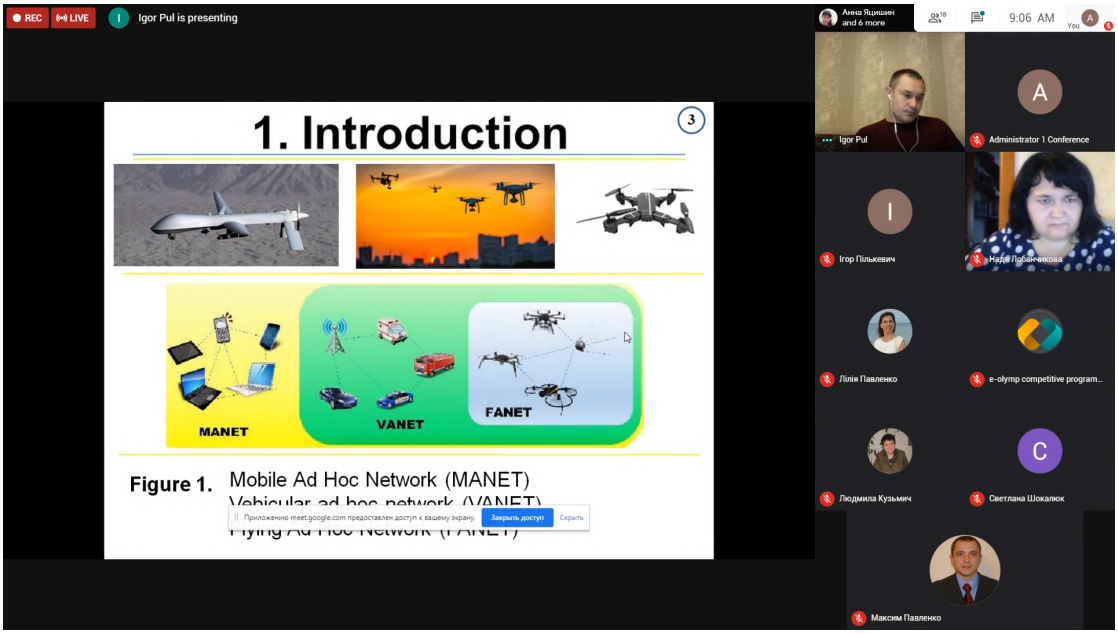


Figure 24: Igor Puleko presents the talk [45].

cooperation. As the topic of augmented reality in education is quite new and little studied for STEM education, the article "Using augmented reality technologies for STEM education organization" [37] authored by Viacheslav V. Osadchyi et al reviews publications on this topic, describes the concept of augmented reality, the analysis of augmented reality technologies is carried out, which are adapted to the teaching of natural and mathematical disciplines. The role of STEM approach with augmented reality in the educational process is determined. An example of the use of augmented reality as part of a robotics project is given.

Career guidance quests that involve solving intellectual and search problems in a game are associated with one's future career, being one of modern means of recruiting school leavers to vocational and higher educational institutions. Such specific computer tools of virtual and augmented reality as pupils' mobile Internet gadgets can enhance visual character and interactivity of quest problems. The article "Development of career guidance quests using WebAR" [52] of Dmytro S. Shepiliev et al deals with applying augmented reality in the web environment to solving these tasks. The authors propose a prototype of a career guidance quest system using WebAR technology.

Iryna S. Zinovieva et al in the article "The use of online coding platforms as additional distance tools in programming education" [71] analyzes various publications of scientists on the training of future IT specialists and the features of training programming using online simulators. The authors made a comparative description of different online platforms for teaching programming according to certain criteria, selected interesting tasks from the online platform hackerrank.com, which have already been used to teach students. Online programming simulators have significant potential in organizing an effective distance learning system in Ukrainian universities. It is important to use online simulators in the learning process as an

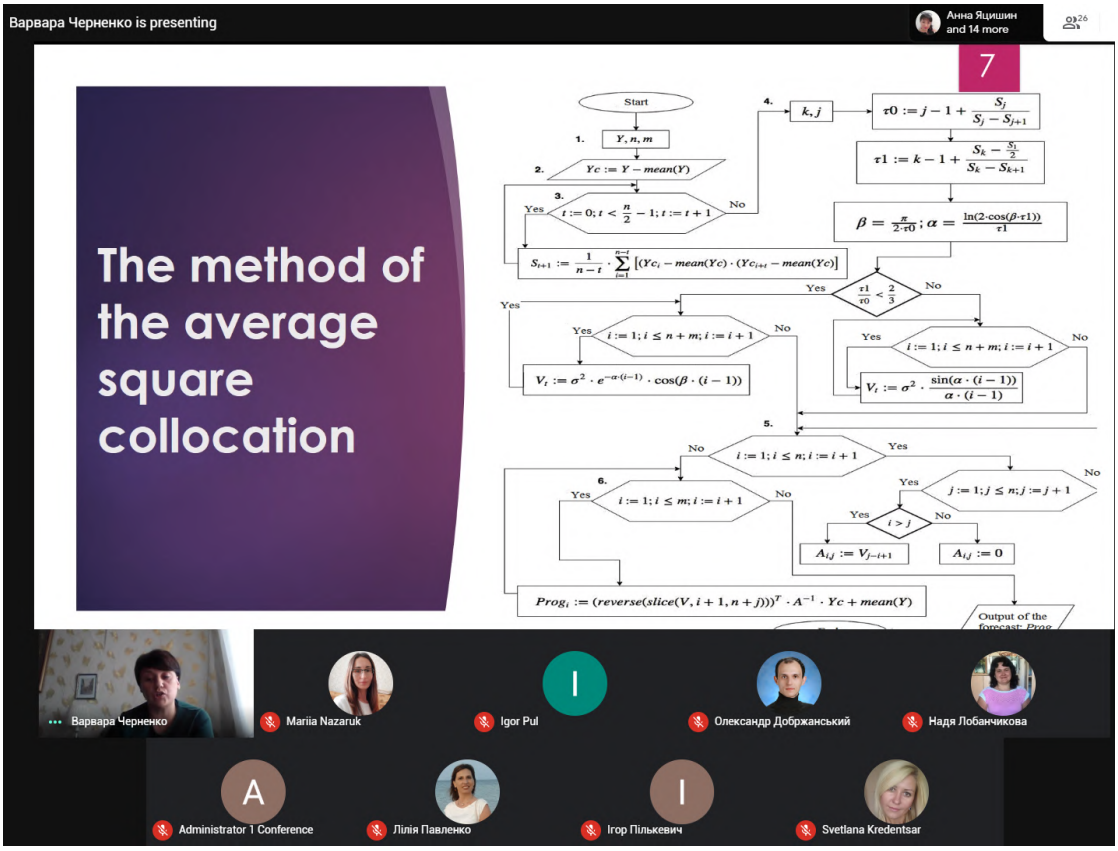


Figure 25: Varvara Chernenko presents the talk [7].

additional tool for the formation of professional competencies, which provides more intensive involvement of students in the process of writing code and practical (situational) application of existing knowledge. Gamification of the process of training future IT specialists helps to increase cognitive activity, and hence – the quality of the educational process and distance learning in particular. The authors recommend the use of online programming simulators as an additional tool for teaching computer science disciplines, taking into account their functionality, as well as the level of preparation of students and the expected learning outcomes.

In today's IT industry, it is important to develop the ability of IT students to collaboratively develop software, professional and personal skills. An effective method for developing such skills in future IT specialists is to organize different types of educational projects related to different programming technologies during the execution of mini projects, group and individual project assignments, term papers, academic training within the academic disciplines. The article "The effectiveness of GitHub cloud services for implementing a programming training project: students' point of view" [13] of Olena G. Glazunova summarizes the results of a pedagogical study involving 29 expert students who study Computer Science and Software Engineering and used cloud service for GitHub collaborative IT development projects. The research findings testify, the most effective characteristics of this service, according to experts, identified the

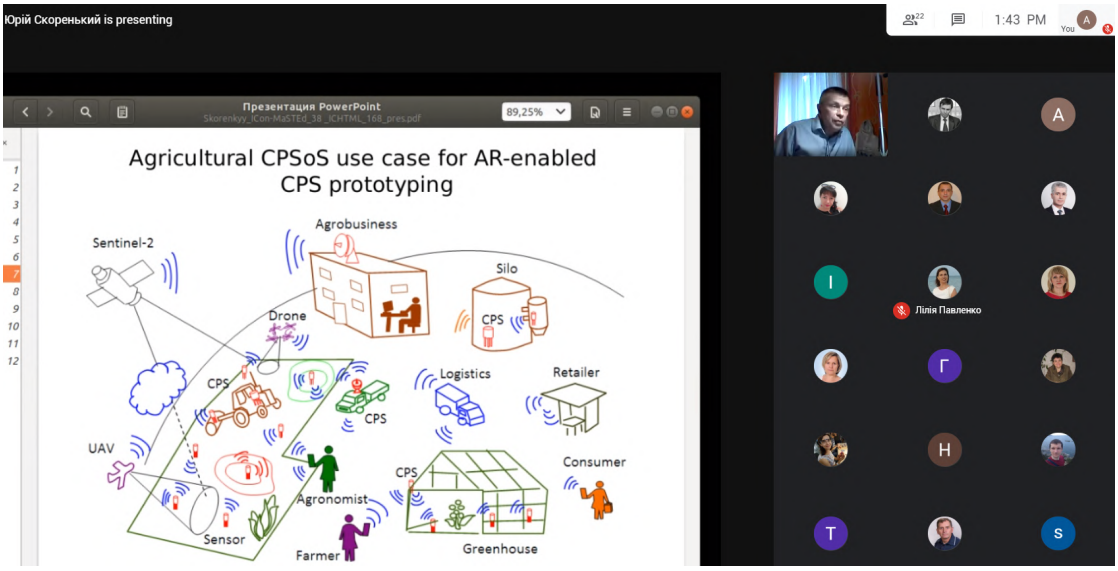


Figure 26: Yuriy Skorenkyy presents the talk [54].

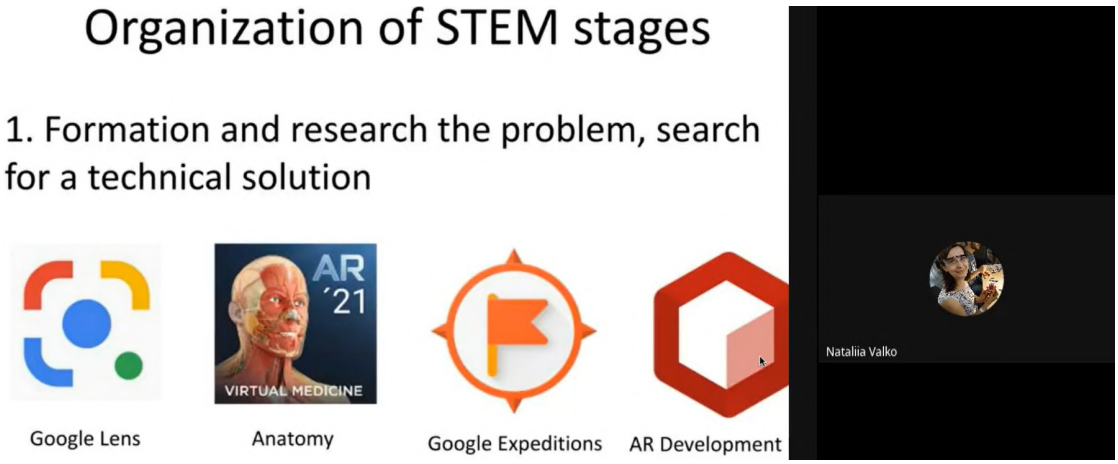


Figure 27: Nataliia Valko presents the talk [37].

possibility of collaborative development of software, the convenience of bug tracking and the convenience of the code editor. It offers examples and results of using GitHub cloud service in the process of executing educational projects by future IT specialists.

The subject of the article "Formation of communication and teamwork skills of future IT-specialists using project technology" [40] of Maksym Pavlenko et al is the formation of communication and teamwork skills of future IT-specialists, using project technology in teaching the administration of computer systems and networks. Content analysis of research has shown that communication and teamwork skills are the most requested and necessary soft skills for future IT professionals. It is offered to use project technology of training for their formation.

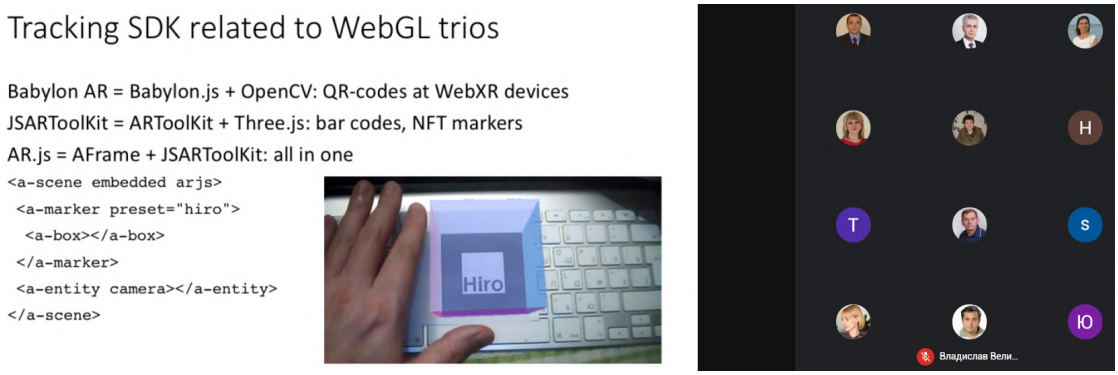


Figure 28: Serhiy Semerikov presents the talk [52].

Figure 29: Anna Iatsyshyn presents the talk [71].

This technology consists of the approaches and tools application used in real-world software development. To implement this technology, authors propose to use mind maps for design. The organization of the working process on the project is implemented in Jira Software, Asana or Trello. Communication among project participants should be implemented with the help

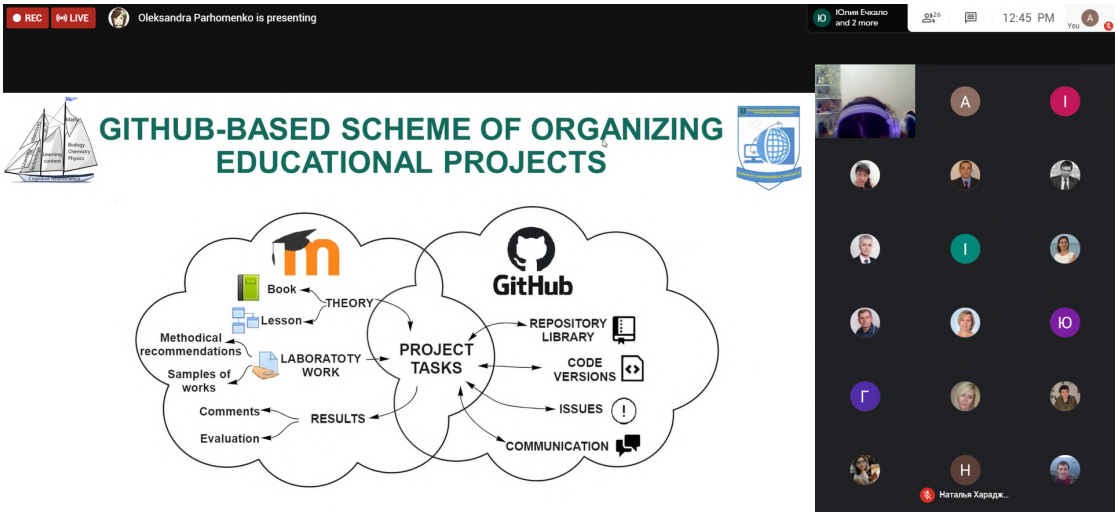


Figure 30: Oleksandra Parhomenko presents the talk [13].

of several means: video chats (Zoom, Skype, Google Meet) and written communication in corporate messengers (Slack, Zulip). Experimental verification has shown the efficiency of the proposed design technology implementation.

The article "Project-based learning in a computer modelling course" [4] reports Nadiia R. Balyk's et al experience of implementing educational projects in a computer modelling course offered to the students majoring in "Secondary Education (Computer Science)" at Ternopil Volodymyr Hnatiuk National Pedagogical University. Authors analyze approaches to teaching mathematical and computer modelling such as: integration of modelling tasks, naturalistic case study, using of role-playing games, possibilities of STEM-education, motivation and positive attitude to modelling training, etc. Then authors illustrate the implementation of the project to study the population dynamics of the grape snail Helix pomatia. The implementation of the project splits into several stages: formulation of the problem, presentation of project tasks, brainstorming, development, testing, presentation of results. The study was conducted at Ternopil Volodymyr Hnatiuk National Pedagogical University within the Norwegian-Ukrainian Project "Development of students' mathematical competencies through Digital Mathematical Modelling" (DeDiMaMo) in partnership with the University of Agder (Norway) and Borys Grinchenko Kyiv University.

Building models of various processes and their further investigation has been always in focus of different specialists' training. There are some quite well known mechanisms and tools of modelling. However, Petri nets theory has found its wide application to the real-life parallel processes modelling. Petri nets give powerful facilities for dynamic models building and enable comprehensive learning of the process peculiarities. Hence, it is important to have relevant tools which allow to apply Petri nets potential to educational practice on purpose of earning by students skills of models building and investigation. The aim of the article "Petri Nets Android application as a mobile aid for students' mastering modelling" [5] of Liudmyla Bilousova et al is to depict the functionality of the authors' mobile Android application "Petri Nets Tool-Kit", and

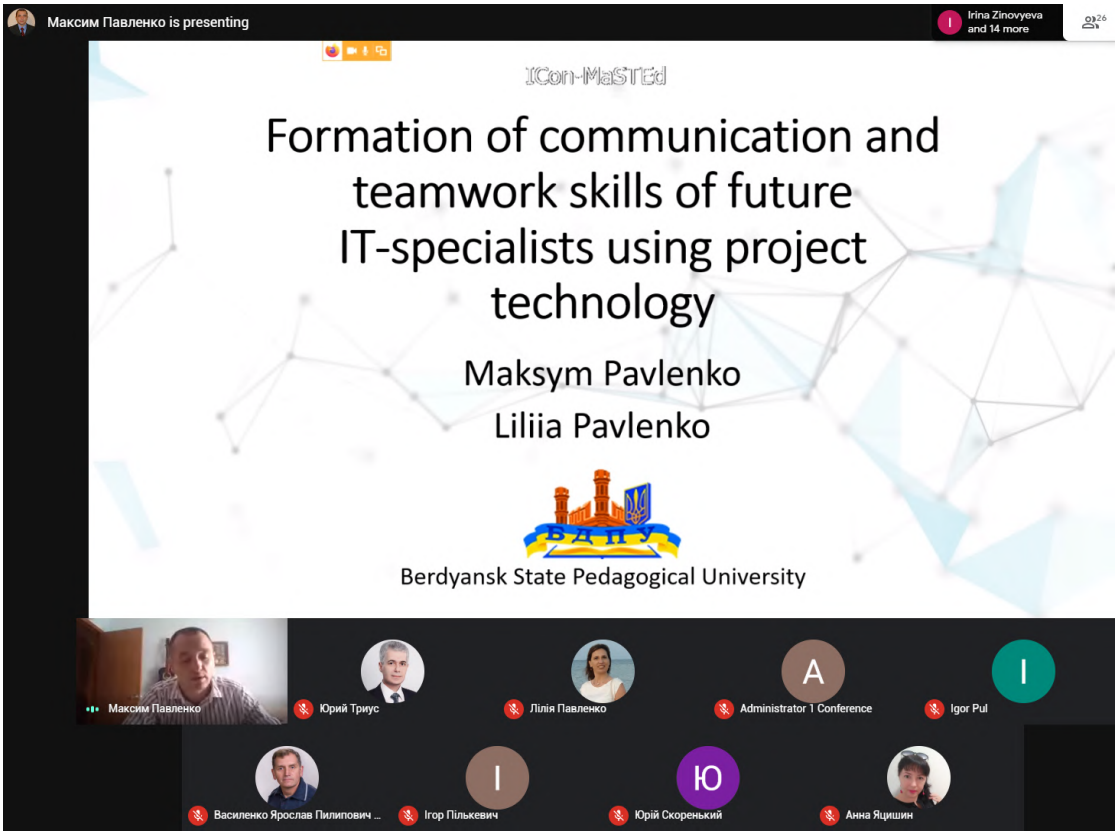


Figure 31: Maksym Pavlenko presents the talk [40].

to specify facilities and examples of its using for mastering modelling by students. Developed and represented in the paper mobile application provides students with the set of tools which enables to create, edit, save their own Petri nets as well as to change their parameters, visualize changing and play various scenarios of the modelled process. The "Petri Nets Tool-Kit" also contains relevant theoretical materials and the set of ready-made Petri nets examples, which makes the application attractive for mobile learning both in classroom activity and in students' independent work in the context of their vocational training in terms of different specialties. The proper stages of learning activity for step-by-step mastering by students the basics of modelling and simulation are disclosed. It is shown that "Petri Nets Tool-Kit" is available exactly in its portable form for Android OS, which encourages students to mobile learning and arms them with a convenient simulation tool provoking them to improve their modelling and investigative skills anywhere during the day. The prospects of the work are outlined in terms of the empirical research as for validating the impact of modelling activity in the elaborated application on the trainees' level of modelling skills.

Yuriy V. Tryus et al in the article "Approaches, models, methods and means of training of future IT-specialists with the use of elements of dual education" [62] substantiates the necessity and expediency of using the dual form of education in training specialists in the field

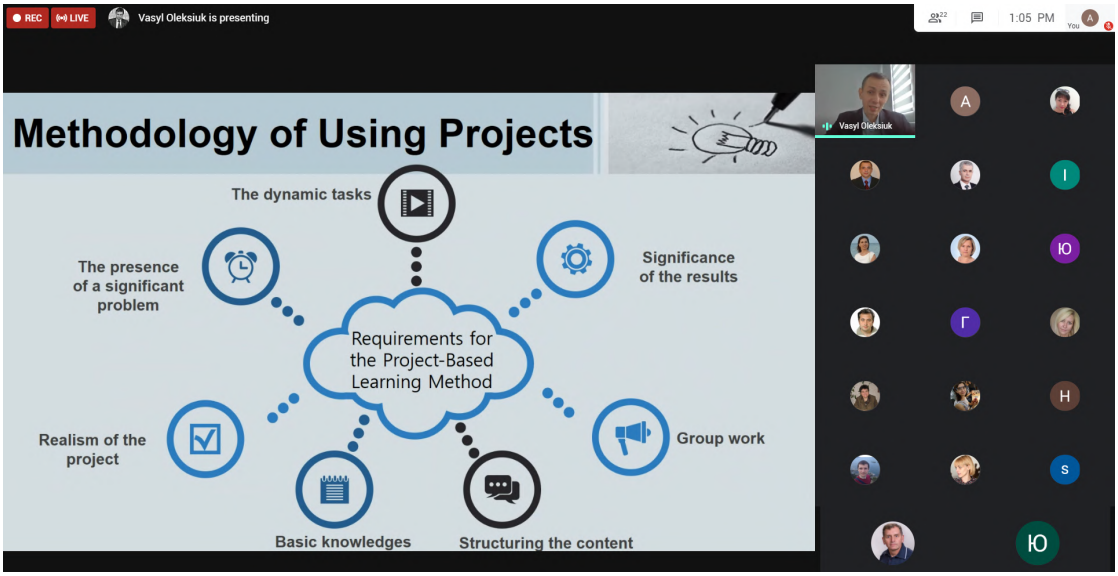


Figure 32: Vasyl Oleksiuk presents the talk [4].

Figure 33: Liudmyla Gryzun presents the talk [5].

of information technology in technical universities of Ukraine, interprets the concept of "dual education" from various sources, including UNESCO documents and the Law of Ukraine "On Education", analyzes some international experience of using dual study in higher education, in particular in Germany, considers the tasks to be solved for successful implementation of the dual form of higher education in Ukraine, and the main stages of this implementation for the period up to 2023. The paper considers some existing models of dual education that can be used in domestic universities. Also considered one of the approaches to the formation of methodological and information support for training of future specialists in information technology in the dual form of education based on distance learning support system developed on the basis of Moodle system, presented experience in implementing elements of dual education at the Faculty of

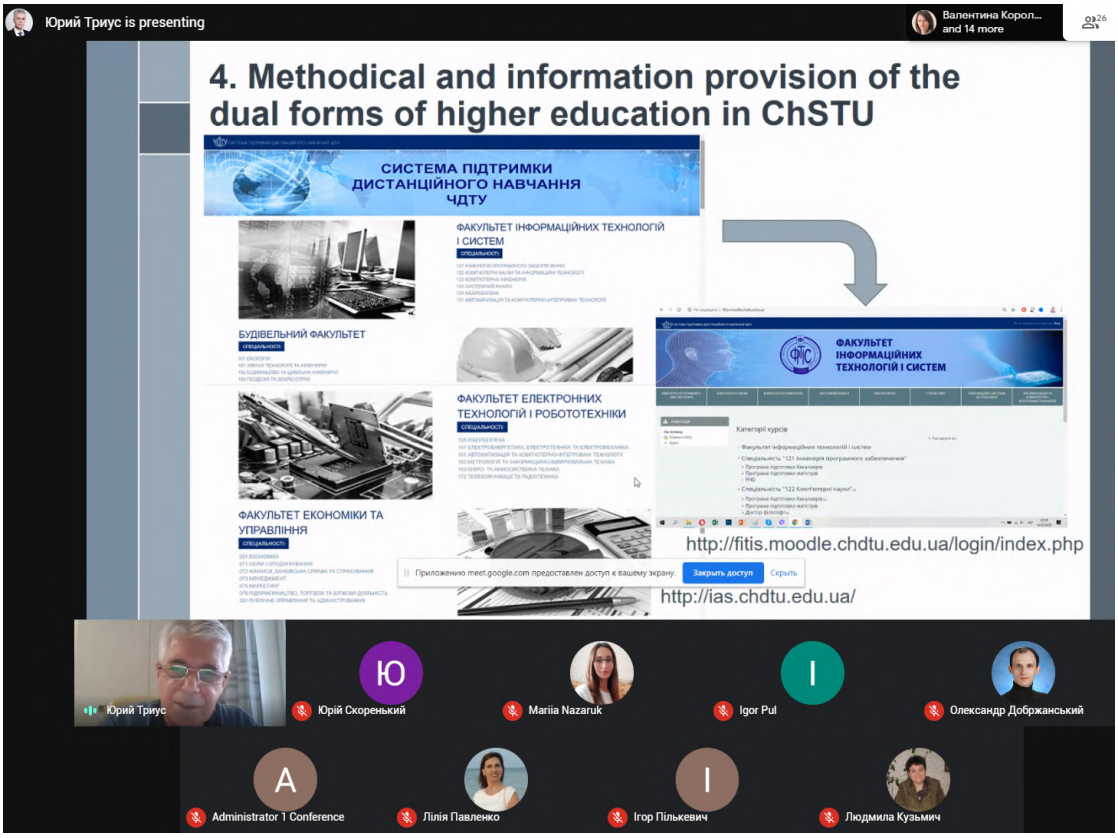


Figure 34: Yuriy Tryus presents the talk [62].

Information Technology and Systems of Cherkasy State Technological University.

The announcement of the 2020/2021 academic year as the Year of Mathematical Education in Ukraine and the adoption of the Concept for the Development of Natural and Mathematical Education (STEM-education) until 2027 were a response to the systemic crisis of mathematical training in general secondary education and training of mathematics teachers in Ukraine. The World focus on the integration of natural and mathematics, informatics and engineering education requires rethinking of the role and place of Informatics as a science, as a study discipline and as a basis of computer engineering in training future mathematics teachers. Nadiia S. Ponomareva in the article "Role and place of Informatics in the training of future teachers of mathematics" [44] emphasis that the teacher of mathematics should be capable for effective professional activity in a rapidly changing technology, educational paradigms and catastrophic educational disruptions, such as the current COVID-19 pandemic.

The article "Methodic quest: Reinventing the system" [50] of Serhiy O. Semerikov et al is an attempt to rethink the concepts of "methodic" and "methodologic / methodical system" as basic to educational technology. What should be the structure of a methodical system? What is primary – the methodical system or the methodology? How are methodical systems created and developed? How do educational technology and a methodical system relate? How does

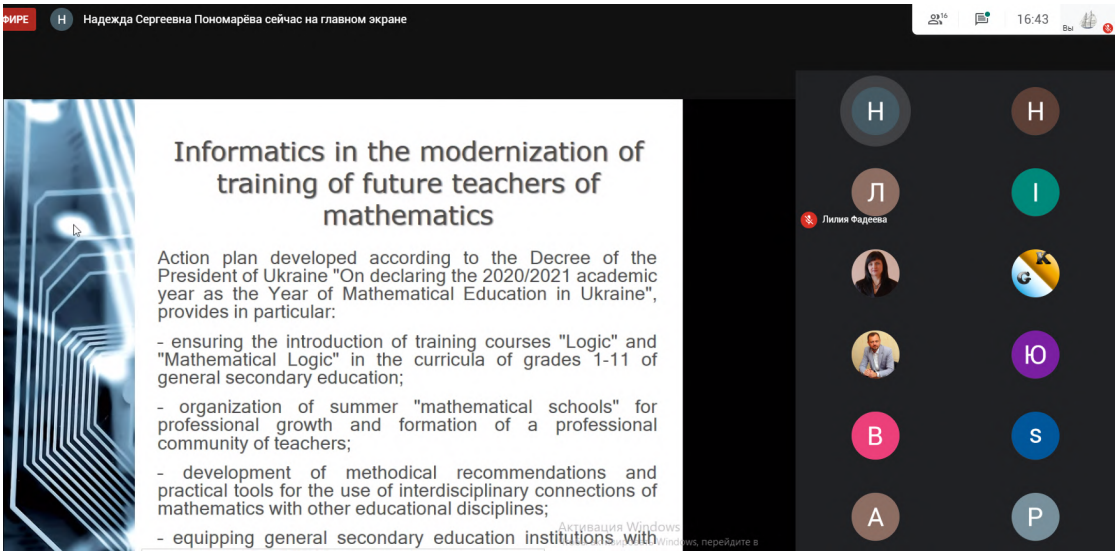


Figure 35: Nadiia Ponomareva presents the talk [44].

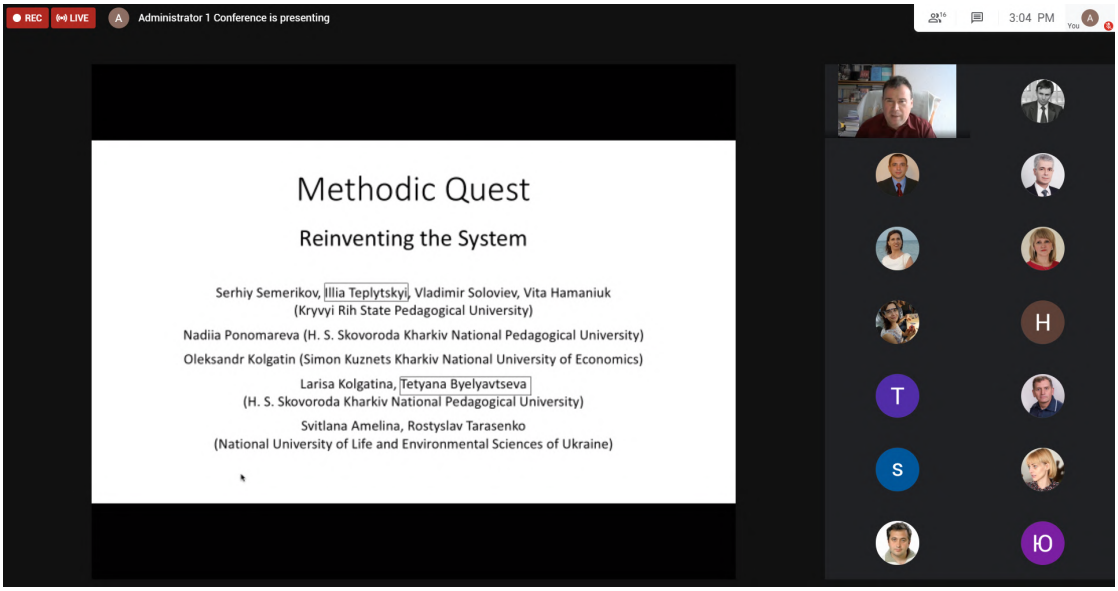


Figure 36: Serhiy Semerikov presents the talk [50].

changing the components of a system make it emergent? These and other issues are explored through the development of a new class of teaching methods – computer-based training systems.

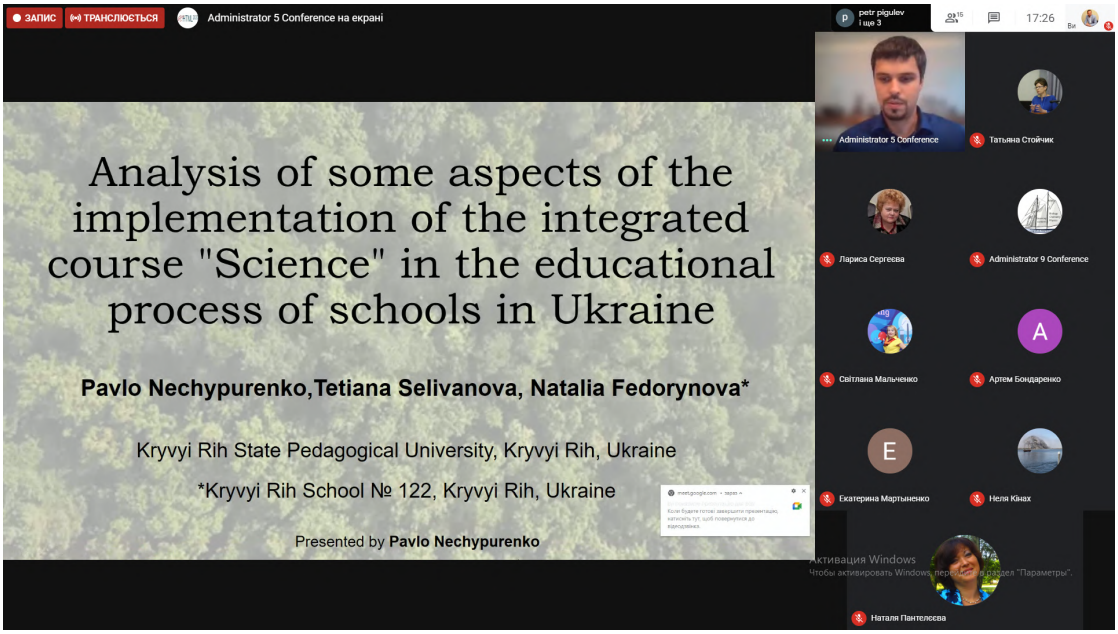


Figure 37: Pavlo Nechypurenko presents the talk [35].

3.8. Integrated Science Education

The integrated course “Science” is being introduced into school curricula in Ukraine for the first time. The article “Analysis of some aspects of the implementation of the integrated course “Science” in the educational process of schools in Ukraine” [35] of Pavlo P. Nechypurenko et al analyzes the experience of implementing an integrated course “Science” in schools of Ukraine. The advantages and disadvantages of various curriculum projects of the integrated course “Science” are discussed. The analysis of the content of the project No 2 of the curriculum of the integrated course “Science” is made. Based on the results of two years of work on the implementation of the experimental integrated course “Science” in the profile school, the analysis of the main problems that arose during the implementation of this course and discusses possible ways to solve them.

The article “Development of soft skills of teachers of Physics and Mathematics” [55] of Leila Sultanova et al considers the problem of the development of soft skills of teachers of Physics and Mathematics in higher educational institutions in the process of certification training in the system of postgraduate pedagogical education of Ukraine. The experience of foreign countries on the relevant teachers’ course training has been analyzed, the essence and significance of such soft skills as sociability, creativity, empathy for the professional development of teachers of Physics and Mathematics in higher educational institutions in the process of certification training has been characterized. The state of these skills development in teachers of Physics and Mathematics was studied, the average level of the development these skills has been stated. The possibilities of the soft skills development were determined, the four-stage process of their transition from unconscious incompetence to unconscious competence in the system of

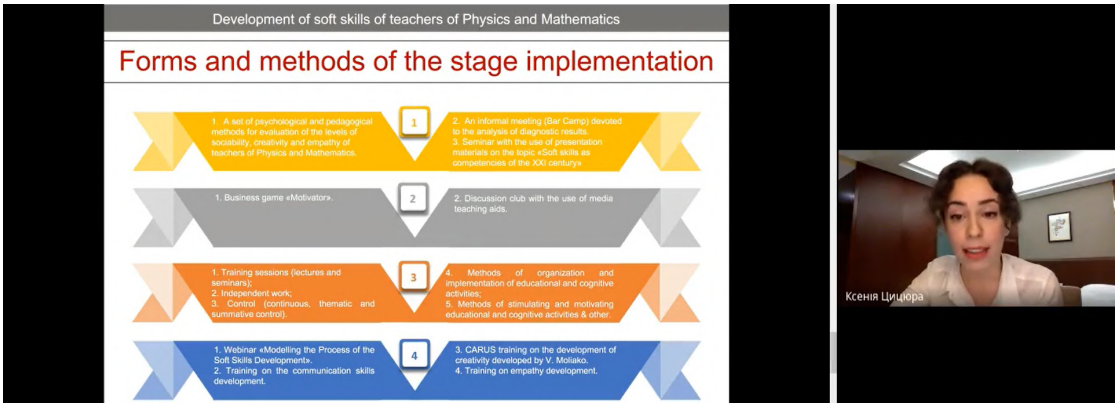


Figure 38: Kseniia Tsytsiura presents the talk [55].

postgraduate education was substantiated. The principles, forms, methods, technologies of the development of soft skills in the system of certification training of teachers of Physics and Mathematics were discussed with the emphasis placed on the role of heuristic methods and forms, creative technologies of the soft skills development.

The article "Formation of the scientist image in modern conditions of digital society transformation" [16] of Anna V. Iatsyshyn considers factors that are influencing formation of scientists image especially: availability to inform scientist or scientific organization about the registration, scientometric indices, use of global identifiers to improve accuracy in calculating indicators, publication of papers in journals with high impact factor, publications in resources that provide visibility in global information space, involvement in global communications system, level of competence. Specialists in various fields of science developed a number of practical recommendations for various techniques and tools that can be used and are helpful to create and to make, both personal image and image of the organization, institution, firm, etc. Also, main directions of using digital technologies to create the image of scientists are identified and substantiated. Scientists formulated recommendations to make their own image using digital systems based on analysis of scientific literature and personal experience: author's digital identifier ORCID, profiles in international scientometric systems, saved publications in electronic libraries, profiles in social and scientific electronic networks, etc.

4. Technology Education

Current trends in scientific research and the development of information technologies cover more and more areas of business. In these conditions, the findings of scientific-technical revolution and the innovations most important factors for the country's economic development and crucial to become a competitive state. The gradual establishment and the scope of use of artificial intelligence on the world innovative technology market increases daily. The purpose of article "The impact of artificial intelligence on employment before and during pandemic: A comparative analysis" [1] of George Abuselidze et al is to investigate its impact on business based on the experience of the world and particularly, in Georgia. Accordingly, the study discusses

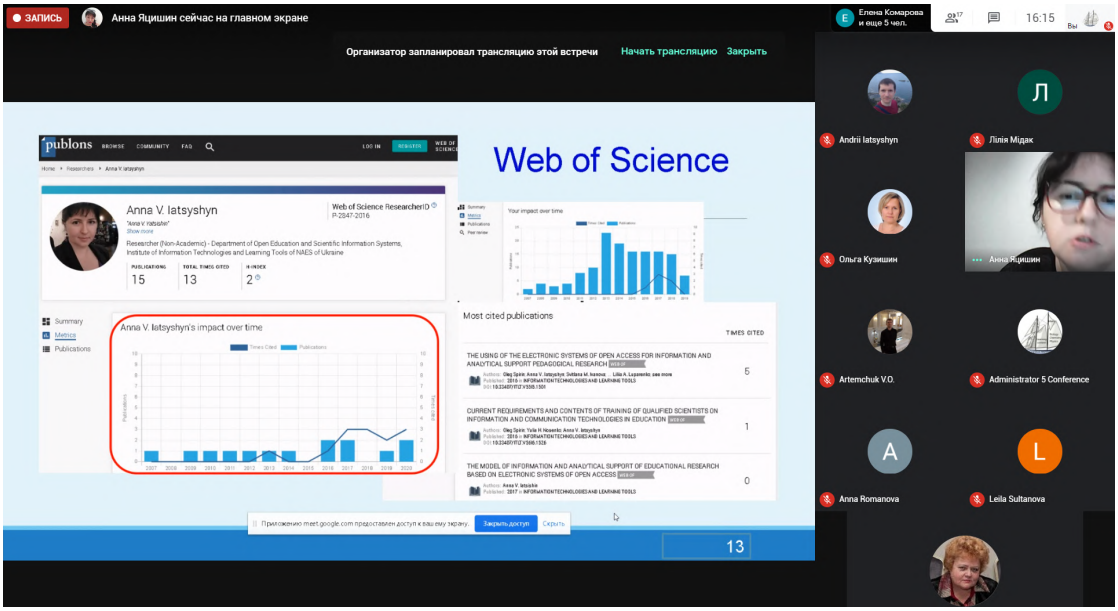


Figure 39: Anna Iatsyshyn presents the talk [16].

the stages and main trends of artificial intelligence development. Depending on the scale of implementation, Georgia's current trends in job cuts / disappearances along with automation are analysed and future prospects are assessed. The paper discusses the use and increased importance of artificial intelligence 4.0 industry in the context of pandemic restrictions in various sectors of the economy and assessed the role in the post-pandemic period. The paper uses both qualitative and quantitative research methods. Content analysis of the scientific literature, statistical indicators and practical examples of different countries and international organizations is provided. Studies of leading analytical institutions are also included to analyse the current situation and prospects for development.

The article "Modern technologies in the development of professional competence in teachers from professional (vocational) education schools" [47] of Valentyna Radkevych et al discloses the peculiarities of developing professional competence in professional training teachers. This process mostly involves using traditional pedagogical technologies. The article presents results of the ascertaining experiment and indicates the need for continuing professional development of teachers based on innovative principles. It also suggests using up-to-date pedagogical technologies of distance and project-based learning and production technologies to develop professional competence in actors in the educational process (teachers and students). This refers to the implementation of a competence-based approach in the professional education system. It is reflected in the development of professional competence based on some steps. They include expanding informational and educational space for actors in the educational process and individualizing learning using modern information resources (distance technologies); ensuring the interaction between actors in the educational process, as well as the joint realization of searching, cognitive and research activities (project-based technologies); organizing the

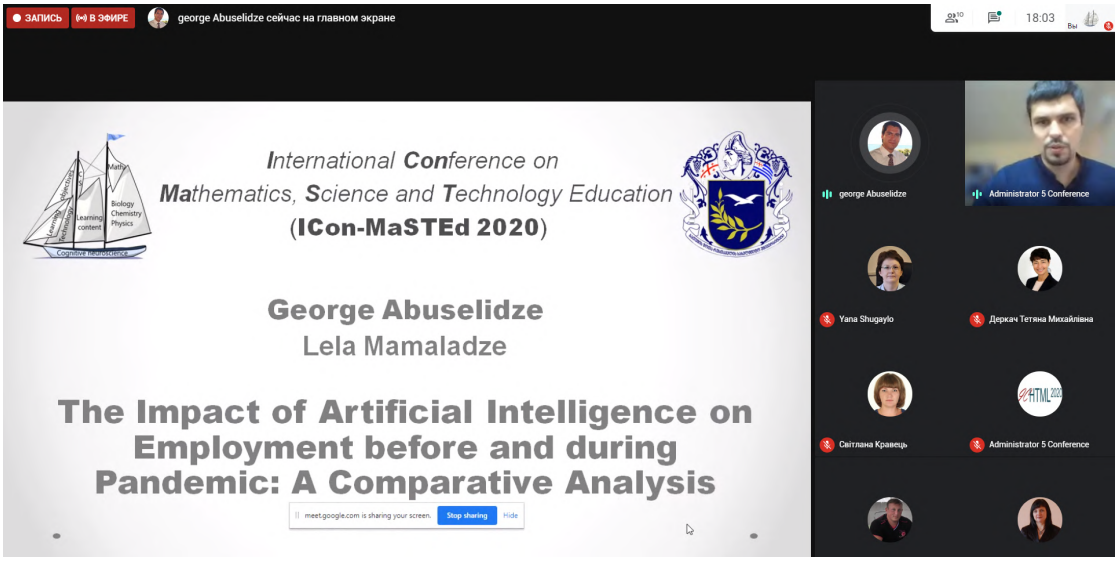


Figure 40: George Abuselidze presents the talk [1].

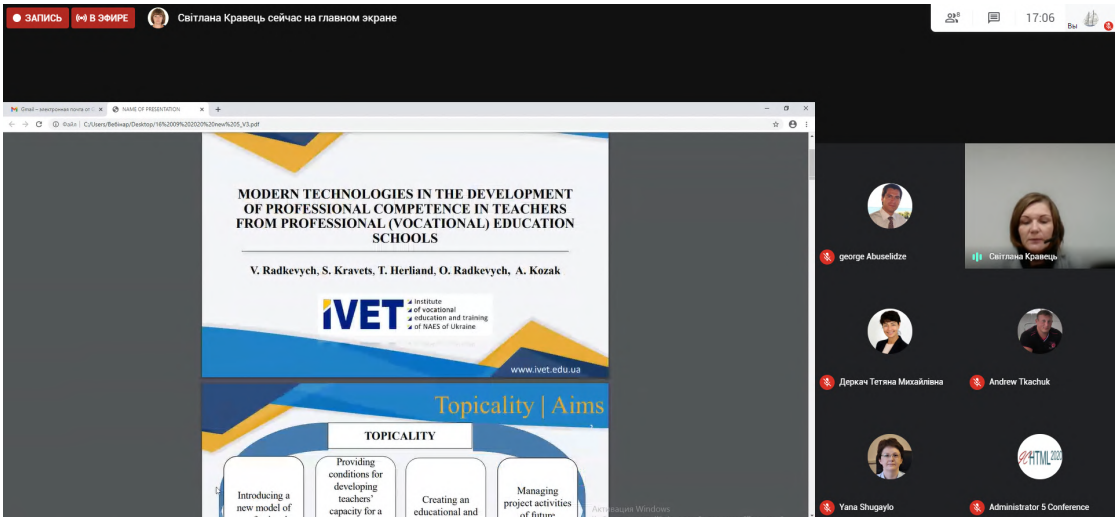


Figure 41: Svitlana Kravets presents the talk [47].

educational process under the social partnership, taking into account the timely response of the professional education system to the emergence of innovations in production and the service sector (production technologies).

The experience of application of methods of problem-based and project-based learning in the training of future engineers for the light industry is presented in the article "Project-based learning for undergraduate engineering students minoring in textile technology and design" [53] by Yana V. Shuhailo et al. Methodological issues are considered, as well as practical recommendations are formulated, for the application of these methods in teaching professionally-

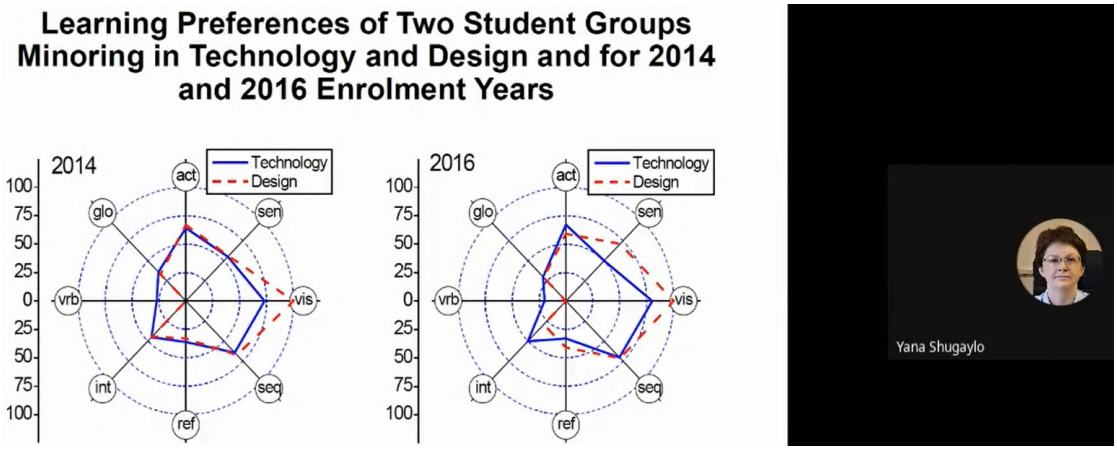


Figure 42: Yana Shuhailo presents the talk [53].

oriented disciplines. Examples of project design and their content are given for two specialised disciplines. They are aimed at the development of students' ability to creative thinking and problem-solving when working both independently and in a team. The method effectiveness is illustrated by the formation of students' new competencies, and an increase in their motivation and experience in teamwork. The preferred styles of students' learning were studied for student groups of four different enrolment years. The learning preferences are relatively stable over the four study years. On average, engineering students minoring in textile engineering and design demonstrate a tendency to active, visual, sensing and sequential learning styles. Project-based teaching methods are not universally suitable for students with different learning preferences. Moreover, the success in projecting under the studied conditions correlates with the existing learning preferences of student teams. Student teams succeed in the implementation of projects if they have a balance in the ref-act dimension with a limited preference of the active style. In other words, excessive activity and lack of reflective reflection hindered the successful completion of projects. In the sen-int dimension, the presence of a pronounced sensitive style is also favourable for design and implementation of class projects. Successes in projecting are mostly insensitive to changes in the vis-vrb and seq-glo dimensions. The introduction of the problem and project-based learning methods is useful for engineering students. They acquire new competencies, gain real experience of teamwork, and increase motivation to learn and develop creativity.

The article "Students training for numerical control machines programming by means of computer-aided manufacturing tools" [14] of Viacheslav Holovnia et al describes the analysis of computer-aided manufacturing systems introduction for the control program machines preparation with the numerical control into the technical students' educational process. The main stages of teaching students the basics of control machines programming by means of addressing to manual programming and CAM-systems are considered. Recommendations for the control programs testing implementation without a numerical control machine, by means of numerical control machine simulators introduction into the educational process are given.

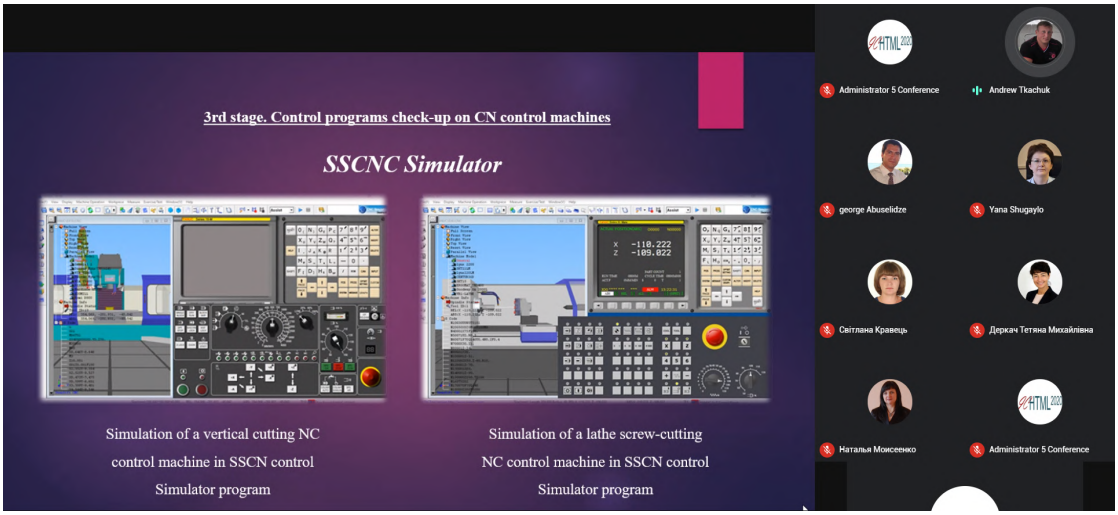


Figure 43: Andrii Tkachuk presents the talk [14].

4.1. Educational Technology

The article "Multimodality of the transmission of philological knowledge during classroom activities using ICT" [68] of Natalya Yaremenko et al deals with multimodal learning strategies aimed at transferring philological knowledge using ICT. Using ICT makes it possible to apply visual association, to create spatial images that express important object properties, and dynamic visualization (animation) allows to define it clearly. An important condition for the integration of these technologies in philological sphere of education is the formation of information and communication competence for higher education institution teachers as well as for philology students. The authors note that using of ICT in the sphere is associated with a number of methodological difficulties, since it requires a philologist-educator to possess a wide range of competences that go beyond the humanitarian knowledge. The optimum software that allows creating audio-visual construct (interactive poster, computer animation, tag cloud, cognitive map, etc.) is offered for studying process. The results of sociological researches of philological specialties of pedagogical universities students' and different educational units teachers' readiness for implementation of multimodal strategies of teaching using ICT are presented. The authors proved the need to introduce an integrative course "Use of ICT in the study of philological disciplines". The analysis determined that outlined multimodal strategies are important educational tools for creation of the modern information educational environment.

The article "Using interactive scribe-presentations when teaching Ukrainian" [2] of Oksana Babakina et al is devoted to the urgent topic of using new modern information technologies in lessons in general and in the Ukrainian language lessons in particular. The authors of the article prove that multimedia presentations have become one of the most popular ways of visual accompaniment in the presentation of theoretical material. In the article the authors analyze the results of the external independent evaluation (EIE) of the Ukrainian language and literature from 2015 to 2018 as well as online testing results of students from the Australian, Canadian and Polish diasporas on the level of Ukrainian language proficiency. According to this analysis

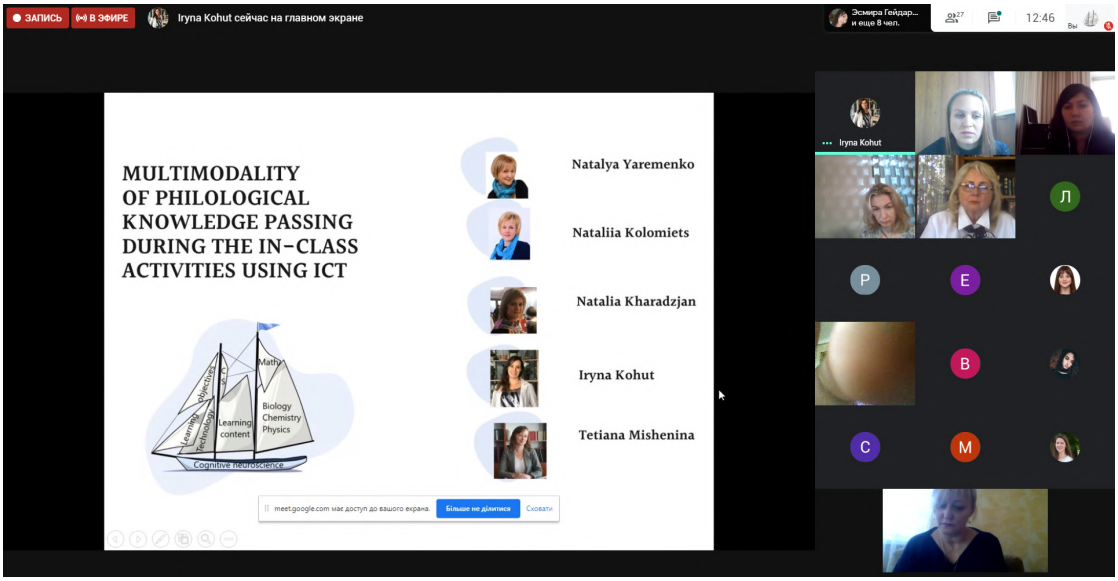


Figure 44: Iryna Kohut presents the talk [68].

it is determined that the level of knowledge on this subject deteriorates every year. Relying on these statistics, scientists have proved the need to improve the quality of knowledge using multimedia presentations, which provide more effective perception of educational information by helping students to visualize it. The researchers have proved the effectiveness of using the PowToon service in teaching philological disciplines in the educational process. This article is a practical step-by-step assistant for teachers and academic staff in creating a scribe-presentation. The authors have analyzed in detail the peculiarities of the methodological approaches that are worth using for effective implementation of PowToon and PowerPoint in the educational process (competence (the ability to actualize available knowledge, skills, experience to solve the difficult tasks in professional activities), systemic (forms the relationship in the study of philology disciplines, systematizes and structures complex information, using them in teaching), informative (use of information and communication technologies in the study of philology disciplines). The effectiveness of using online (PowToon) and offline (PowerPoint) services to create multimedia presentations has been compared. The key stages of the scribe and the advantages of the scribe-presentation have been considered. Taking into account that information is absorbed and reproduced better when it is visualized, that is, through visual perception, therefore, it is proved that use of PowToon service is accompanied by positive emotions and high indicators in the students' learning outcomes. It is confirmed by a reflection questionnaire at the end of the lesson. The questionnaire consists of five questions and is evaluated on a 10-point scale. After analyzing the responses to the questionnaire the authors have come to the conclusion that the use of the script-presentations has a better influence on the perception of new visual information; increases the motivation for learning, interest in a subject that prompts subjects of the educational process to develop their creative projects and use their knowledge in everyday life; saves teachers' time while preparing for a lesson; inspires

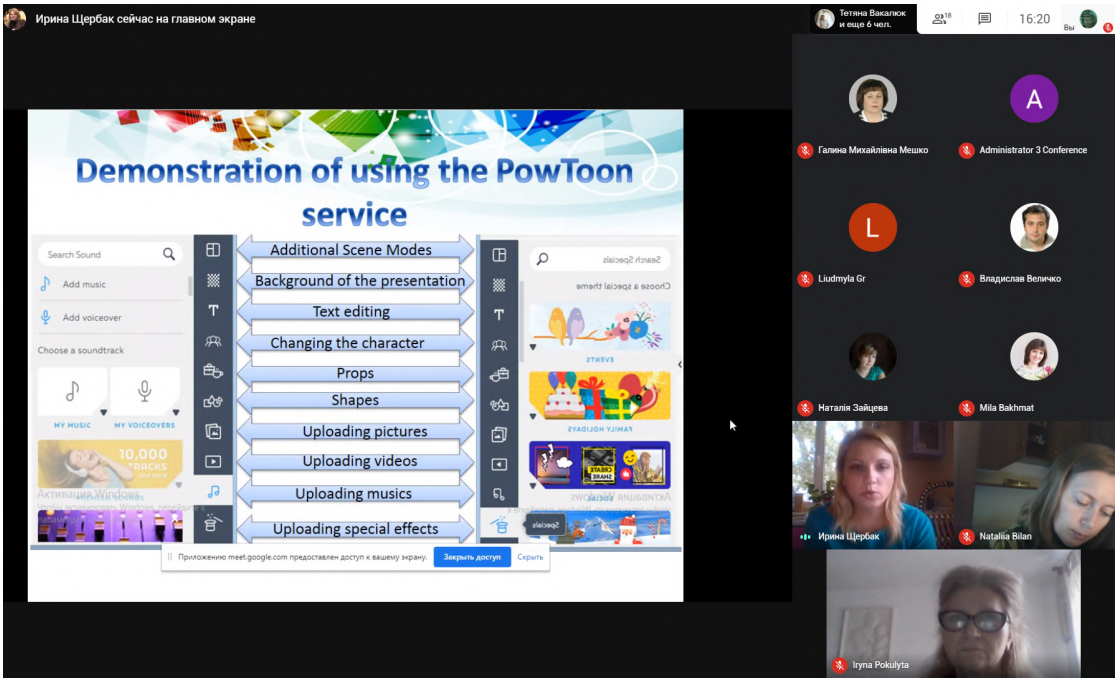


Figure 45: Irina Shcherbak presents the talk [2].

teachers and academic staff to give unusual lessons and provide new interesting teaching ideas, as well as create integrated lessons.

The article "Constructing personal learning environments through ICT-mediated foreign language instruction" [22] of Larysa Kupchyk et al deals with the concept of student-centred Personal Learning Environment (PLE) in the context of higher education, which is used as a means of transforming foreign language learning and teaching practices. It aims to reveal the opportunities for creating PLEs through incorporating ICT in the process of foreign language education. The study focuses on the roles of teachers and students of non-language University majors in designing efficient learning environments highly adapted to changing objectives and student personal needs. The authors reveal the unlimited potential of ICT in constructing PLEs for both in-class activities and informal learning, providing a scope of practical student activities, which imply their active engagement both in and outside the classroom, as well as constructing a flexible, personalized, time and space independent learning environment. Students, teachers, ICT, which is a set of resources based on the use of educational technology tools thoroughly selected and organised in order to manage the content, applying relevant methods of teaching and learning strategies, as well as a learning process, are all regarded as constituents of PLEs aimed at mastering four foreign language skills when taking the course "Foreign Language for Specific Purposes": reading, listening, writing and speaking within personal, academic, and field-related contexts.

Iryna Shavkun and other authors of article "Exploring the experience of integrated teaching of the management core courses in a foreign language based on ICT use" [51] search the solution

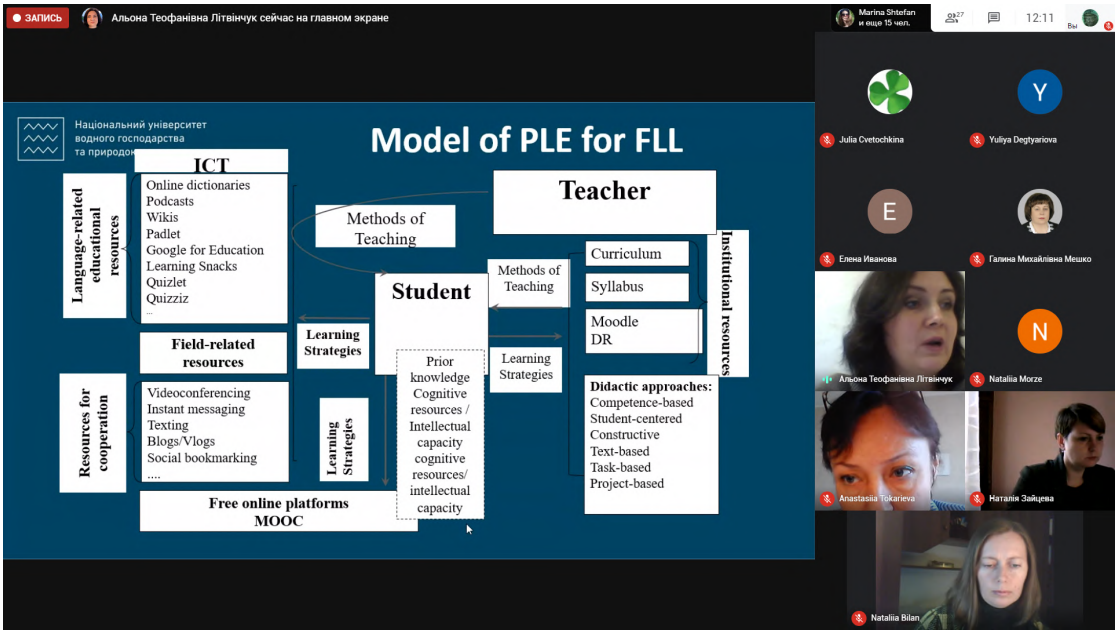


Figure 46: Alona Litvinchuk presents the talk [22].

to the practical tasks of the contemporary education characterized by the increasing role of individual work in implementation of ICT at the lessons and in the independent work, the development of new principles, strategies and methods of teaching within the framework of integrated learning. These novelties can be applied when teaching professional subjects and foreign language and will provide the effective learning process aimed at acquiring the necessary competencies. The research discusses the process of integrated teaching using ICT and defines the organizational and educational conditions of integrated building of professional and foreign language competences using ICT. The authors generalize the experience of implementation of contemporary innovative technologies in integrated teaching of the professional subjects and foreign languages and analyze the ways of the effective ICT use in the integrated teaching of the management core courses in a foreign language. The content analysis performed in the research provides the basis for classification of both positive and negative aspects accompanying ICT use in education.

The article "The formation of educational environment in foreign language training of energy engineering students by means of project technology" [15] of Roman M. Horbatiuk et al deals with the results of experimental work concerning the educational environment formation that is focused on the foreign language training of future energy engineering students. Project learning technology is chosen as the means of formation. A model of the educational environment for the metalanguage studying of the speciality of energy engineering students has been developed. In the educational process, educational projects with elements of professional orientation were implemented in accordance with the subject of the discipline "Business Foreign Language", and the language abilities and internal potential of students were taken into account. The preparedness of energy engineering students to integrate knowledge of professionally oriented

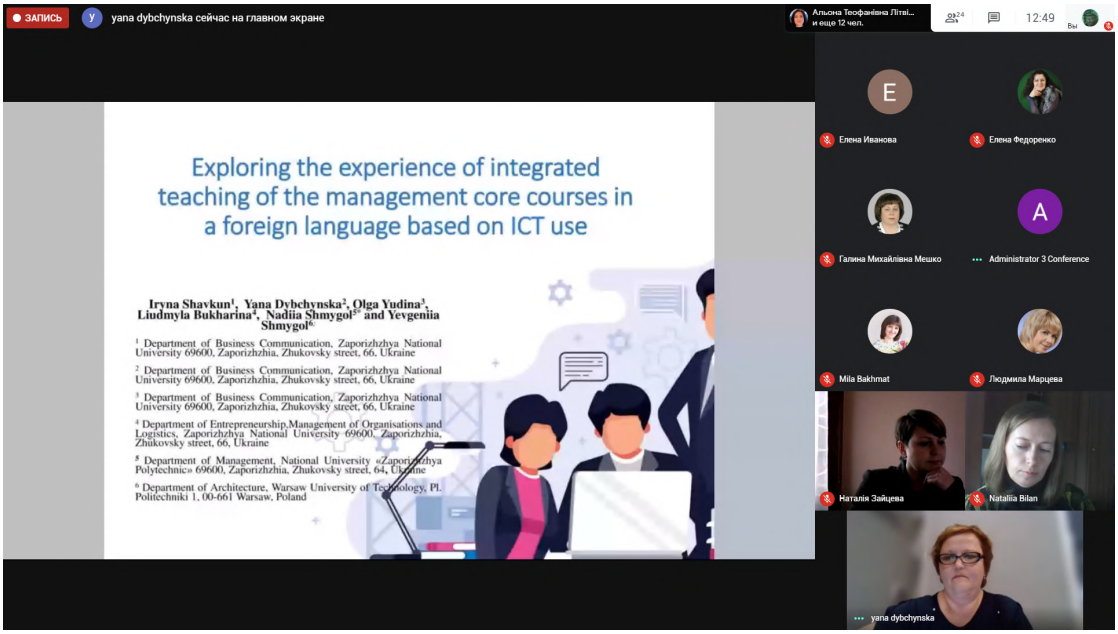


Figure 47: Yana Dybchynska presents the talk [51].

disciplines into a foreign language environment for solving project tasks of communicative nature has been determined. According to the results of the pedagogical experiment, it was established that in the process of project activity the mastering level of lexical and speech competences as the components of foreign language competence of students has significantly increased. The developed educational environment is characterized by differentiation, individuality, independence, autonomy, informativeness, creativity, which allows to create the necessary conditions for successful learning of foreign language, development of creative thinking, communicative skills of energy engineering students, formation of foreign, communicative, professional, informational, project, research competencies.

The article "Students' computer-based workshops in mandatory classes of English for students majoring in psychology and linguistics: A comparative experimental study" [67] of Nataliia P. Volkova et al addresses the issue of developing and using students' workshops in English. In the article, such workshops are defined as the fullest form of peer-teaching in which one or several students (workshop organizers) guide their group-mates in performing extra-linguistic learning activities conducted in the target language. The research describes workshops as one of the most efficient ways of involuntary (subconscious) target language acquisition achieved through extra-linguistic practical (experiential) activities performed by way of communication in the language to be learned. The article reports the results of a comparative experimental study in which students of a non-linguistic major (Psychology) and students majoring in English as a foreign language on which their career option (Applied Linguistics) is based were practicing workshops in English in their mandatory classes on that language. The results of the experimental study clearly demonstrate and prove that workshop practice was quite successful in both cases not only in what concerns the involuntary (subconscious) development of learners'

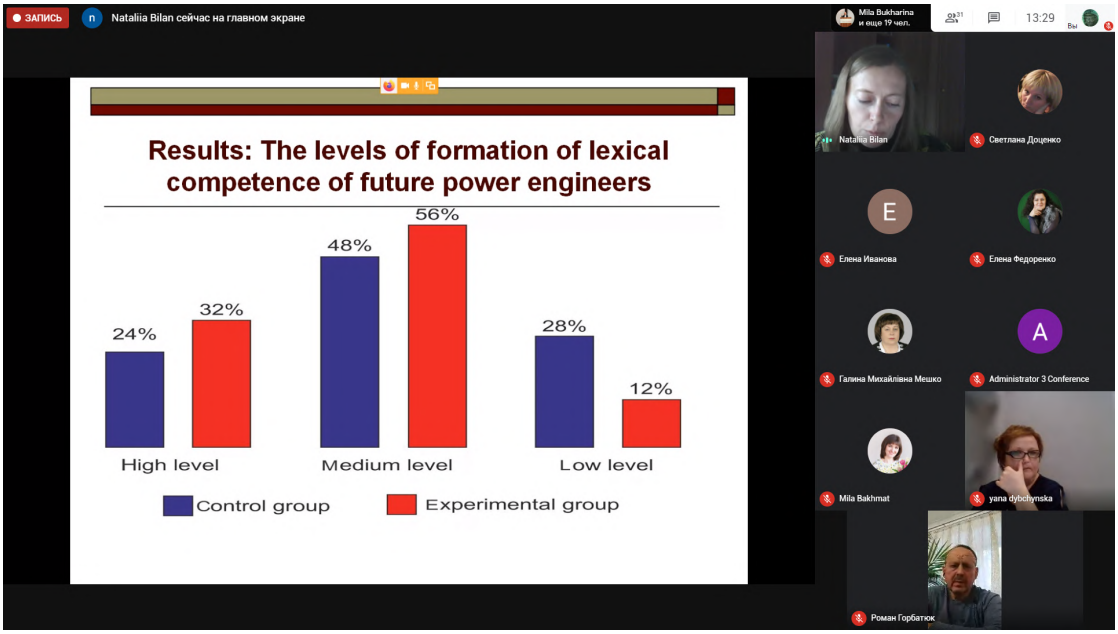


Figure 48: Nataliia Bilan presents the talk [15].

target language communication skills. No less evident was the development of some of the students' psychological qualities (emotional intelligence) important for their further studies and professional careers.

The article "Application of ICT tools in teaching American English for computer science students in the context of global challenges" [56] of Svitlana V. Symonenko et al deals with the urgent issue of American English learning for IT-professionals under challenging conditions of the changeable economic situation in the world. Some statistical data on global education trends and its analysis are given to confirm the topicality of the problem. State-of-the-art trends in foreign language teaching in the context of global challenges are presented. It is stated that informal education environments, distant learning platforms, virtual reality environments, artificial intelligence applications and collaboration platforms are to be mastered by Ukrainian undergraduates. Certain peculiarities of choosing and studying British and American English course by students of IT-specialities at three Ukrainian universities are given: the course choice procedure, the reasons for course preference, and the syllabus content. The best technologies, applications and tools for classroom activities and independent learning are substantiated, specific examples of their application for British and American English course learning are presented. The transferability of the skills inculcated in the course participants through implementation of the certain tools is founded.

In the present context of COVID-19 lockdown, when pedagogies had to turn from in-person to virtual instructions, computer-mediated communication, including distance learning and e-learning, has come to the foreground to maintain the barrier-free educational environment. The three-dimensional model of the e-learning, which includes the principles of knowledge acquisition at 'any place', at 'any time', at 'any speed' is incomplete without the organisational

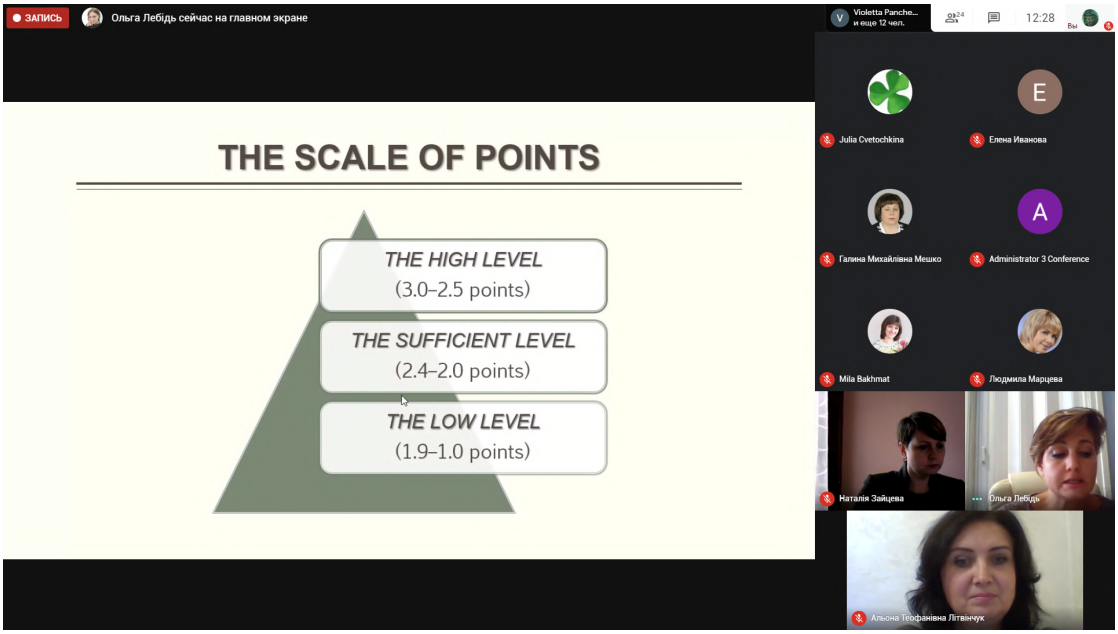


Figure 49: Olha Lebid presents the talk [67].

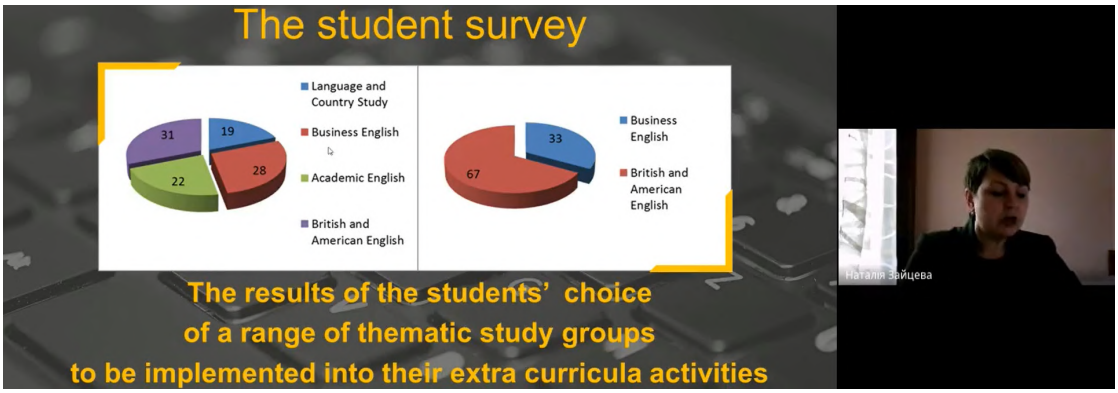


Figure 50: Nataliia Zaitseva presents the talk [56].

culture component. To analyse what e-learning modes are used in a particular institution, to measure the efficiency of distance courses and, further, to suggest the most effective model and the ways of e-learning integration into a particular HEI according to its needs' analysis was set up as the aim of the article "E-learning in the present-day context: from the experience of foreign languages department, PSACEA" [59] authored by Anastasiia Tokarieva et al. To achieve this aim, a complex of qualitative and quantitative research methods was applied. Therefore, in the first phase of our inquiry, a literature review was conducted in which authors analysed the definitions of 'distance learning' and 'e-learning', traced the history of the question, and collected the main characteristics, quality parameters, and models of the distance and e-learning.

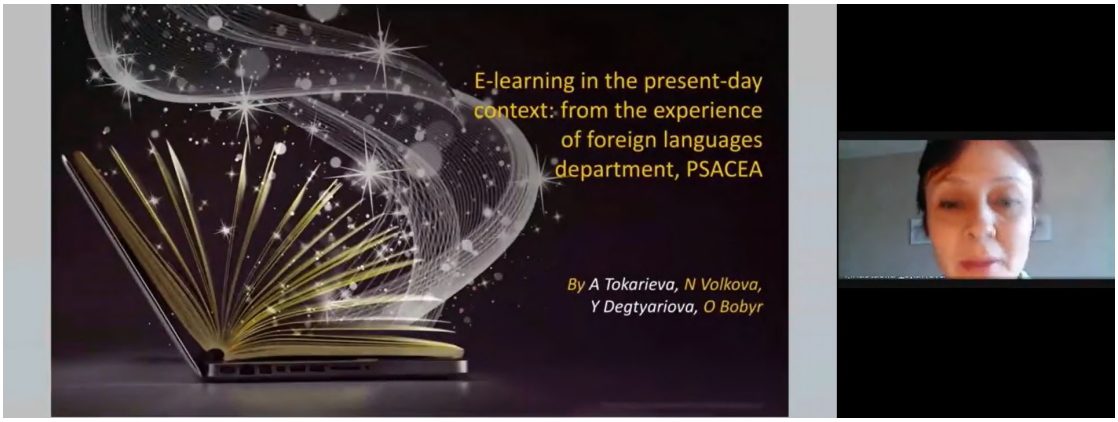


Figure 51: Anastasiia Tokarieva presents the talk [59].

On the later phases, was introduced the form 'Analysis of the Distance Learning Tools Preferences', disseminated among the teachers; a questionnaire 'Distance Learning Mode of Work Satisfaction/Dissatisfaction', disseminated among students, and 'The Instructional Materials Motivation (IMMS)' online survey by J. M. Keller to measure the efficiency of the distance learning courses design, also disseminated among students. The empirical data was collected at Prydniprovska State Academy of Civil Engineering and Architecture (PSACEA), the Department of Foreign Languages during March-May, 2020. Thirty instructors from the Department of Foreign Languages and twenty-three students from the first-third years of Foreign Languages studies who regularly participated in online lessons took part in the experiment. Based on the theoretical and empirical data, authors got a picture of the e-learning state (in its first approximation) in our HEI, proved that the forms and questionnaires used in the experiment may serve as informative tools of quantitative measurement, drafted the format for further improvement of the e-learning in our organisation.

The winter and spring of 2020 was a challenging time worldwide. The COVID-19 pandemic seriously affected all spheres of life: from an industrial decline to educational transformations. In order to continue the 2019/2020 academic year, higher educational institutions had to adjust in-class learning to online. The article "Assessing online education during the COVID-19 pandemic: a survey of lecturers in Ukraine" [3] of Liudmyla Bakhmat et al aims at assessing the satisfaction and acceptance rate of Ukrainian lecturers with online education, as well as indicating problems and benefits they had singled out. The technical side of online education was also of interest. Therefore, the study employed an online survey to investigate technical support and tools used during the quarantine, advantages and disadvantages of online teaching, the level of satisfaction and acceptance. The findings from the study suggest that lecturers got different levels of technical support and used an assortment of tools to organise online education. The study revealed that the main advantage was time efficiency, while internet connection and technical problems were the most commonplace problems. Other findings of the survey are that lecturers were partially satisfied with online education but showed low acceptance of online education.

The article "Features of distance learning of cloud technologies for the organization educa-

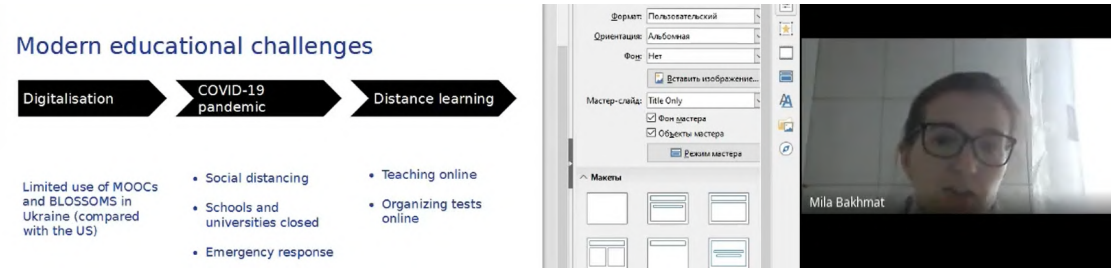


Figure 52: Liudmyla Bakhmat presents the talk [3].

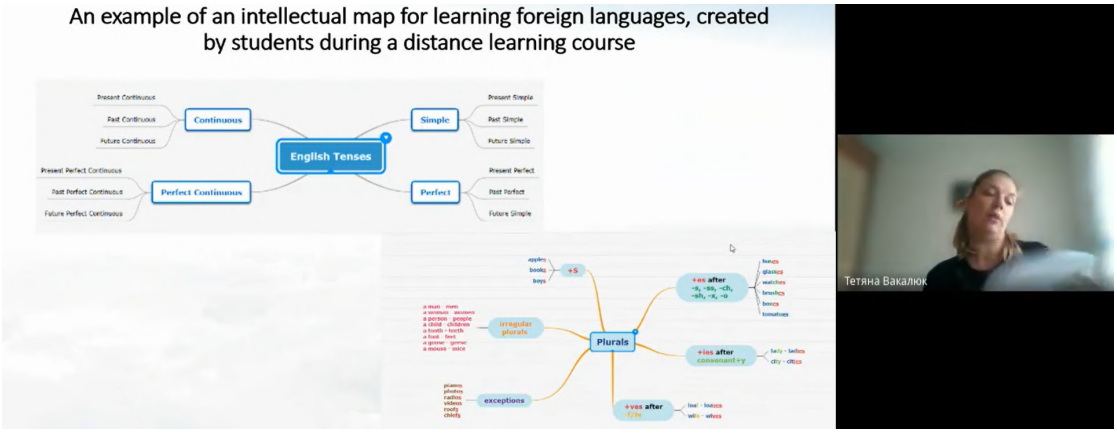
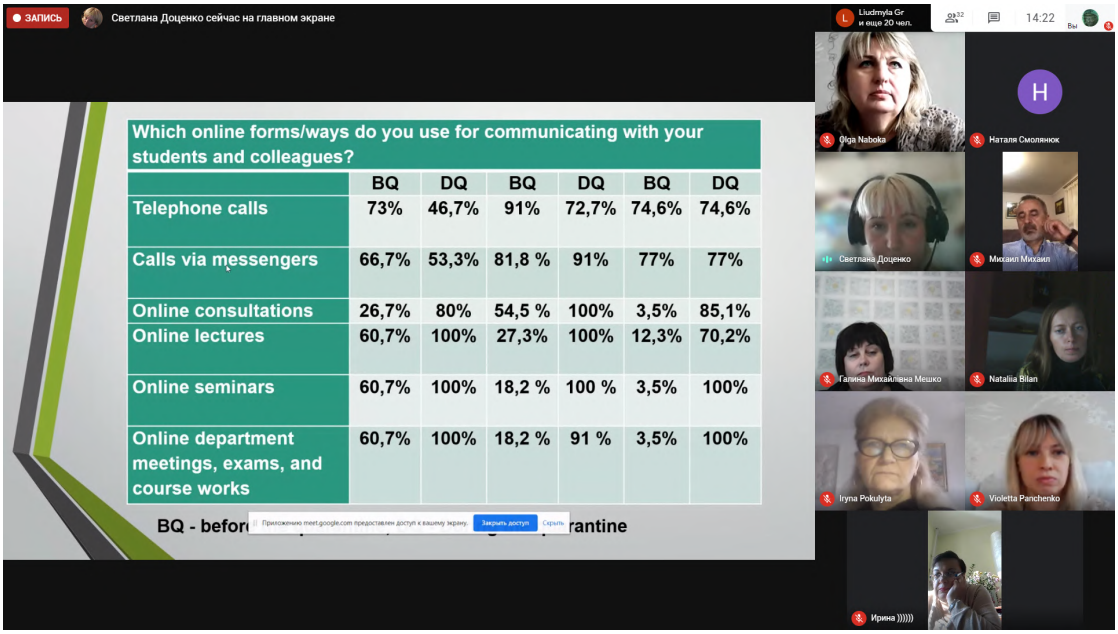


Figure 53: Tetiana Vakaliuk presents the talk [63].

tional process in quarantine" [63] of Tetiana Vakaliuk et al substantiates the need to develop and implement a distance course "Cloud technologies in the educational process in quarantine". It is noted that the purpose of the course was to acquaint teachers of general secondary education institutions, college teachers, vocational and higher education institutions with the basic possibilities of using cloud technologies to ensure the educational process in distance learning. The list of topics with which the students get acquainted is given: basic concepts, models of cloud services, architecture and proposals from leading cloud services companies; cloud services in the work of the teacher, the peculiarities of working with mail; cloud storage as an alternative to replacing conventional drives; opportunities to create documents with the provision of sharing rights to multiple users; opportunities to create Internet surveys using cloud technologies; opportunities to create presentations using cloud technologies; cloud-based means of creating smart maps; means of creating sites; cloud-based learning management systems (for example, Google Classroom). The peculiarities of the proposed distance course and the difficulties that the students had in performing certain tasks are identified and described. The statistical results of the course are given.

The relevance of the article "Developing digital competence of teachers of Humanitarian disciplines in the conditions of COVID-19 quarantine measures" [60] authored by Iryna M. Trubavina et al is explained by the necessity of developing digital competence of teachers



	BQ	DQ	BQ	DQ	BQ	DQ
Telephone calls	73%	46,7%	91%	72,7%	74,6%	74,6%
Calls via messengers	66,7%	53,3%	81,8 %	91%	77%	77%
Online consultations	26,7%	80%	54,5 %	100%	3,5%	85,1%
Online lectures	60,7%	100%	27,3%	100%	12,3%	70,2%
Online seminars	60,7%	100%	18,2 %	100 %	3,5%	100%
Online department meetings, exams, and course works	60,7%	100%	18,2 %	91 %	3,5%	100%

Figure 54: Svitlana Dotsenko presents the talk [60].

of Humanitarian disciplines at the higher education institutions (HEIs) in the conditions of the quarantine measures to prevent the spread of COVID-19. It is particularly challenging for teachers of Humanitarian disciplines, who are not specialists in the digital sphere as their profession is focused on humans. The purpose of the paper is to define the influence of the quarantine on the work of teachers at HEIs, revealing the level of the development, challenges and peculiarities of enhancing the digital competence of teachers of Humanitarian disciplines, theirs needs in education and giving recommendations how to arrange education and make administrative decisions. The methods of the research are survey, theoretical analysis, others. The results are to define the peculiarities of the influence of the quarantine on the arrangement of distance learning, the peculiarities of developing digital competence of teachers during the quarantine, their needs in education, the challenges in conducting mass distance learning, the determined complex of scientific approaches to developing digital competence. The practical significance of the research refers to developing three internship programs, based on the results of diagnosing teachers' digital competence.

The relevance of the next Iryna M. Trubavina's et al article "From the experience of organizing artistic and productive activities of older preschool children by means of distance education in the conditions of quarantine measures for the spread of COVID-19" [61] relates to the need for continuing preschool education under quarantine conditions to prevent the spread of COVID-19 by means of distance technologies and preparation of children for STEAM-education. Artistic and productive activities are considered to be the resource of STEAM-education. The aim of the article is to substantiate educational opportunities of distance education programs for undertaking artistic and productive activities of older preschool children on quarantine. Research methods: theoretical analysis, surveys, generalization of experience, analysis of children's

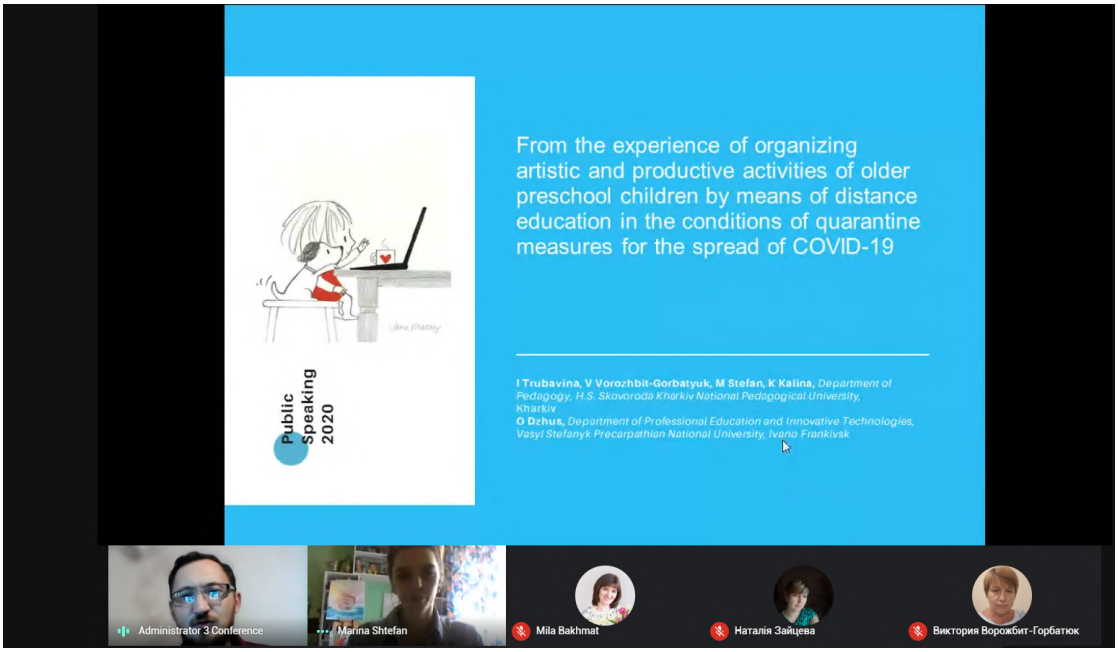


Figure 55: Maryna Shtefan presents the talk [61].

products, parental feedback. The scientific basis of the study is a set of approaches of different levels. Scientific novelty of the research is two-fold. The possibility of organizing artistic and productive activities of older preschool children by means of remote technologies in terms of preparing parents to interact with educators and organizational, technical, informational assistance to children. The features of the organization of such education in Ukraine under conditions of introducing quarantine measures are revealed. Practical significance is viewed through development and approbation of the content of classes on artistic and productive activities, integrated with the fundamentals of mathematics. There have been developed the questionnaires on digital competence for educators and digital literacy for parents.

The article "Shift from blended learning to distance one during the lockdown period using Moodle: test control of students' academic achievement and analysis of its results" [43] of Kateryna Polhun et al highlights the urgency of the problem of introducing blended learning into the educational process of institutions of higher education and ensuring the quality of education using the tools of e-learning management system. The experience of using electronic testing during the final control of students' educational achievements is covered. A thorough analysis of the results was carried out, in particular the relationship between current and final grades, test scores and its duration were established. The reliability of the test tasks separately and the test as a whole, among other indicators, were tested using mathematical statistics methods.

The article "Organization and conduct of classes in educational institutions during distance learning" [12] of Nataliia P. Franchuk et al considers the use of cloud technologies during distance learning. The implementation of the mechanism of distance learning in general secondary

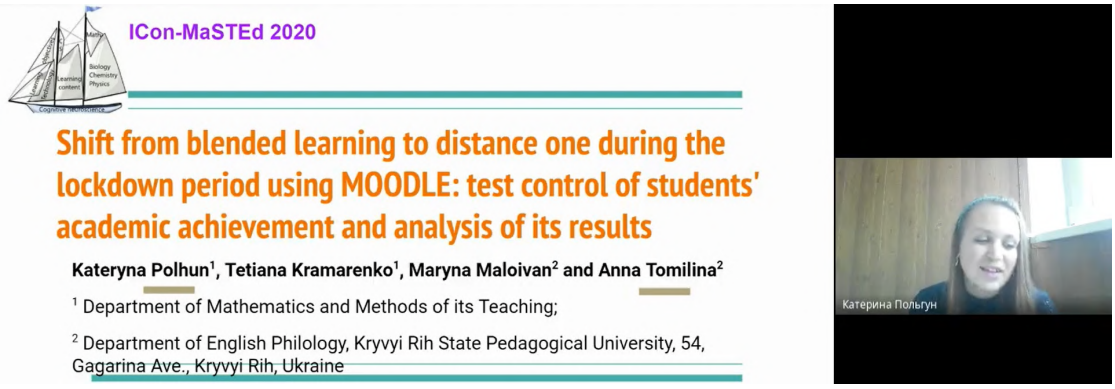


Figure 56: Kateryna Polhun presents the talk [43].

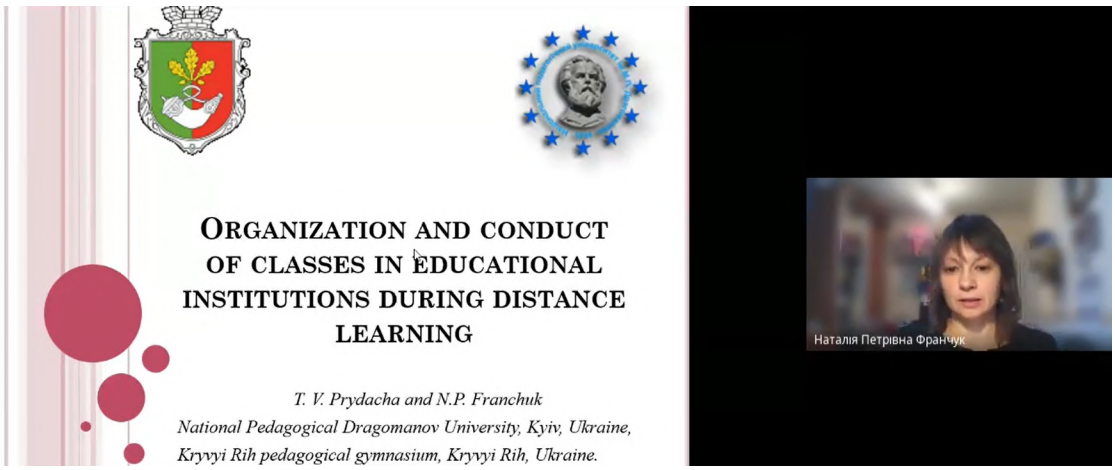


Figure 57: Nataliia Franchuk presents the talk [12].

education in two areas is described: distance form as a separate form of education and the use of distance learning technologies in the organization of education in various forms (day, evening, correspondence, etc.). The software for the organization of distance learning of pupils and students is listed. Examples of development of own electronic educational materials for teaching mathematics and computer science are given.

The educational system has undergone significant transformations in recent decades, the main catalyst of which is the development of the information sphere of society. Both individual elements and the structural, substantive content are modified and updated. Among the vectors that determine the dynamics and direction of this process is the growing socio-cultural role of modern media, which are based on digital technologies as a globalization platform and the main type of communication. The change of the information code – digitalization of the media sphere, creation of new media platforms of social interaction initiates the need to build an educational system that meets the demands of today. Among the many factors that are currently relevant in educational approaches are media technologies. Their role in the training of specialists in various

Figure 58: Iryna Pokulyta presents the talk [42].

fields is growing symptomatically, as it is associated with the functions of "new media", which for the subject of activity become transgressive guidelines for constructing reality. Educational and further professional activity of a social worker needs to be reconsidered in the context of innovative strategies, first of all formation of media technologies in social work. Their formation is based on modern principles of new media: interactivity of communication and gamification of virtual practices. In social work at different levels of activity of the representatives of this sphere, media competencies are in demand, which include mastery of instrumental methods of implementing game, virtual, art practices as a motivational resource, technology of initiating social activity, cultural-adaptive and creative orientation of social assistance clients. This issue includes the specifics of the profession of social worker through the prism of the possibilities of filling his case with a creative resource – the tools of media technology in social work. The article "Media technologies and virtual practices in creative approaches to educational training of a social worker" [42] of Iryna K. Pokulyta et al outlines both the potential of gamification and virtualization of media practices in the educational and further professional activities of a social worker, and points out the possible dangers of implementing these technologies for certain categories of people in need. The article is a research exploration in the formation of a professional strategy of a social worker based on the involvement of the latest media practices as an expansion of media tools, the implementation of a creative approach to helping the client of social services.

In the article "The needs of intelligent information and media education for students of higher education institutes: the sociological aspect" [29] of Alla Lobanova et al the actual modern problem that is pervasive minutes informatization of modern life, including the education system, which is not only positive but also negative effects on young people. The thesaurus "reasonable information needs" is introduced into scientific circulation and the author's understanding of its content, essence, structure, principles, and factors is substantiated. Attention is focused on the need, in terms of the unauthorized and unlimited influence of information content, including fake and manipulative nature, on the minds of young people, including students, the introduction and improvement of media education in all institutions of higher education. Its purpose, functions, role in the formation of reasonable information needs of students of higher educational institutions of both humanitarian and technical profile of Ukraine and Poland are considered.

The article "PhD student training: principles and implementation" [38] of Liubov F. Panchenko

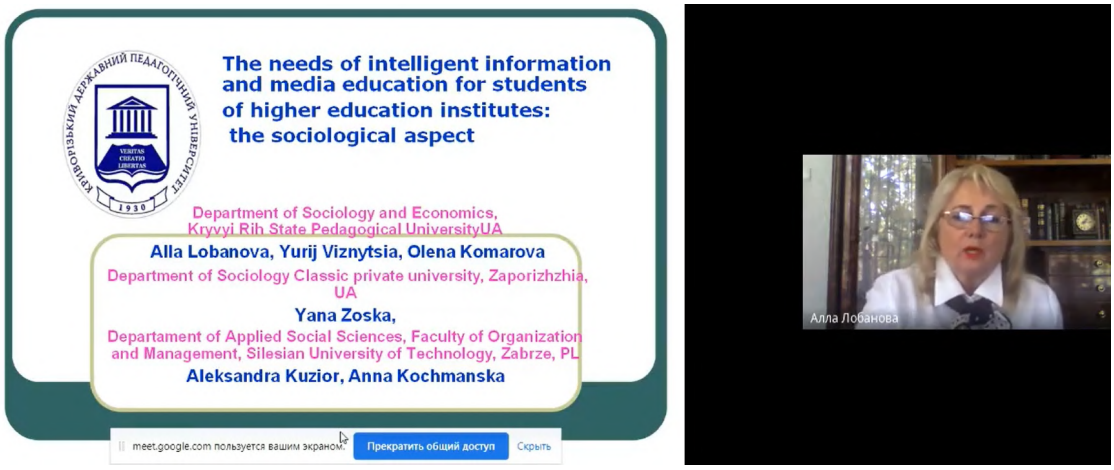


Figure 59: Alla Lobanova presents the talk [29].

et al deals with the problem of PhD student training. The Salzburg Principles about the improvement and quality assurance of doctoral programs at universities in every country from European University Association are analysed and materials of LERU on quality culture in Doctoral Education in Europe are used. The three focuses of the research component of doctoral program are proposed. The first focus relates to reproducible research principle. The second focus is related to the use of multivariate models of phenomena's study and SEM methodology. The SEM methodology is mostly based on deductive logic, involves the preliminary construction of a structural model of the relationships between the variables in order to further check for consistency with the experimental data. The third focus combines qualitative and quantitative methods and the use of triangulation (data triangulation, investigation triangulation, theory triangulation etc.). The content of selected courses for doctorate students is proposed: Reproducible Research and Multivariate Methods in Scientific Research courses. The importance of courses related to the future career is demonstrated, in particular the career of academic researcher. Further development of our work is the creation of teaching and methodological support for selected course "Twitter for professional development of PhD students".

The article "Development of informational and research competence of postgraduate and doctoral students in conditions of digital transformation of science and education" [27] of Mariia P. Leshchenko et al devoted to the digital transformation of education and science which puts forward new requirements for training of graduate and doctoral students, in particular for development of informational and analytical competence. It is described in international documents governing scientific field. Analysis of digital systems and consideration of their services allows to say that their existing list and functionality can be used to develop informational and research competence of postgraduate and doctoral students. It is confirmed that important role in development of informational and research competencies of postgraduate and doctoral students is given to digital technologies, in particular, to digital open systems. Their use contributes to improving and expanding opportunities in research, presentation of research results and image of the researcher and institution. Digital society requirements to informational and research

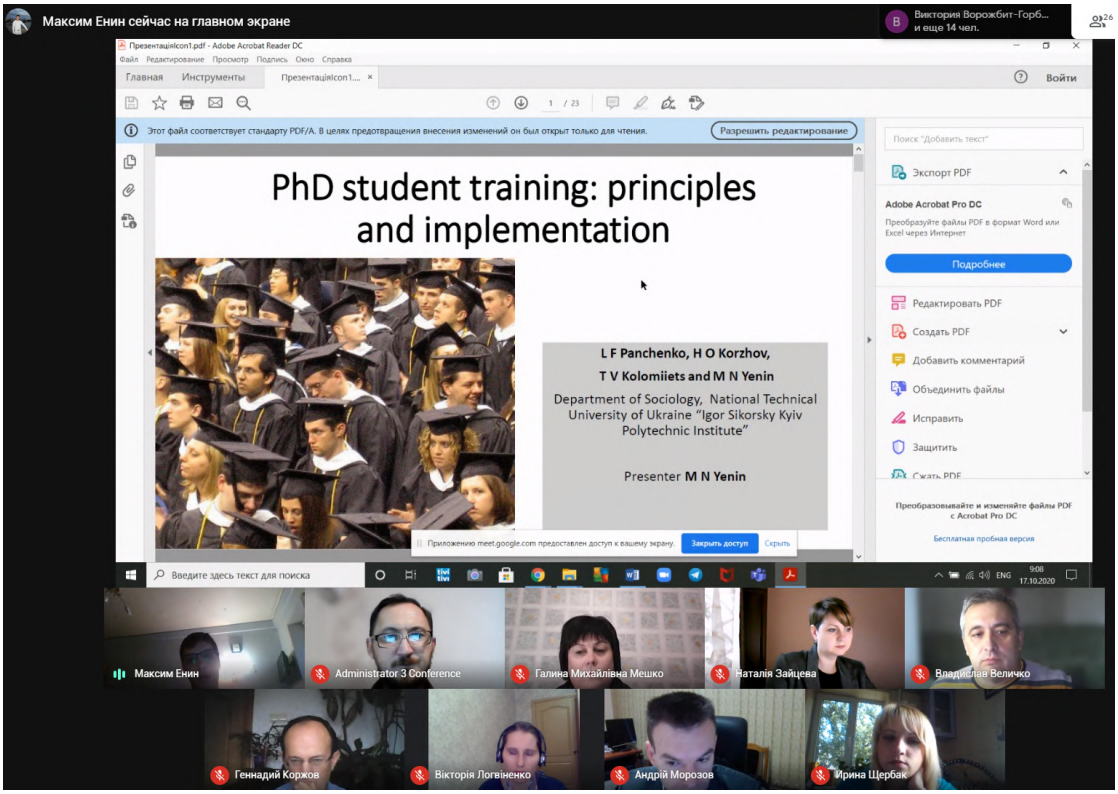


Figure 60: Maksym Yenin presents the talk [38].

competence of postgraduate and doctoral students are defined and described. They include: readiness and ability to carry out research activities; ability to search and select necessary information and data, their transformation, storage and transmission using digital technologies; ability to critically evaluate found information (check their accuracy, timeliness, expediency); ability to perform scientific research (organization, planning, conducting) with use of digital technologies. Course of experimental work is presented; the obtained results are given and their interpretation is carried out. Fisher's angular transformation was applied in order to confirm reliability of obtained results of experimental study. Experimental verification of the proposed methodological system of using digital systems in postgraduate and doctoral students training, aimed at the development of information and research competence confirmed its effectiveness and pedagogical feasibility.

The article "Research of professional responsibility of students of technical specialities by means of information and communication technologies" [31] of Halyna M. Meshko et al is devoted to the use of information technologies for pedagogical research aimed at studying the formation of key competencies and learning outcomes in higher education institutions, in particular, the professional responsibility of students of technical specialties. The diagnostic capabilities of the ATutor system, which operates at the Ternopil National Technical University named after Ivan Pului (Ukraine), are presented. The process of data collection involving distance

Figure 61: Anna Iatsyshyn presents the talk [27].

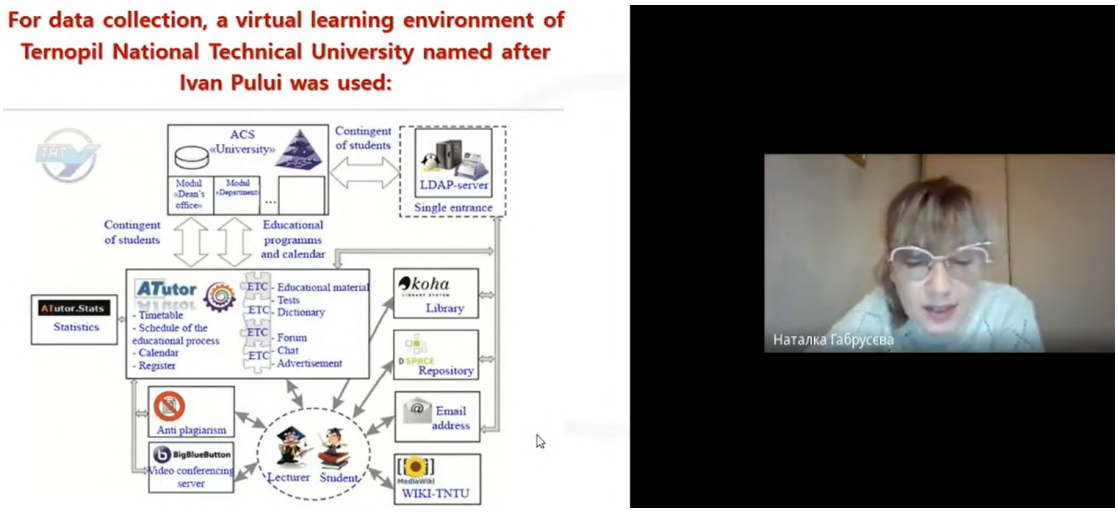


Figure 62: Nataliia Habrusieva presents the talk [31].

learning technologies and the results of the analysis of the study are described. The state of formation of professional responsibility in students of technical specialties is determined, the main problems and difficulties in the formation of professional responsibility of future specialists in the technical field are clarified, and the possibilities and role of social disciplines are revealed. The structural and logical scheme of integrating disciplines of a humanitarian cycle in a distance learning course "Professional Responsibility of a Technical Specialist in Modern Conditions" is presented.

One of the main challenges of today is to increase the resilience of individuals to stressful

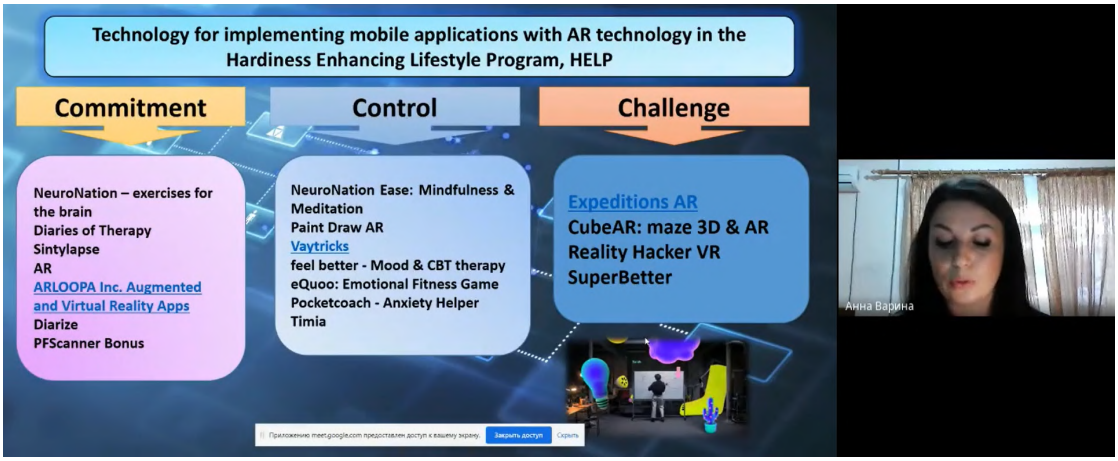


Figure 63: Hanna Varina presents the talk [36].

environmental factors and preserve the quality of life and efficiency. Hardiness is a psychological phenomenon, the essence of which is a productive way out of the crisis towards personal growth. Taking into account the effectiveness of information and technological progress, the issue of internalization of AR technologies in the process of training a competitive, viable specialist who is able to mobilize and self-realize internal potential resources is vital. The article "The peculiarities of the usage of AR technologies in the process of hardiness of future professionals" [36] of Viacheslav V. Osadchyi et al analyzes the possibilities of using innovative AR technologies in the process of developing the hardiness of the future specialist on the basis of the implementation of competence and subject-personal approach to the introduction of AR technologies in the educational process in the system of higher education. The article describes the experience of integrated implementation of elements of augmented reality in the program of development of hardiness – Hardiness Enhancing Lifestyle Program based on the concept of BYOD. According to the results of the obtained empirical data the efficiency of using innovative AR technologies in the structure of mobile applications in the process of development of the components of hardiness of the personality of the future specialist is proved. Prospect for further research is the development of a methodology for integrated implementation of AR technologies in the practice of higher education in order to optimize the training of future professionals.

In article "Theoretical and methodological bases of designing the educational institution information and consulting environment" [24] of Olena O. Lavrentieva et al the definition of the educational institution information and consulting environment has been formulated. It was found the such environment is a relevant part of the information education society, within which it becomes possible exchange of information and consultative support of subjects of the educational process via the computer focused technologies. The semantic and functional content of an educational institution information and consulting environment have been specified. Its social, spatial-object, psychological and pedagogical components have been analyzed. The criteria for assessing the quality of the information and consulting environment have been described. The main factors and leading pedagogical technologies of organizing and forming of

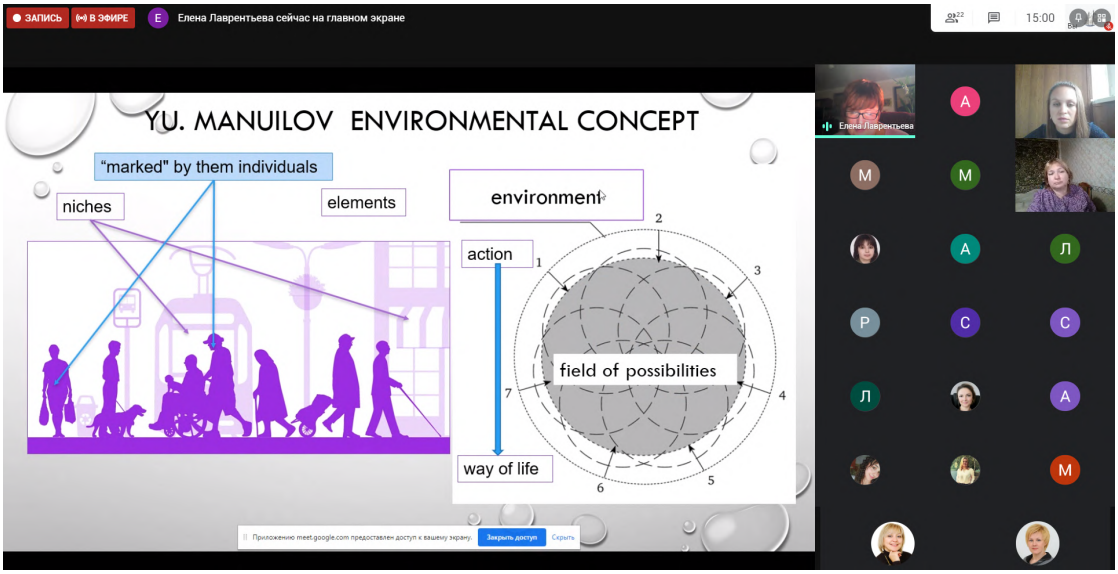


Figure 64: Olena Lavrentieva presents the talk [24].

the information and consulting environment have been determined. The pattern of the educational institution information and consulting environment covering organizational, technical methodical resource areas have been established. Based on the results of empirical research with use of content analysis and factor analysis the benefits and risks of the educational institution information and consulting environment have been reviewed and summarized. It is concluded that the organization of the educational institution information and consulting environment will promote increase the efficiency of the educational process and the quality of educational services.

The article "An electronic environment of higher education institution (on the example of Zhytomyr Polytechnic State University)" [33] of Andrii V Morozov considers the expediency of developing and using the electronic environment of a higher education institution. It was found that the existence of such an electronic environment of a higher education institution would allow to effectively use the available resources of higher education. A model of the electronic environment of a higher education institution is proposed, which consists of 4 components: educational, scientific, organizational, and managerial. The structural elements of each of the components are described. An example of the implementation of such an electronic environment on the example of the Zhytomyr Polytechnic State University is considered. The personal offices of the student and the teacher, which are realized according to the given model at the Zhytomyr Polytechnic State University, are considered in detail. It is established that the indisputable advantage is the complete identification of the person who went to different parts of such an environment, another advantage is the integrated use of logins and passwords to all these components.

Nataliia V. Morze et al in the article "Implementation of adaptive learning at higher education institutions by means of Moodle LMS" [34] highlights e-learning courses as the popular means

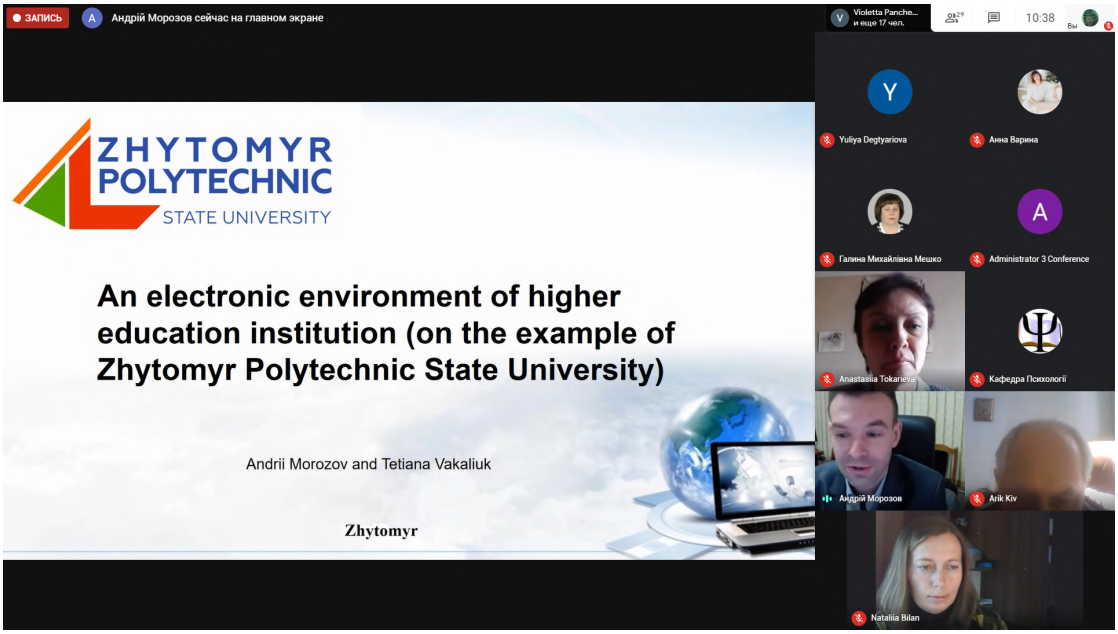


Figure 65: Andrii Morozov presents the talk [33].

of delivering knowledge to students in higher education institutions. Most participants of learning process note that they benefit from the possibility to gain knowledge regardless of time, location and device they use. Among other advantages possibility to return to learnt material several times, divide material into parts, consume information through different types of educational materials (video, infographics, presentations, text, quizzes etc.) are mentioned. At the same time most of the surveyed students chose that they lack personalization both of materials and studying process, limited in terms of fulfillment and would like to have a choice of the level of study. The educational trend that is able to put into practice the above mentioned requirements is blended learning as it has a range of advantages such as usability, consideration of individual abilities, additional materials introduction, activities monitoring. Although it combines offline and online learning, effectiveness of e-learning courses designed for its implementation play a crucial role. To make a learning process correspondent to the students' needs adaptive learning can be introduced in higher education institutions. Adaptive learning is a methodology that allows to identify level of students' knowledge and their learning styles and transform materials, tasks and ways of their delivery according to the needs of learning process participants. LMS Moodle offers different solutions for adaptive learning. They provide administrators and teachers with tools to vary all stages of a learning process starting with delivery of information and ending with assessment.

The article "Developing and using open electronic educational resources in educational activities" [64] of Vladyslav Ye. Velychko et al looks into the effective use of open electronic educational resources. The concept of open electronic educational resources is exposed, their structure and key elements are presented, issues of implementation in educational practice are considered. Requirements for open electronic educational resources are defined, tools for

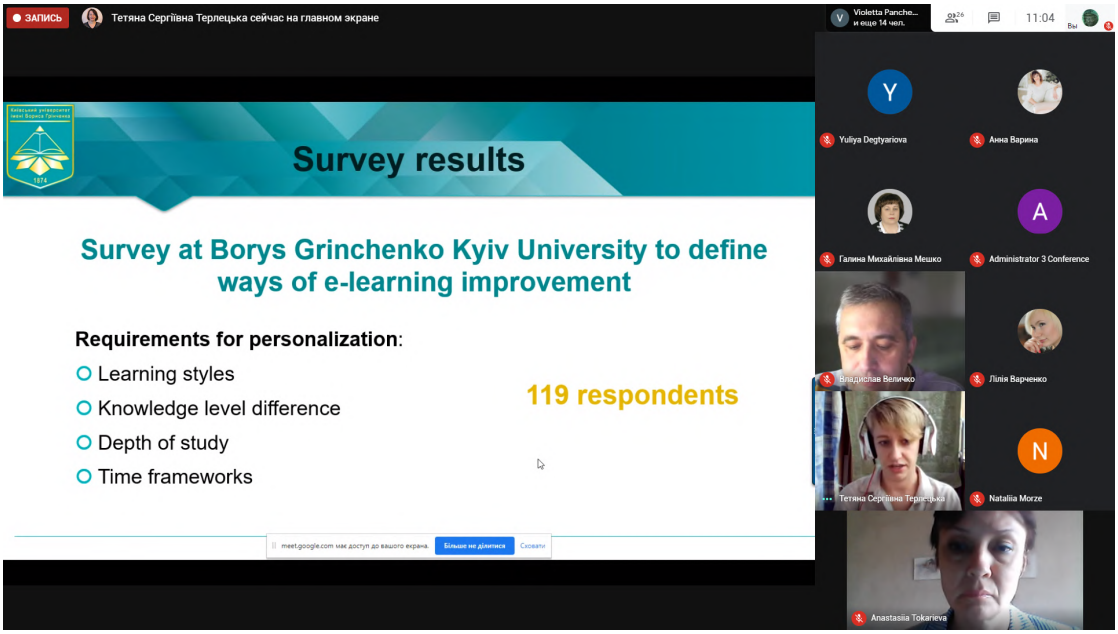


Figure 66: Tetiana Terletska presents the talk [34].

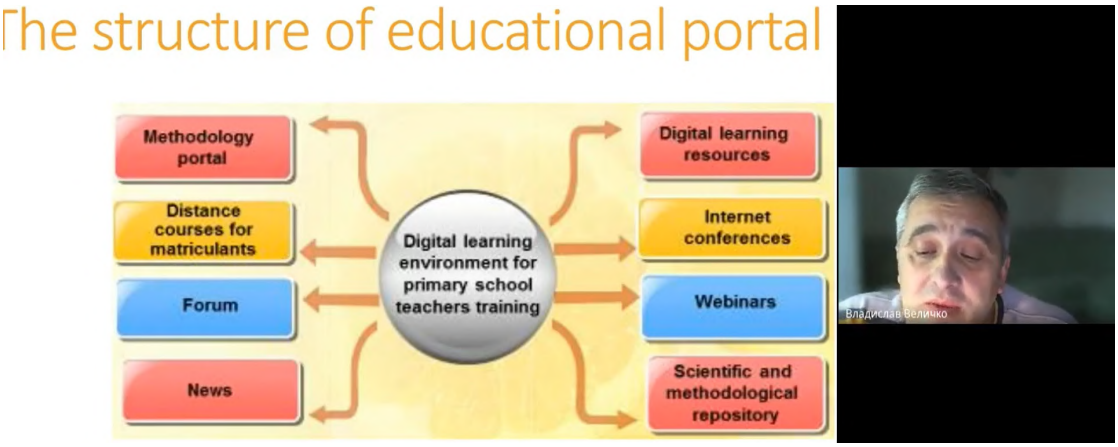


Figure 67: Vladyslav Velychko presents the talk [64].

designing and platforms for their support and dissemination are identified. The analysis of the existing open electronic educational resources and the experience of their use is conducted. The principles of open electronic resources design based on crowdsourcing are revealed. The stages of creating e-learning resources that meet open Creative Commons licenses on the examples of pre-service teachers' training are explored. The essence of Creative Commons licenses is reflected. The theoretical and methodological principles of the use of open electronic educational resources in the educational activity of pre-service teachers are considered. There is a direct link between open educational resources and university education.

The article "Implementation of professionally oriented ICT in the process of managers training" [57] of Lidiia P. Tkachenko et al touches upon the problem of introducing professionally oriented software products based on ICT into the educational process of training managers of the hotel, restaurant and tourism business. The purpose of the study is to prove the effectiveness of the implementation of professionally oriented software products based on ICT in the training of managers. The research is based on the analysis of recommendations of employers and managers of the specialties "Tourism" and "Hotel business", the content of educational programs for training bachelors in management, the content of general professional and special competencies, the structural and logical scheme of disciplines. The most effective ICT using computer software products that contribute to the formation of a set of professional competencies in future managers have been identified: MS Project, Teamwork, TeamLab, Open Workbench, GanttProject, dotProject, Outlook, OneNote, EverNote, Nirvana, Wunderlist, Toggl, MS Office, Office 365, Document.Online, AllFusion Process Modeler 7, MS Visio, MS PowerPoint, MS Sway, Libre Office.Impress, FreeMind, Mind42, ViSta, MacANOVA, Matrixer. The effectiveness of these technologies has been experimentally tested in the course of practical training in the format of full-time distance learning and practical training of student managers. The research describes the technology of using professional software products in the educational process. The effectiveness of these technologies has been experimentally tested in the course of practical training in the format of full-time distance learning and practical training of student managers. The research describes the technology of using professional software products in the educational process. The results of the pedagogical experiment confirmed that the introduction of information and communication technologies contributes to the formation of professional competencies in the field of ICT among students of this specialty. The conducted research proves the need for changes in the working curricula of disciplines "Information systems and technologies", "Practices of information and communication technologies", "Statistics", "Management and administration", "Finance, money and credit", "Accounting and audit". "Business foreign language", "Professional rhetoric", "Foreign professional language", "PR and advertising technologies", "Business accounting", "International business management", "Electronic business information technologies".

Peculiarities of the usage of the hierarchy analysis method for the making decision on the choice of the most efficient computer mathematics system used for the preparation of the IT-sphere specialists are in the focus of the research "Application of the hierarchy analysis method for the choice of the computer mathematics system for the IT-sphere specialists preparation" [11] authored by Anatoliy Fedonuyk et al. Eight alternatives were selected for the hierarchy analysis method and seven criteria were considered. The alternative is chosen by means of figuring of the priority vector corresponding to each alternative. The alternative with the highest value is considered the right decision. The scale of impact was used that is the scale of evaluations for the paired comparisons of the advantage of the first object over other with meaning from 1 to 9. The basic criteria for which the alternatives are calculated were described in the course research; their characteristics were chosen, in particular functionalities, studying materials, on-line mode, mobile application, license, language support and an open code. The matrix of the paired comparisons for each criterion was constructed and numerical characteristics of these matrices were calculated – the highest own value, the index of compatibility and the index of the consistency of formulas. Every matrix is composed of the expert evaluations for the alternatives,

Figure 68: Olena Dolgopol presents the talk [57].

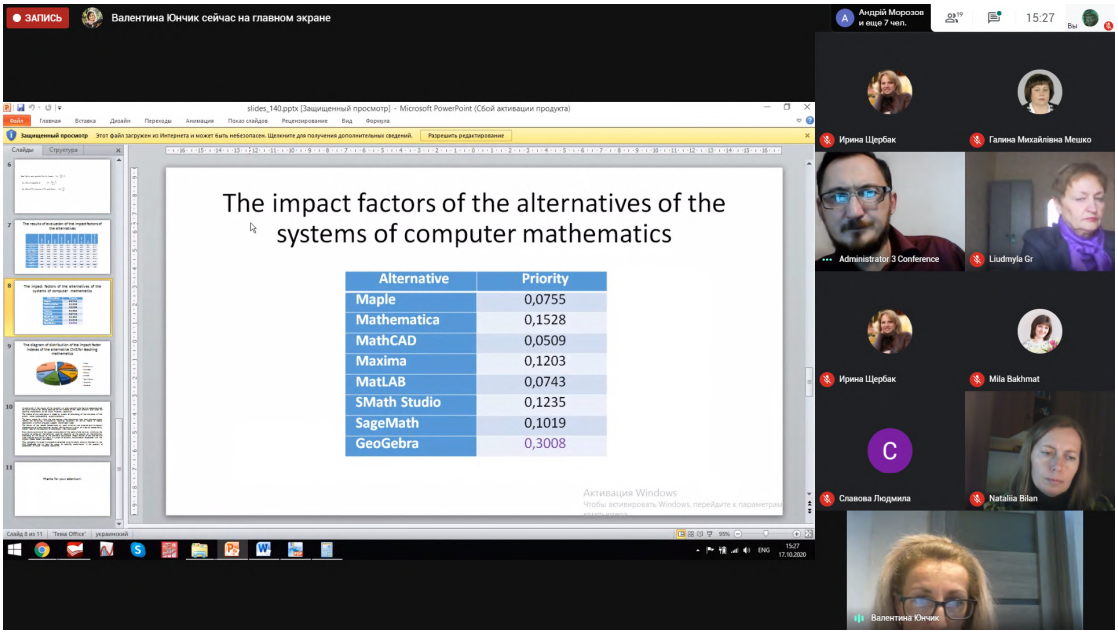


Figure 69: Valentina Yunchyk presents the talk [11].

which are the systems of computer mathematics used in the courses of mathematics. Based on the results of the calculations carried out the impact of the alternative was shown and the system having the highest impact was chosen.

The article "Method for assessing the information content of factors forming the cognitive

Figure 70: Victoriya Logvinenko presents the talk [25].

independence of students" [25] Evgeniy Lavrov et al of describes the problem of awakening the cognitive activity of students, arising due to revolutionary transformations in teaching technologies. It shows the need to study the factors that affect cognitive activity and assesses the information content of those factors. Based on the method of pair comparisons, a technology for ranking the factors affecting cognitive activity has been developed. A mathematical model of the formation and processing of expert assessment results and an example of calculations are given, and the feasibility of including the subsystem for evaluating factors affecting cognitive activity in the computer control system of the university is shown. The structure of an adaptive e-learning system based on the technology of taking into account the factors that form the cognitive independence of students is described Experiments carried out in 3 universities of Ukraine have shown that the use of the developed mathematical model and information technology allows to increase significantly academic performance and to decrease the frequency of refusals from independent work of students using the e-learning environment.

5. Conclusion

XII instalment of ICon-MaSTEd was organised by Kryvyi Rih State Pedagogical University, Ukraine (with support of the rector Prof. Yaroslav Shramko), in collaboration with Kryvyi Rih National University, Ukraine (with support of the rector Prof. Mykola Stupnik), Institute of Information Technologies and Learning Tools of the NAES of Ukraine (with support of the director Prof. Valeriy Bykov) and Ben-Gurion University of the Negev, Israel (with support of the rector Prof. Chaim Hames).

We are thankful to all the authors who submitted papers and the delegates for their participation and their interest in ICon-MaSTEd as a platform to share their ideas and innovation. Also, we are also thankful to all the program committee members for providing continuous guidance

and efforts taken by peer reviewers contributed to improve the quality of papers provided constructive critical comments, improvements and corrections to the authors are gratefully appreciated for their contribution to the success of the workshop. Moreover, we would like to thank the developers of EasyChair and HotCRP, who made it possible for us to use the resources of this excellent and comprehensive conference management system, from the call of papers and inviting reviewers, to handling paper submissions, communicating with the authors, and creating the volume of the workshop proceedings.

Special thanks to session chairs, Professors Olga Bondarenko, Vita Hamaniuk, Svitlana Malchenko, Iryna Mintii, Pavlo Nechypurenko and Yaroslav Shramko from Kryvyi Rih State Pedagogical University, Professor Andrii Striuk from Kryvyi Rih National University, Professors Kateryna Osadcha and Viacheslav Osadchyi from Bogdan Khmelnitsky Melitopol State Pedagogical University, Professors Andrii Morozov and Tetiana Vakaliuk from Zhytomyr Polytechnic State University, Professor Kateryna Vlasenko from Donbas State Engineering Academy for their work on the conference and its program, excellent and gratefully appreciated conference support.

We are looking forward to excellent presentations and fruitful discussions, which will broaden our professional horizons. We hope all participants enjoy this conference and meet again in more friendly, hilarious, and happiness of further ICon-MaSTEd 2021. The next meeting in the series is the XIII International Conference on Mathematics, Science and Technology Education, 12–14 May 2021, Kryvyi Rih, Ukraine (https://icon-masted.easyscience.education/2021/).

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