

CTE 2018 – How cloud technologies continues to transform education

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Abstract. This is an introductory text to a collection of papers from the CTE 2018: The 6th Workshop on Cloud Technologies in Education, which was held in Kryvyi Rih, Ukraine, on the December 21, 2018. It consists of short introduction and some observations about the event and its future.

Keywords: cloud technologies in education, digital transformation of learning, cloud-based learning environments, cloud ontologies, cloud services for learning foreign language, cloud technologies in STEAM education.

1 CTE 2018 at a glance

Cloud Technologies in Education (CTE) is a peer-reviewed international Computer Science workshop focusing on research advances, applications of cloud technology in education.

The CTE Workshop occupies contributions in all aspects of educational technologies and cloud-based learning tools, platforms, paradigms and models, functioning programmes or papers relevant to modern engineering and technological decisions in the IT age. There is urgent general need for principled changes in education elicited by current e-learning tools, services and IT communication.

CTE topics of interest:

- Mobile and blended learning.
- Cloud-based e-learning platforms, tools and services.
- Cloud-based learning environments.
- Cloud technologies of open education.
- Cloud technologies of mobile learning.
- Cloud-based learning management systems.
- Cloud technologies for informatics learning.
- Cloud technologies for mathematics learning.
- Cloud technologies for physics learning.



Fig. 1. CTE 2018 Local Organization Committee:
Iryna S. Mintii, Pavlo P. Nechypurenko,
Serhiy O. Semerikov,
Andrii M. Striuk, Yuliia V. Yechkalo

- Cloud-based and mobile learning technologies for teacher and VET.
- Seamless learning and holistic education modelling and design.
- Massive open online courses.
- Open learning systems and virtual conferences for training professionals.
- Methods of using cloud-based learning tools.

This volume represents the proceedings of the 6th Workshop on Cloud Technologies in Education (CTE 2018), held in Kryvyi Rih, Ukraine, in December 21, 2018. It comprises 36 contributed papers that were carefully peer-reviewed and selected from 59 submissions. Each submission was reviewed by at least 3, and on the average 3.4, program committee members. The accepted papers present the state-of-the-art overview of successful cases and provides guidelines for future research.

The volume is structured in five parts, each presenting the contributions for a particular workshop track.

2 Session 1: Digital transformation of learning

Elena H. Fedorenko, Vladyslav Ye. Velychko, Andrii V. Stopkin, Alona V. Chorna and Vladimir N. Soloviev [5] focuses on the special significance of education informatization as the main aspect of the existence and development of a modern higher education. The process of computerization of education is considered as the main basis of informatization in the historical aspect. This paper emphasizes the importance of implementing ICT in the learning process of free software and the interest of scientists in the field of education. The author's focus is on the importance of the acquired skills and abilities as a result of informatization of education and implementation of the educational process of ICT. It is acknowledged that the practice of implementing ICT in the educational process of higher educational institutions are expanding every day and yields only positive results. It is noted that educational activity based on the use of ICT is a basis for changing the structure of the educational process for both teachers and students.

Andrey I. Kupin, Olena V. Tarasova, Tetiana S. Sulyma, Svitlana V. Sokolova, Ivan O. Muzyka and Vitaliy V. Tron [14] are analyzed the professional thinking issues. The authors pointed that the technical thought concepts, images and practical actions are in a complex and dynamic interaction with each other. The regression analysis of the students' academic progress indicators who are trained by the traditional and innovative methodology with forming influence is conducted in the article. Analysis of thinking activity development levels in the process of professional tasks solving performed by the students of the control and experimental groups demonstrated the straight-line correlation dependence of the professional thinking development on the organization of professional activity in general and the training organization in particular.

Nataliia P. Volkova, Nina O. Rizun and Maryna V. Nehrey [35] concerns the issue of data science tools implementation, including the text mining and natural language processing algorithms for increasing the value of high education for development modern and technologically flexible society. Data science is the field of study that involves tools, algorithms, and knowledge of math and statistics to discover knowledge

from the raw data. Data science is developing fast and penetrating all spheres of life. More people understand the importance of the science of data and the need for implementation in everyday life. Data science is used in business for business analytics and production, in sales for offerings and, for sales forecasting, in marketing for customizing customers, and recommendations on purchasing, digital marketing, in banking and insurance for risk assessment, fraud detection, scoring, and in medicine for disease forecasting, process automation and patient health monitoring, in tourism in the field of price analysis, flight safety, opinion mining etc. However, data science applications in education have been relatively limited, and many opportunities for advancing the fields still unexplored.

Anastasiia V. Tokarieva, Nataliia P. Volkova, Inesa V. Harkusha and Vladimir N. Soloviev [31] highlights the potential of social media, ICT, mobile technologies and applications as tools for communication, interaction, building up social skills and unique learning environments. One of the latest trends observed in education is an attempt to streamline the learning process by applying educational digital games. Despite numerous research data, that confirms the positive effects of digital games, their integration into formal educational contexts is still relatively low. The purpose of this article is to analyze, discuss and conclude what is necessary to start using games as an instructional tool in formal education. In order to achieve this aim, a complex of qualitative research methods, including semi-structured expert interviews was applied. As the result, the potential of educational digital games to give a unique and safe learning environment with a wide spectrum of build-in assistive features, be efficient in specific training contexts, help memorize studied material and incorporate different learning styles, as well as to be individually adaptable, was determined. At the same time, the need for complex approach affecting the administration, IT departments, educators, students, parents, a strong skill set and a wide spectrum of different roles and tasks a teacher carries out in a digital game-based learning class were outlined. In conclusion and as a vector for further research, the organization of Education Design Laboratory as an integral part of a contemporary educational institution was proposed.

Olga P. Pinchuk, Oleksandra M. Sokolyuk, Oleksandr Yu. Burov and Mariya P. Shyshkina [23] highlights the peculiar features of digital environment include: integration of ICTs; use of local and global networks and resources; support and development of qualitatively new technologies of information processing; active use of modern means, methods and forms of teaching in the educational process. Today, tools and technologies of the information and communication networks (ICNs), in particular the Internet, which custom and operational-procedural properties were changed at the initial stage from closed local to open ones at present, become widespread. The development of ICNs (from closed local to open ones) changes the typology of learning environments. The following models of learning environments, which widely use ICT and ICN tools (with basic features that characterize them) are distinguished: using the local communication network for presentation of educational information; using the local communication network and open network resources; using open network resources; for independent use of open network resources directly in the classroom by a student; for use of open network resources by a student in the process of independent

learning activity; for use by a student educational resources, specially created by a teacher, as well as resources of an open networks in his independent learning activity.

Olena O. Lavrentieva, Lina M. Rybalko, Oleh O. Tsys and Aleksandr D. Uchitel [15] discovers the possibilities and classification of ICTs and tools that can be used in organizing students' independent study activities of higher education institutions has been explored. The analysis of the information and technological approaches to the organization of students' independent study activities made it possible to determine the means of realization of the leading forms of organization for this activity (independent and research work, lectures, consultations and non-formal education), to characterize and classify the ICTs and tools that support presentation of teaching materials, electronic communication, mastering of learning material, monitoring of students' learning and cognitive activity, such as ones that serve for the sake of development and support of automated training courses, systems of remote virtual education with elements of artificial intelligence, which implement the principle of adaptive management of learning and the organization of students' independent study activities. The paper provides the insight into the essence of the conducted investigation on the assesses of the effectiveness of ICTs and tools in the process of organizing students' independent study activities.

Oleksandra I. Yankovych, Volodymyr M. Chaika, Tetiana V. Ivanova, Kateryna M. Binytska, Iryna I. Kuzma, Oksana T. Pysarchuk and Halina I. Falfushynska [36] substantiates the technology of forming media literacy of senior preschool children in the establishments of preschool education of Ukraine. In the article, the features of preschool media education have been determined, the problems in implementation of media education in preschool establishments have been identified and the prospects for their solution have been determined. It has been proved that preschool age is sensitive for the formation of critical thinking. The concept of "preschool media education" as part of the educational process has been characterized by the three-component structure.

Hryhorii V. Tereshchuk, Iryna I. Kuzma, Oleksandra I. Yankovych and Halina I. Falfushynska [30] substantiates the relevance of implementing the technology of formation of a successful personality of a primary school age pupil during media education implementation at primary school. In the article, a technology model is developed; the necessity of solving problems of success simultaneously with increasing the level of media culture of a pupil, the formation of key competencies for life, preparation of a child for the life's self-realization on the basis of the partnership implementation of schoolchildren, parents and teachers is proved; the need of the embodiment of the pedagogy of heart and the pedagogy of success is shown; the diagnostic toolkit for determining the levels of formation of the successful personality of primary school pupils is specified.

3 Session 2: Cloud-based learning environments

Maiia V. Popel and Mariya P. Shyshkina [25] analyzes the current stage of educational studies of the cloud-based learning systems. The relationship between the notions of the cloud-based learning system and the cloud-based learning environment are

investigated. It is shown that in the research literature there is no single interpretation of the concept of a cloud-based system for educational purposes. Still the number of basic approaches to the interpretation of the concept under investigation are revealed. The first approach is based on the understanding of the system, as a set of cloud services or cloud-based technologies. The second approach is to consider a separate cloud service as a cloud-based learning system. In this case, the cloud service tools should include such components that cover the content, the tools, the forms and the methods of learning. The structure of the cloud-based learning system within the interpretation of the latest works of Ukrainian researchers is considered.

The article of Yuliya H. Nosenko, Maiia V. Popel and Mariya P. Shyshkina [20] deals with the problems of using adaptive cloud-based learning systems in the modern high-tech educational environment and expanding access to them as tools of educational and research activity at higher education pedagogical institutions in Ukraine. The conceptual apparatus of cloud-based adaptive learning systems application and design is considered; their main characteristics are revealed; the ways of their pedagogical application are described. The experience of Institute of Information Technologies and Learning Tools of NAES of Ukraine on designing and applying of the cloud-based learning and research environment is outlined. The results of the survey on using adaptive cloud-based learning systems are presented. It is established that in the near future adaptive cloud-based learning systems will become the driving force behind the development of new pedagogy, new strategies for personalizing education, and expanding opportunities for active learning.

The article of Oleksandr H. Kolgatin, Larisa S. Kolgatina, Nadiia S. Ponomareva and Ekaterina O. Shmeltser [13] deals with the problem of out-of-class students' independent work in information and communication learning environment based on cloud technologies. Results of appropriate survey among students of pedagogical university are discussed. The students answered the questions about systematicity of their learning activity and propositions for its improving. It is determined that the leading problems are needs in more careful instruction according to features of the task completing, insufficient experience in self-management, the lack of internal motivation. Most of all, students recommend to provide the tasks with detail instruction (oral or written) and to pay attention to careful planning the time that is necessary for full completion of the task. It is pointed that such complicated requirements can be satisfied only by complex use of information and communication technologies as well as the automated system of pedagogical diagnostics. Some requirements for management of students' out-of-classroom independent work are formulated as a result of this discussion.

Anna V. Iatsyshyn, Valeriia O. Kovach, Yevhen O. Romanenko and Andrii V. Iatsyshyn [9] highlights the need to modernize preparation of future PhDs, caused by challenges of new information, globalized society and digital transformation of all spheres of life, including education and science. Concepts of "cloud computing", "cloud technologies", "cloud learning technologies", "cloud services", "cloud oriented environment" were analyzed. Experience of cloud technologies and their services application in educational and scientific space in researches of foreign and Ukrainian students was considered. Ukrainian experience in preparation of future PhD of various

specialties with cloud services application was analyzed. It was emphasized that approaches improving to preparation of future PhDs based on cloud services application would increase their level of digital competence. It is recommended to include a separate course or module of specific discipline on work with cloud technologies and services during preparation of future PhDs. It is important to improve disciplines and tools content to support education process. It can be learning of disciplines using cloud technologies or services by future PhD's. Also, cloud services application to support scientific and scientific-organizational activities will increase level of organization and implementation of scientific research. It is important to create cloud-oriented environment for preparation of future PhDs in higher education and research institutions. Making cloud-oriented educational and scientific environment should be based on principles of open education. It is recommended to use cloud-based platforms and services (G Suite for Education; Microsoft Office 365; specialized SaaS (CoCalc or other)).

4 Session 3: Cloud ontologies

The article of Ivan M. Tsidylo, Hryhoriy V. Tereshchuk, Serhiy V. Kozibroda, Svitlana V. Kravets, Tetiana O. Savchyn, Iryna M. Naumuk, Darja A. Kassim [32] deals with the problem of the methodology of designing computer ontology of the subject discipline by the future teachers-engineers in the field of computer technologies. The scheme of ontology of the subject discipline is presented in which the set of concepts of the future computer ontology and the set of relations between them are represented. The main criteria of the choice of systems of computer ontologies for designing computer ontology of the subject discipline: software architecture and tools development; interoperability; intuitive interface are established. The selection of techniques for designing ontologies using computer ontology systems is carried out. The algorithm of designing computer ontology of the subject discipline by the future teachers-engineers in the field of computer technologies is proposed.

Yevhenii B. Shapovalov, Viktor B. Shapovalov and Vladimir I. Zaselskiy [28] investigates the approach to systematization of scientific information based on the ontological IT platform Transdisciplinary Ontological Dialogs of Object-Oriented Systems (TODOS). It has been proposed to select semantic characteristics of each work for their further introduction into the IT platform TODOS. An ontological graph with a ranking function for previous scientific research and for a system of selection of journals has been worked out. These systems provide high performance of information management of scientific information.

Viktor B. Shapovalov, Yevhenii B. Shapovalov, Zhanna I. Bilyk, Artem I. Atamas, Roman A. Tarasenko and Vitaliy V. Tron [27] propose to use graph-generators and graph-visualizers of the TODOS IT platform for taxonomization of educational materials. A separate aspect of the TODOS IT platform is the possibility of using a centralized web-oriented learning environment. Creation of the system and transdisciplinary knowledge is a problem of modern education, which can be solved by creating a centralized web-oriented educational environment. Using this approach is an

important part of the learning process. Such a centralized web-oriented environment based on the ontological approach involves filling, adaptive educational services with information resources that reflect the conceptual system of a particular discipline. The paper presents specific developments of one centralized web-oriented educational environment can be used to teach different subjects such as biology, chemistry, Ukrainian language and literature, using the STEM approach.

5 Session 4: Cloud services for learning foreign language

Alona M. Prykhodko, Oksana O. Rezvan, Nataliia P. Volkova and Stanislav T. Tolmachev [26] discusses the use of a Web 2.0 technology tool – educational blog – in the system of teaching foreign languages for enhancement of teaching effectiveness and optimization of students' performance. The authors describe the content, characteristics and didactic properties of an educational blog as an alternative or auxiliary educational environment, define its methodological objectives and list a number of advantages of this approach versus conventional teaching model. The effectiveness of the above-mentioned Web 2.0 technology tool was confirmed by the experiment which showed that an educational blog integrated in a foreign language teaching system contributed to optimization of the process of teaching and learning, development of foreign language communicative competence of students and thereby allowed them to acquire not only communicative but also technological skills.

The article of Svitlana M. Amelina, Rostyslav O. Tarasenko and Albert A. Azaryan [1] deals with the innovative approach to the organization of the information training of translators. The proposed approach will ensure not only the formation of information competence of future translators, but also the formation of an individual information and technology case of the translator. The components of an individual information and technology case are determined. They may include electronic terminology databases, translation memory databases for use in automated translation systems, databases of electronic links to terminological resources network, databases of electronic links to corpora of parallel texts. The using information and technology case of the translator as one of the diagnostic tools for evaluating the information competence level of the translator is proposed. It was found that the creating information and technology case is effective in developing information literacy and improving information technology skills.

Olena O. Pavlenko, Oksana Ye. Bondar, Bae Gi Yon, Choi Kwangoon, Nataliia S. Tymchenko-Mikhailidi and Darja A. Kassim [22] presents an overview of free online resources, mobile apps, and other opportunities available for an independent study of a foreign language (based on the examples of English and Korean languages) in group and individual settings, geared towards increasing a foreign language competence. Initially, the authors formulated the criteria for selecting free online resources: the resource should be convenient for independent work; the resource should be available at any convenient time; it should be easy in navigation; it should provide opportunities for improving as many components of a foreign language competence as possible; preferably, the resource should have online as well as offline mobile apps. It is

suggested to classify free online resources based on their functional characteristics. Various opportunities of the available resources are highlighted and the expediency of their utilization for specific objectives (i.e., advancement of foreign language competence in listening, reading, writing, speaking; the expansion of the vocabulary, etc.) is substantiated. The authors also emphasize free online opportunities of preparation for international examinations not only in the English language, such as TOEFL or IELTS, but also in the Korean language, such as TOPIK, by using online resources in English.

Olha V. Chorna, Vita A. Hamaniuk and Aleksandr D. Uchitel [4] highlights the use of YouTube at the pedagogical university. The article represents the results of theoretical analysis of content on the subject of its personal- and didactic-definite orientation, as well as some aspects of the practical use of commonly used YouTube video materials in the process of teaching German as the first or second foreign language in higher education, namely at the pedagogical university. Taking into account the practical experience of using the materials of several relevant thematic YouTube channels with a fairly wide constant audience, a concise didactic analysis of their product is presented and recommendations on converting video content into methodological material in the framework of practical course of German language by future teachers are offered. Due to the suggested recommendations, the following tasks can be solved: enrichment of the vocabulary; semantization of phraseological units, constant figures of speech, cliché; development of pronunciation skills; expansion of linguistic competence; improving listening and speaking skills; increasing motivation to learn, etc.

Viktoriia O. Ustinova, Svitlana V. Shokaliuk, Iryna S. Mintii and Andrey V. Pikilnyak [33] discuss the modern techniques of organizing computer support for future teachers' independent work in German language. The article summarizes the experience of organizing computer support for future teachers' independent work and the substantive and methodological features of its implementation into the process of experimental introduction of the Moodle course "Foreign (German) Language" into the educational process carried out on the basis of Kryvyi Rih State Pedagogical University (Ukraine).

Rostyslav O. Tarasenko, Svitlana M. Amelina and Albert A. Azaryan [29] shows the current trends in the translator training, which reflect the orientation towards the use of cloud-based automated translation systems. The possibilities of studying cloud-based translation systems in the educational process of training the translator are considered. The role of mastering modern translation tools for forming information competence of translators, particularly technological component, was described. The definition of the list and type of basic translation tools that should be mastered in the studying process was discussed. These tools should include automated translation systems and terminological management systems. It is advisable to provide for the study of both desktop and cloud-based systems. The inclusion in the content of the training translators the study of cloud-based systems of automated translation after desktop systems is proposed. A number of advantages of cloud-based translation systems for the use in the process of training the translators is defined and substantiated. A comparative analysis of the functional of cloud-based automated translation systems (Wordfast Anywhere,

XTM Cloud, and MemSource) with the aim of including them in the content of the training program for translators has been carried out.

6 Session 5: Cloud technologies in STEAM education

Liudmyla I. Bilousova, Liudmyla E. Gryzun, Daria H. Sherstiuk, Ekaterina O. Shmeltser [2] represents the authors' cloud-based complex of computer dynamic models and their transdisciplinary facilities. Proper theoretical background for the complex design is elaborated and the process of the computer models development is covered. The models in the complex are grouped in the sections according to the curriculum subjects (Physics, Algebra, Geometry, Biology, Geography, and Informatics). Each of the sections includes proper models along with their description and transdisciplinary didactic support. The paper also presents recommendations as for using of the complex to provide holistic learning of Mathematics, Science and Informatics at secondary school. The prospects of further research are outlined.

The article of Arnold E. Kiv, Olexandr V. Merzlykin, Yevhenii O. Modlo, Pavlo P. Nechypurenko and Iryna Yu. Topolova [12] deals with the possibilities of using specialized (virtual labs and simulators, software for natural process simulation) and general (programming languages and libraries, spreadsheets, CAS) software in school researches. Such software as virtual labs, software for natural process simulation, programming languages and libraries in school researches can be used to simulate phenomena that cannot be learned in a school lab (for example, for modeling a radioactive decay or for demonstrating the states of relativistic mechanics). Also, virtual labs in school practice are usually used in those cases where students cannot perform an experiment in real labs. For example, it is convenient for distance learning. The using of programming languages and libraries in physics learning research requires both students' physics research competencies and programming competencies. That is why using this software in physics classes can hardly be recommended. However, programming languages and libraries can become a powerful tool for the formation and development of research competencies of physics students in extracurricular learning activities.

Andriy I. Herts, Ivan M. Tsidylo, Nataliia V. Herts and Stanislav T. Tolmachev [7] describes the cloud service ThingSpeak as a tool for monitoring and estimates the atmospheric air pollution. The main components of open instruments of environmental monitoring were implemented via microcontroller development system – Teensy 3.2, sensor module (temperature, humidity, pressure) BME280, SenseAir S8 carbon dioxide sensor module, PMS3003 air pollution sensor, Wi-Fi module ESP-01 and online ThingSpeak platform for storing and processing data. The prototype of an open source software system is developed, which, due to its openness, integration capabilities, ease of design and informativeness, provides monitoring of the human respiratory zone in two districts of the city of Ternopil on the content of suspended particulate matter PM10 and PM2.5. The estimation of the influence of sources of pollution on the level of content suspended particulate matter in the atmospheric air was carried out with the help of multidimensional statistical methods, in particular using statistical procedure by

principal component analysis, which allowed to process a large set of data and to obtain information on quantitative indicators and the nature of pollution. The analysis of particulate matter contents in the context of the cloud computing concept reflects the real-time monitoring metrics through the ThingSpeak services, which serves as a place not only for collecting, analyzing data, but also for discussing the results, thereby training students-biologists to monitor the quality of the surface layer of the atmosphere.

The article of Olga V. Bondarenko, Olena V. Pakhomova and Vladimir I. Zaselskiy [3] is devoted to the topical issue of the cloud technologies implementation in educational process in general and when studying geography, in particular. The authors offer a selection of online services which can contribute to the effective acquisition of geographical knowledge in higher school. The publication describes such cloud technologies as Gapminder, DESA, Datawrapper.de, Time.Graphics, HP Reveal, MOZAIK education, Settera Online, Click-that-hood, Canva, Paint Instant. It is also made some theoretical generalization of their economic, technical, technological, didactic advantages and disadvantages. Visual examples of application are provided in the article. The authors make notice that in the long run the technologies under study should become a valuable educational tool of creation virtual information and education environments connected into common national, and then global, educational space.

Ihor V. Kholoshyn, Iryna M. Varfolomyeyeva, Olena V. Hanchuk, Olga V. Bondarenko, Andrey V. Pikilnyak [11] discuss the Earth remote sensing data as one of the basic directions of Geo-Information Science, a unique source of information on processes and phenomena occurring in almost all spheres of the Earth geographic shell (atmosphere, hydrosphere, lithosphere, etc.). The authors argue that the use of aerospace images by means of the information and communication technologies involvement in the learning process allows not only to increase the information context value of learning, but also contributes to the formation of students' cognitive interest in such disciplines as geography, biology, history, physics, computer science, etc. It has been grounded that remote sensing data form students' spatial, temporal and qualitative concepts, sensory support for the perception, knowledge and explanation of the specifics of objects and phenomena of geographical reality, which, in its turn, provides an increase in the level of educational achievements. The techniques of aerospace images application into the modern school practice have been analyzed and illustrated in the examples: from using them as visual aids, to realization of practical and research orientation of training on the basis of remote sensing data. Particular attention is paid to the practical component of the Earth remote sensing implementation into the modern school practice with the help of information and communication technologies.

Ihor V. Kholoshyn, Olga V. Bondarenko, Olena V. Hanchuk and Ekaterina O. Shmeltser [10] outline the basic principles for implementing ArcGIS Online in the educational process (interdisciplinary integration, the sequence of individualization in training, communicability, distance education and regional studies), and provide an example of an interactive map created with the help of the specified cloud GIS, since this kind of map is the most popular a form of research by geography students. In the article it is noted that integration of ArcGIS Online into the educational process allows the teacher to follow a clear pedagogical strategy, taking into account possible variants

of its use (demonstration, direct mastering of GIS in a computer class and independent work in an individual mode). Considering cloud GIS as a new stage in the development of geoinformational education, the authors emphasize their key benefits (round-the-clock access, work with GIS package in the cloud, the ability to use other maps as well as the creation of their own maps and web-applications) and disadvantages (monetization of services, underestimation of the GIS role in the curriculum of the higher school, the lack of Ukrainian content, etc.).

Yevhenii O. Modlo, Serhiy O. Semerikov, Pavlo P. Nechypurenko, Stanislav L. Bondarevskyi, Olena M. Bondarevska and Stanislav T. Tolmachev [19] discuss the use of mobile Internet devices (MID) in the formation of ICT component of bachelors in electromechanics competency in modeling of technical objects. It has been established that despite the fact that MID are actively used by electrical engineers, the methods of using them in the process of bachelor in electromechanics training is considered only in some domestic scientific studies. The article highlights the components of the methods of using MID in the formation of the ICT component of the competence of the bachelor in electromechanics in modeling of technical objects, providing for students to acquire basic knowledge in the field of Computer Science and modern ICT and skills to use programming systems, math packages, subroutine libraries, and the like. For processing tabular data, it is proposed to use various freely distributed tools that do not significantly differ in functionality, such as Google Sheets, Microsoft Excel, for processing text data – QuickEdit Text Editor, Google Docs, Microsoft Word. For 3D-modeling and viewing the design and technological documentation, the proposed comprehensive use of Autodesk tools in the training process.

Liudmyla H. Havrilova, Olena Ye. Ishutina, Valentyna V. Zamorotska, Darja A. Kassim [6] substantiates the scientific and methodological background of creation and development of the distance learning courses for the future music teachers is. The components and structure of future music teachers' instrumental performance competence are defined; the content of the course is revealed. The materials are based on the authors' teaching experience within the distance learning course "Basic Musical Instrument (Piano)". The main blocks of the distance course design and development are considered among them to be theoretical, practical, individual work, and control blocks. The specificity of distance learning methods in the future music teachers' instrumental and performance training is substantiated and three main methods are distinguished. The method of involving information and communication technologies, including multimedia; project method, and features of knowledge and skills controlling are elaborated. The results of implementation and experimental research of using distance learning courses for developing future music teachers' instrumental performance competence are described. The influence of different methods use on students' success is explored.

Nadiia V. Olefirenko, Ilona I. Kostikova, Nataliia O. Ponomarova, Liudmyla I. Bilousova and Andrey V. Pikilnyak [21] presents e-learning resources for successful math teaching to pupils of primary school. Primary schools are basically focused on development subject knowledge and general study skills. One of the ways of their developing is to use tools and apps. There are the examples of using interactive tools and apps for teaching Math for young learners by teachers-to-be in the article. The

article presents as well the experimental data about training teachers-to-be to use tools and apps. Interactive tools and apps provide real task variability, uniqueness of exercises, operative assessment of correction, adjustment of task difficulty, a shade of competitiveness and gaming to the exercises. To create their own apps teachers-to-be use the tools that are the part of the integrated Microsoft Office package using designing environments, and other simple and convenient programs. The article presents experimental data about the results of training teachers-to-be to create apps. A set of criteria for creation apps was made and checked at the experimental research such as ability to develop apps, knowledge and understanding the functional capabilities of apps, knowledge of tools for creating apps and their functional capabilities, ability to select and formulate tasks for young learners, ability to assess adequately the quality of the developed apps.

The article of Iryna V. Lovianova, Dmytro Ye. Bobyliev and Aleksandr D. Uchitel [16] deals with the problem of introducing cloud calculations into 10th-11th graders' training to solve optimization problems in the context of the STEM-education concept. After analyzing existing programmes of optional courses on optimization problems, the programme of the optional course "Optimization Problems" has been developed and substantiated implying solution of problems by the cloud environment CoCalc. It is a routine calculating operation and not a mathematical model that is accentuated in the programme. It allows considering more problems which are close to reality without adapting the material while training 10th-11th graders. Besides, the mathematical apparatus of the course which is partially known to students as the knowledge acquired from such mathematics sections as the theory of probability, mathematical statistics, mathematical analysis and linear algebra is enough to master the suggested course. The developed course deals with a whole class of problems of conventional optimization which vary greatly. They can be associated with designing devices and technological processes, distributing limited resources and planning business functioning as well as with everyday problems of people. Devices, processes and situations to which a model of optimization problem is applied are called optimization problems. Optimization methods enable optimal solutions for mathematical models. The developed course is noted for building mathematical models and defining a method to be applied to finding an efficient solution.

Oksana M. Hlushak, Volodymyr V. Proshkin, Oksana S. Lytvyn [8] describes the using of e-learning course "Analytic Geometry" in the process of training students majoring in Computer Science and Information Technology. As a result of analysis the expediency of free access of bachelors majoring in Computer Sciences and Information Technologies to modern information educational resources, in particular, e-learning courses in the process of studying mathematical disciplines is substantiated. It was established that the e-learning course is a complex of teaching materials and educational services created for the organization of individual and group training using information and communication technologies. Based on the outlined possibilities of applying the e-learning course, as well as its didactic functions, the structure of the certified e-learning course "Analytic Geometry" based on the Moodle platform was developed and described. Features of application of cloud-oriented resources are considered: Desmos, Geogebra, Wolfram|Alpha, Sage in the study of the discipline "Analytic Geometry".

The prospect of further scientific research is outlined through the effectiveness of the use of e-learning courses for the improvement of additional professional competences of students majoring in Computer Sciences and Information Technologies (specialization “Programming”, “Internet of Things”).

The article of Maryna M. Volikova, Tetiana S. Armash, Yuliia V. Yechkalo and Vladimir I. Zaselskiy [34] devoted to the peculiarities of the practical use of cloud services for the organization of qualitative professional training of future specialists. It is established that in order to implement state policy, there is an essential need for using various ICT, in particular cloud services, which are not only economically acceptable in the new educational environment, but also a powerful tools of obtaining new knowledge, skills and abilities. The advantages and disadvantages of using cloud services in the educational process of higher education are substantiated; the examples discuss the methods of using cloud services in the process of studying fundamental disciplines. It describes the use of the blog as a media-educational technology during the advent of pedagogical practice. The methods of using cloud-based services on the example of creation of a distance course “Linear algebra and analytic geometry” are considered. The prospects of research, which consist in getting acquainted with cloud technologies of the humanitarian profile future specialists at the second higher education, are determined. It has been established that the practical application of cloud technologies in the educational process will promote more qualitative and progressive learning; the formation of a close interaction between the teacher and student; development of professional skills and abilities of independent work.

The article of Oksana M. Markova, Serhiy O. Semerikov, Andrii M. Striuk, Hanna M. Shalatska, Pavlo P. Nechypurenko and Vitaliy V. Tron [17] deals to implementation of cloud service models in training of future information technology specialists. Leading research directions are defined on the basis of self-analysis of the study results on the use of cloud technologies in training by employees of joint research laboratory “Cloud technologies in education” of Kryvyi Rih National University and Institute of Information Technology and Learning Aids of the NAES of Ukraine in 2009-2018: cloud learning technologies, cloud technologies of blended learning, cloud-oriented learning environments, cloud-oriented methodological systems of training, the provision of cloud-based educational services. The ways of implementation SaaS, PaaS, IaaS cloud services models which are appropriate to use in the process of studying the academic disciplines of the cycles of mathematical, natural science and professional and practical training of future specialists in information technology are shown, based on the example of software engineering, computer science and computer engineering. The most significant advantages of using cloud technologies in training of future information technology specialists are definite, namely, the possibility of using modern parallel programming tools as the basis of cloud technologies. Conclusions are drawn; the direction of further research is indicated: designing a cloud-oriented learning environment for future specialists in computer engineering, identifying trends in the development of cloud technologies in the professional training and retraining of information technology specialists, developing a methodology for building the research competencies of future software engineering specialists by using cloud technologies.

The article of Dmytro A. Pokryshen, Evgeniy H. Prokofiev and Albert A. Azaryan [24] is devoted to the coverage of the course “Database management system Microsoft Access”, an educational blog review “The development of a creative child. ICT”, which is used as an auxiliary tool for promoting a course and teacher in the Internet, structural analysis of this blog is made. The channel location is set on YouTube video hosting and how it is used in the course on databases. Attention is drawn to the fact that theoretical and practical material is considered on real, implemented informational and analytical systems. To prepare students for the Olympiads and provide methodological help teachers of computer science are looking at tasks from databases that were offered at the All-Ukrainian Olympiads on Information Technologies, especially II, III and IV stages (online and online Olympiads), which are located in open access to the blog and YouTube channel. The main focus of the article is devoted to the practical side of teaching teachers of computer science, experience in using the above technologies.

Iryna S. Mintii, Svitlana V. Shokaliuk, Tetiana A. Vakaliuk, Mykhailo M. Mintii and Vladimir N. Soloviev [18] highlights the theoretical and methodological aspects of preparing the test questions of the most common types in the form of text files for further import into Moodle learning management system (LMS). The action algorithms for importing questions and instructions for submitting question files in such formats as Aiken, GIFT, Moodle XML, “True/False” questions, “Multiple Choice” (one of many and many of many), “Matching”, with an open answer – “Numerical” or “Short answer” and “Essay” are offered in this article. The formats for submitting questions, examples of its designing and developed questions were demonstrated in view mode in Moodle LMS.

7 Conclusion

The vision of the CTE 2018 is provides a premier interdisciplinary platform for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of educational technology.

The workshop has successfully performing forum to transferring and discussing research result among the researcher, students, government, private sector or industries. Participants and presenters from several countries such as Israel, Poland, Sweden, Ukraine have attended the workshop to share their significant contribution in research related to Cloud Technologies in Education.

We are thankful to all the authors who submitted papers and the delegates for their participation and their interest in CTE 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.

We hope you enjoy this workshop and meet again in more friendly, hilarious, and happiness of further CTE 2019.

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