Педагогіка вищої та середньої школи
2019. Випуск 52. С. 235–252

УДК 378.147:004.77

Practical use of cloud services for organization of future specialists professional training

Maryna M. Volikova[1], **Tetiana S. Armash**[2][0000−0002−9212−6027], **Yuliia V. Yechkalo**[3][0000−0002−0164−8365] **and Vladimir I. Zaselskiy**[1]

[1] Kryvyi Rih Metallurgical Institute of the National Metallurgical Academy of Ukraine, 5, Stepana Tilhy Str., Kryvyi Rih, 50006, Ukraine

[2] Kryvyi Rih State Pedagogical University, 54, Gagarina Ave., Kryvyi Rih, 50086, Ukraine

[3] Kryvyi Rih National University, 11, Vitali Matusevich Str., Kryvyi Rih, 50027, Ukraine

a.volikov@ukr.net, armash@i.ua, uliaechk@gmail.com, zaselskiy52@mail.ru

Abstract. The article is 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. The object of the study is the professional training of students in higher education institutions. The subject of research is the process of organizing professional training of future specialists with the use of cloud services.

To achieve the set goals, a set of general scientific (analysis, synthesis, comparison) and specific scientific (bibliographic, problem-based) was used. Observation and conversation manipulation allowed to highlight the advantages and disadvantages of using cloud services and draw conclusions from the problem under investigation.

The foreign experience of using cloud services has been researched and the features of the application of traditional and distance technology training abroad have been determined.

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.

Keywords: cloud services, high school, specialists.

1 Introduction

The 21st century is safe to call the century of cloud technologies. It is for the cloud-based services themselves, namely, their skillful use by teachers and students in the educational process depends on the quality of the material being learned. Educational changes that produce today are not only changes in the effective use of modern techniques, but also the complex use of communication tools, both in the study of humanities and fundamental disciplines. Therefore, innovative youth education is, first and foremost, a preparation for active and full-fledged life in the new conditions of today, which is the key to the successful development of Ukrainian society.

The normative legal documents of Ukraine that determine the priority directions of educational activity in the field of ICT include: Laws of Ukraine "On Education" (2017), "On Higher Education" (2014); Decrees of the President of Ukraine "On Measures to Ensure Priority Development of Education in Ukraine" (2010), "On the National Strategy for the Development of Education in Ukraine until 2021" (2013), "On Measures for the Development of National constituent of the global information network of the Internet and ensuring wide-ranging access to this network in Ukraine" (2000); Order of the Cabinet of Ministers of Ukraine "On Approval of the Strategy for the Development of the Information Society in Ukraine" (2013) and others.

Referring to the text of the aforementioned documents once again convinces in the understanding of the domestic scientific community the feasibility of using modern cloud services aimed at improving the educational process, ensuring the openness and quality of education, training young people in the use of progressive information tools, as well as creating an information security system in the field of management of educational institutions. Therefore, today, in order to implement the state policy, there is an urgent need to use various ICT, in particular cloud services, which, in the new educational environment, are not only economically acceptable, but also a powerful tools of acquiring new knowledge, skills and abilities.

It should be noted that ICT have found their wide coverage in domestic and foreign scientific and pedagogical discourse. To domestic scientists whose work is a significant contribution to improving the methods of using

the cloud technologies in education include the Maiia V. Popel [12, 17] and Mariya P. Shyshkina [17, 21], who in their works violate the problems of cloud-oriented systems use in the educational process of higher educational institutions. The solid work in this direction is also found in the writings of Yurii V. Tryus [25].

The scientist raises issues related to the cloud services use in the teaching of mathematical discipline, namely freely distributed web-oriented systems of computer mathematics and technologies of mobile mathematics learning. Vladimir N. Kukharenko is emphasizing some aspects of students distance learning and the webinars use in the educational process. The researcher believes that mass distance courses are possible under the condition of the formation of students of the personal learning environment and the skills of the curator of the content, that is, the ability to work with large unstructured information, create electronic magazines, service, write blogs [10].

Oksana M. Markova [13, 24], Serhiy O. Semerikov [16, 24] and Andrii M. Striuk [9, 22] study the experience of using cloud services by foreign scientists, as well as prospects for the use of information and communication technologies in Ukraine. Scientists have come to the conclusion about the continuity of the development of cloud technologies over the past 55 years and their close relationship with the development of ICT in general [14]. Yuliia V. Yechkalo [26] explains the possibilities of using basic Google services during the study of physics at a high school, and draws attention to the fact that services today are an effective means of assimilating a significant amount of information [5].

Important contributions to the research and distribution of cloud services are made by foreign researchers such as Davide Salomoni [20], Gustavo Gutiérrez-Carreón [7], and others; the questions of on-line learning of students are explored by Robert W. Mendenhall [15], William G. Bowen [2] and others; network technologies are described in detail in the works of Tianping Dong [4], Faten Karim [8]; the use of cloud technologies in teaching mathematics is considered in the works of Georgii A. Aleksanian [1] and others; the trends and prospects for using cloud-based services in education are studied by Ghazal Riahi [19] et al.

In their publications, scientists draw attention to the fact that the knowledge of the cloud technology, the availability of computer software and open access to Internet resources expands the range of opportunities for both teaching and learning. However, Michele D. Dickey [3] and Gordon Freedman [6] who are working on the use of distance learning technology increasingly insist that the use of cloud services should be not only effective,

but also accessible to the general public of students.

Consideration of domestic and foreign works allows us to state that despite the considerable number of scientific works aimed at the large-scale study of ICT, the use of cloud services, namely their advantages and disadvantages, remains controversial and requires profound analysis and theoretical generalization.

We believe that the scientific achievements of domestic and foreign scientists today serve as a powerful theoretical basis for the use of cloud services for the organization of professional training of future specialists in various fields of activity.

2 Methods

The purpose of the research is to determine the peculiarities of the practical use of cloud-based services for the organization of qualitative professional training of future specialists. The purpose is led to the choice of a set of scientific methods, in particular the following:

- general science: analysis, synthesis, comparison, generalization, classification and systematization allowed to study and group the research material, to show the scientific views on the use of cloud services for the organization of high-quality professional training of future specialists, provided the opportunity to formulate conclusions;
- special scientific: informational and bibliographic methods ensured the development of scientific literature, normative-legal documents, materials of periodicals; the problem-chronological method helped to determine the degree of research problem.

3 Results

Modern youth as humanitarian and technical specialties widely uses information and communication means, in particular cloud services, although the application of them began in the early 1960s, but they gained the greatest popularity in the early 2000s. It is worth noting that the future mathematics teachers of Kryvyi Rih State Pedagogical University in the process of studying the methods of teaching mathematics widely use the cloud technologies (sites, blogs, electronic courses, mobile mathematical environments) that help to change the educational environment, and also make education more qualitative in conditions of constant competition of higher educational establishments.

3.1 Use of cloud services during the pedagogical practice of students in school

Traditionally, during the pedagogical practice, students are offered to maintain a prescribed form of a paper version of the psychological and pedagogical diary, which reflects not only the content of the work carried out by the students, but also the results of his research activities and the execution of individual tasks. A feature of the modern approach to gaining knowledge by students is blogging [18]. Therefore, the practical significance of using cloud technologies is determined by such advantages as: attraction of like-minded people, time saving, constant filling, since mobile devices are always on hand at hand, constant control of the written, the teacher can always read the blog and write their comments or timely point out certain disadvantages. In turn, experience shows that the massive use of the blog as media-educational technology [27] in the learning process affects the content of the material that is taught by students on the Internet. According to our belief, the youth cannot always write everything truthfully and frankly covering the details, thereby realizing that the blog may be available to a wider range of users than the paper version of the diary. This experience has shown that the use of cloud services opens up a wide range of opportunities for interpersonal communication and professional growth of students. Instead, the cloud services help the teacher not only control the effectiveness of the classes, but also make adjustments during the practice.

Thus, a blog can act as a subject educational environment for the student himself who conducts it and for readers who read it. In our belief, the practical use of the blog opens up wide opportunities for implementing their own ideas and initiatives. The use of this service allows:

- students freely and openly communicate with each other during the practice;
- teachers and other members of the group will evaluate the work of students, since the blog in this case serves as a tool for organizing and conducting control.

What is important is that cloud services are an effective tool through which reflexive, research-based teaching methods are implemented through the re-viewing of necessary information, reading of publications and participation in online discussions.

In table 1, features of the practical use of cloud services during pedagogical practice in the form of advantages and disadvantages are presented.

Table 1. Advantages and disadvantages of using cloud services in the educational process while undergoing pedagogical practice in school

Advantages	Disadvantages
Feedback between student and supervisor	Constant control written by the student, which leads to a decrease in sincerity
Making comments from readers and like-minded people	High standards of reporting quality
Save time	As user grows, information leakage increases
Constant updating of data	

3.2 Use of cloud services at Intel program "Learning for the Future"

In order to consolidate the knowledge gained and develop the skills of independent research, students are encouraged to master the international Intel program "Learning for the Future". The purpose of the program is to help young people develop their own projects on selected subjects and develop their mathematical learning skills through ICT and project methods.

The program implementation is involves the modular student training with a clear algorithm for learning. It is aimed at creating projects with a wide range of cloud-based services. This approach to teaching gives the teacher the opportunity to apply various forms of organization of the training process, such as: independent work with computer, work in pairs, interactive work in small groups, collective discussion of issues, etc.

It can be noted that the content of the program is aimed at the formation of the following student's abilities: to handle a large amount of information; to find and select the required information; to create new knowledge; to carry out research and project activities; to work with information resources, including cloud services.

In general, the program is aimed to improve the mathematical competence, the implementation of teaching tasks, which in turn contributes to the qualitative development of competitive professionals capable of adapting in the new educational environment.

In table 2, features of the practical use of cloud services cloud services at Intel program "Learning for the Future" in the form of advantages and disadvantages are presented.

Table 2. Advantages and disadvantages of using cloud services in the learning Intel program "Learning for the Future"

Advantages	Disadvantages
Maintaining the relevance of information	Not for every topic you can and need to create projects
Rapid correction	High requirements for the quality of communication channels
Ability to properly prepare for classes	
Accounting software usage	

3.3 Features of the study of mathematical disciplines using cloud technologies

Depending on the course offered by the student to study, it is recommended to use a variety of computer mathematics systems that are freely available on the Internet to save time, since more and more credits are related to the independent study of the learning material. At Calculus study, the graphic editors should be used to construct areas and integration surfaces, but one should not forget that students should use graphic editors only when they can build it and define the boundaries of the area or the surface of the integration on their own, and it is time to use graphic editors to save time. Also, when studying the probability theory and mathematical statistics, they can use software tools to calculate the numerical characteristics of random variables that require cumbersome numerical computations, and so on. We have also taken into account the students' ability to work with spreadsheets, edit mathematical formulas, etc.

Table 3. Advantages and disadvantages of using cloud services in the study of mathematics

Advantages	Disadvantages
Ability to prepare for the classroom qualitatively	There is no opportunity to work out the skills of mathematical calculations and transformations
Rapid correction	Constant monitoring of the data entered
Ability to customize the software for the needs of a particular course	
Saving time	

We believe that when using cloud services in solving mathematic

problems it is expedient to apply problem and research methodology of training using individual and group activities. In this case, cloud services give an opportunity, regardless of the choice of program, to get the desired results.

In table 3, features of the practical use of cloud services during the study of mathematical disciplines in the form of advantages and disadvantages are presented.

3.4 Application of cloud technologies in students' research activities

Cloud services are a powerful tool for improving the quality of higher education in its development and modernization. Therefore, students, which is constantly moving cloud services, will promote:

- qualitative preparation for various forms of educational work;
- interest in educational subjects;
- the desire to acquire skills and skills in a relatively short time;
- the emergence of interest in learning and the desire to succeed;
- curiosity, the desire to know the essence of the observational facts, the phenomena surrounding them in life.

You can also improve the quality of writing master's theses by utilizing cloud services. It is advisable to use cloud services to create online questionnaires, interactive tasks, and electronic courses on selected topics of research.

In table 4, features of the practical use of cloud services during the research activity of students in the form of advantages and disadvantages are presented.

Table 4. Advantages and disadvantages of using cloud services during research activities of students

Advantages	Disadvantages
Wide opportunities for creating and testing non-standard hypotheses	Verification of information from online resources
Online surveys to conduct research	Borrowing someone else's experience
Use of services to create interactive exercises on the topic of research	
Familiarity with the expertise of a large number of industry experts	

3.5 Features of creating electronic courses

Cloud technologies play an important role in the organization of all elements of the educational process, including the independent work of students, through the information support of the learning process.

The use of cloud services in the educational process provides an opportunity for effective implementation of the principle of continuity of education and openness, as well as the ability to implement independent educational activities of students. We define the requirements for the organization of independent work during training with the use of cloud services:

- control effectiveness;
- provision of feedback;
- high activity of interaction between students and teachers, between students themselves;
- individualization and differentiation of learning;
- the possibility of using a collective form of independent work;
- a more comfortable atmosphere of independent work (establishing a democratic style of communication between students and teachers);
- providing each student with the necessary materials for self-study (lecture material, glossary, useful links, assignments, online teacher tutorials, Internet resources, etc.).

In our opinion, the problem of developing and implementing electronic distance learning courses in the educational process is more urgent for a more successful organization of independent work of students.

An electronic course "Linear algebra and analytic geometry (part 1)" [11] for future mathematics teachers meets the new State Standards and Programs, in particular for university.

The purpose of the course is to familiarize students with the theoretical foundations of linear algebra, which are necessary for the further study of courses of special disciplines, to teach students to experience the formation and development of practical skills and abilities that are needed for the analysis, research and solving problems.

After studying the course, students should get:

- knowledge of basic properties, theorems of linear algebra and examples of their application;
- knowledge of mathematical methods and algorithms for problem solving and their application;

- ability to prove the basic theorem;
- ability to use methods and techniques of linear algebra.

The proposed course contains three modules. Study course is provided by the curriculum in 18 weeks. For each of the course topics, the following components have been developed and proposed:

- the purpose of studying a specific topic;
- the content of the topics being studied;
- self-training plan for the student;
- tasks and questions for self-control;
- tests;
- typical mistakes made by students when studying a particular topic;
- list of used and recommended literature;
- additional links on the Internet (list with electronic bible libraries, some educational courses, catalogs and search engines).

In the process of mastering the course, students will have consultations, chats, forums, topic discussions, etc., both with the teacher and with the students.

The course has a system of hyperlinks for didactic-methodical literature on the course, which will enable students to at a higher level learn the teaching material and reduce the time spent by students at the computer.

The propaedeutic of the study of the electronic course are:

- knowledge of elementary mathematics;
- availability and ability to work with e-mail;
- access to the Internet;
- ability to work in different editors (text, spreadsheets, etc.).

In the process of studying this course, the students undergo the following types of control: incoming, current (control questions at the end of study of each topic), intermediate (presented in the test form for each course topic), final (exam). At the same time, current and intermediate control is carried out remotely, and the final one — in direct communication with the teacher (not necessarily with the testator) of the course.

This experience has shown that the use of electronic courses in disciplines, not only makes it possible to master the subject qualitatively and systematically, but also allows them to perform tasks of increased complexity, to solve non-standard tasks.

The mentioned problems in their scientific investigations are actualized by Serhiy O. Semerikov. The scientist emphasizes the need to use a variety of cloud technologies in the learning process and draws attention to the fact that it is technologies that open up new prospects for learning, especially for those who live in isolation or in remote places or face learning difficulties [23, p. 189]. In particular, the scientist singles out the following features of e-learning:

- the possibility of interaction between the teacher and the student in the dialogue mode, which in some cases can be closer to the dialogue interaction in traditional educational technologies;
- fast sending / receiving of educational materials in electronic data;
- operational access to Internet information resources;
- the possibility of checking and controlling knowledge in remote mode;
- the possibility of organizing laboratory workshops in a virtual mode through the implementation of remote network access to real laboratory equipment;
- creation of "virtual groups" for operational interaction between students;
- the possibility of accumulation of statistical data and, on the basis of their analysis, the management of the training;
- improving the quality of teaching and management;
- introduction of automated quality management training;
- individualization of vocational training through the creation of individual training schedules for individual students [23, p. 191–192].

Expediency and possibilities of using cloud services are of interest not only to domestic, but also foreign scientists. In particular, William G. Bowen [2] believes that the rapid growth of online learning in the United States is an indication that cloud clusters occupy an important place among the many areas of educational development by opening up opportunities and perspectives for young people. Interestingly, our study is a test conducted among students to test residual knowledge. Test results have shown that there are no sharp differences between experimental groups (traditional and remote learning technologies). However, one cannot ignore the fact that the group that was learning to use cloud services in terms of performance was better.

In the context of our research, research by Robert W. Mendenhall [15] is interesting, which points out that the quality of education is largely

independent of the way services are provided; alongside there is a high-quality, distance and quality traditional classroom in the classroom, but in both cases there is a low level of self-esteem of the material. Scientist points out that the disadvantages of distance learning still exist, many of them can be identified as follows:

- most universities have not yet found new ways to use cloud services for high-quality conversion;
- for educational institutions with distance learning it is difficult to calculate the number of hours and minutes that students spend on direct learning;
- the most important aspect of this issue is the use of time in an audience: whether students can acquire the knowledge they need to be successful by other means.

Mendenhall draws attention to the fact that the distance learning form demonstrates its advantages over other forms:

- in an online tutorial that really uses a variety of cloud-based services, the role of a tutor can vary from mentoring to effective teaching;
- using cloud services to evaluate the student's learning can clearly identify the student's level of knowledge of the program material and how much time it takes for the tasks in and out of the audience;
- cloud services allow to fundamentally change the model for individualization of training and thus improve learning and reduce costs.

As a result, Mendenhall emphasizes that the use of distance learning is a matter of higher education quality [15].

Table 5. Advantages and disadvantages of using cloud services in the electronic courses

Advantages	**Disadvantages**
Continuous reflexive and evaluation activity Convenient remote control navigation system Wide opportunities for interaction between members of the education through the system of messages, forums, chats Ability to pass the distance course at a convenient pace	Lack of "live" communication between members of the educational process High requirements for the quality of communication channels

In table 5, the peculiarities of the practical use of cloud services in the application of electronic courses in the form of advantages and disadvantages are presented.

4 Conclusions and perspectives for further studies

Research has shown that the benefits of using cloud services are far more than disadvantages, so their use in the educational process will only improve the quality of learning and will in the future serve as a powerful incentive for the professional development of students. It should be emphasized that the use of cloud services should be deliberate and methodically feasible. Therefore, the disadvantages of using cloud services in the educational process can be eliminated or their impact reduced to a minimum.

To summarize, qualitative professional training of specialists will be effective if institutions of higher education can safely use cloud services, thus inducing teachers to master modern methods and techniques of their practical application. At the same time, the result of scientific research have shown that it is cloud services that open up wide opportunities for the realization of creative abilities for both teachers and students.

The research carried out within the framework of this work does not exhaust all aspects of the practical use of cloud services for the organization of high-quality professional training of future specialists. Given the urgency of the issue raised for the domestic education system, further issues of relevance to the issues related to the possibilities of using cloud services during the study of the disciples of the humanitarian cycle.

References

1. Aleksanian, G. A.: Formirovanie samostoiatelnoi deiatelnosti studentov SPO v obuchenii matematike s ispolzovaniem oblachnykh tekhnologii (Formation of independent activities of students of secondary vocational education in teaching mathematics using cloud technologies). Dissertation, Armavir State Pedagogical University (2014).
2. Bowen, W. G., Chingos, M. M., Lack, K. A., Nygren, T. I.: Online Learning in Higher Education: Randomized trial compares hybrid learning to traditional course. Education Next 13 (2), 59–64. https://www.educationnext.org/files/ednext_XIII_2_bowen_chingos.pdf (2013). Accessed 25 Oct 2018.
3. Dickey, M. D.: Three-dimensional virtual worlds and distance learning: two case studies of Active Worlds as a medium for distance

education. British of Educational Technology 36 (3), 439–451 (2009). doi: 10.1111/j.1467-8535.2005.00477.x

4. Dong, T., Ma, Y., Liu, L.: The Application of Cloud Computing in Universities' Education Information Resources Management. In: Zhu, R., Ma, Y. (eds.) International Conference on Information Engineering and Applications (IEA 2011). Lecture Notes in Electrical Engineering, vol. 154, pp. 938–945. Springer, London (2012). doi: 10.1007/978-1-4471-2386-6_122
5. Echkalo, Yu. V.: Bazovi servisy Google u navchanni fizyky studentiv vyshchykh navchalnykh zakladiv (The basic Google services in physics learning in higher education). Naukovi zapysky, Seriia: Problemy metodyky fizyko-matematychnoi i tekhnolohichnoi osvity 5 (2), 95–98 (2014).
6. Freedman, G. Cloud Technology Can Lift the Fog over Higher Education. The Chronicle of Higher Education. https://www.chronicle.com/article/Cloud-Technology-Can-Lift-the/131673 (2012). Accessed 17 Aug 2019.
7. Gutiérrez-Carreón, G., Daradoumis, T., Jorba, J.: Integrating Learning Services in the Cloud: An Approach that Benefits Both Systems and Learning. Journal of Educational Technology & Society, 18 (1), 145–157 (2015).
8. Karim, F., Goodwin, R.: Using Cloud Computing in E-Learning Systems. International Journal of Advanced Research in Computer Science and Technology 1 (1), 65–69. https://www.ijarcst.com/doc/vol1-issue1/faten.pdf (2013). Accessed 17 Aug 2019.
9. Kiv, A. E., Semerikov, S. O., Soloviev, V. N., Striuk, A. M.: First student workshop on computer science & software engineering. In: Kiv, A. E., Semerikov, S. O., Soloviev, V. N., Striuk, A. M. (eds.) Proceedings of the 1st Student Workshop on Computer Science & Software Engineering (CS&SE@SW 2018), Kryvyi Rih, Ukraine, November 30, 2018. CEUR Workshop Proceedings 2292, 1–10. http://ceur-ws.org/Vol-2292/paper00.pdf (2018). Accessed 31 Dec 2018.
10. Kukharenko, V., Oleinik, T.: Open Distance Learning For Teachers. In: Ermolayev, V., Mallet, F., Yakovyna, V., Kharchenko, V., Kobets, V., Korniłowicz, A., Kravtsov, H., Nikitchenko, M., Semerikov, S., Spivakovsky, A. (eds.) Proceedings of the 15th International Conference on ICT in Education, Research and Industrial Applications.

Integration, Harmonization and Knowledge Transfer (ICTERI, 2019), Kherson, Ukraine, June 12–15 2019, vol. II: Workshops. CEUR Workshop Proceedings 2393, 156–169. http://ceur-ws.org/Vol-2393/paper_295.pdf (2019). Accessed 30 Jun 2019.

11. Liniina alhebra ta analitychna heometriia (chastyna 1) (Linear algebra and analytic geometry (part 1)). http://moodle.kdpu.edu.ua/course/view.php?id=59 (2019). Accessed 17 Aug 2019.

12. Markova, O., Semerikov, S., Popel, M.: CoCalc as a Learning Tool for Neural Network Simulation in the Special Course "Foundations of Mathematic Informatics". In: Ermolayev, V., Suárez-Figueroa, M. C., Yakovyna, V., Kharchenko, V., Kobets, V., Kravtsov, H., Peschanenko, V., Prytula, Ya., Nikitchenko, M., Spivakovsky A. (eds.) Proceedings of the 14th International Conference on ICT in Education, Research and Industrial Applications. Integration, Harmonization and Knowledge Transfer (ICTERI, 2018), Kyiv, Ukraine, 14–17 May 2018, vol. II: Workshops. CEUR Workshop Proceedings 2104, 338–403. http://ceur-ws.org/Vol-2104/paper_204.pdf (2018). Accessed 30 Nov 2018.

13. Markova, O. M., Semerikov, S. O., Striuk, A. M., Shalatska, H. M., Nechypurenko, P. P., Tron, V. V.: Implementation of cloud service models in training of future information technology specialists. In: Kiv, A. E., Soloviev, V. N. (eds.) Proceedings of the 6th Workshop on Cloud Technologies in Education (CTE 2018), Kryvyi Rih, Ukraine, December 21, 2018. CEUR Workshop Proceedings 2433, 499–515. http://ceur-ws.org/Vol-2433/paper34.pdf (2019). Accessed 10 Sep 2019.

14. Markova, O. M., Semerikov, S. O., Striuk, A. M.: The cloud technologies of learning: origin. Information Technologies and Learning Tools 46 (2), 29–44 (2015). doi: 10.33407/itlt.v46i2.1234

15. Mendenhall, R. W.: How Technology Can Improve Online Learning — and Learning in General. Chronicle of Higher Education. https://www.chronicle.com/article/How-Technology-Can-Improve/129616 (2011). Accessed 25 Oct 2018.

16. Modlo, Ye. O., Semerikov, S. O., Nechypurenko, P. P., Bondarevskyi, S. L., Bondarevska, O. M., Tolmachev, S. T.: The use of mobile Internet devices in the formation of ICT component of bachelors in electromechanics competency in modeling of technical objects. In: Kiv, A. E., Soloviev, V. N. (eds.) Proceedings of the 6th Workshop on Cloud Technologies in Education (CTE 2018), Kryvyi Rih, Ukraine, December

21, 2018. CEUR Workshop Proceedings 2433, 413–428. http://ceur-ws.org/Vol-2433/paper28.pdf (2019). Accessed 10 Sep 2019.

17. Popel, M. V., Shyshkina, M. P.: The areas of educational studies of the cloud-based learning systems. In: Kiv, A. E., Soloviev, V. N. (eds.) Proceedings of the 6th Workshop on Cloud Technologies in Education (CTE 2018), Kryvyi Rih, Ukraine, December 21, 2018. CEUR Workshop Proceedings 2433, 159–172. http://ceur-ws.org/Vol-2433/paper09.pdf (2019). Accessed 10 Sep 2019.
18. Prykhodko, A. M., Rezvan, O. O., Volkova, N. P., Tolmachev, S. T.: Use of Web 2.0 technology tool — educational blog — in the system of foreign language teaching. In: Kiv, A. E., Soloviev, V. N. (eds.) Proceedings of the 6th Workshop on Cloud Technologies in Education (CTE 2018), Kryvyi Rih, Ukraine, December 21, 2018. CEUR Workshop Proceedings 2433, 256–265. http://ceur-ws.org/Vol-2433/paper16.pdf (2019). Accessed 10 Sep 2019.
19. Riahi, G.: E-learning Systems Based on Cloud Computing: A Review. Procedia Computer Science 62, 352–359 (2015). doi: 10.1016/j.procs.2015.08.415
20. Salomoni, D., Campos, I., Gaido, L., de Lucas, J.M., Solagna, P., Gomes, J., Matyska, L., Fuhrman, P., Hardt, M., Donvito, G., Dutka, L., Plociennik, M., Barbera, R., Blanquer, I., Ceccanti, A., Cetinic, E., David, M., Duma, C., López-García, A., Moltó, G., Orviz, P., Sustr, Z., Viljoen, M., Aguilar, F., Alves, L., Antonacci, M., Antonelli, L. A., Bagnasco, S., Bonvin, A. M. J. J., Bruno, R., Chen, Y., Costa, A., Davidovic, D., Ertl, B., Fargetta, M., Fiore, S., Gallozzi, S., Kurkcuoglu, Z., Lloret, L., Martins, J., Nuzzo, A., Nassisi, P., Palazzo, C., Pina, J., Sciacca, E., Spiga, D., Tangaro, M., Urbaniak, M., Vallero, S., Wegh, B., Zaccolo, V., Zambelli, F., Zok, T.: INDIGO-DataCloud: a Platform to Facilitate Seamless Access to E-Infrastructures. Journal of Grid Computing 16 (3), 381–408 (2018). doi: 10.1007/s10723-018-9453-3
21. Semerikov, S. O., Shyshkina, M. P.: Preface. In: Semerikov, S. O., Shyshkina, M. P. (eds.) Proceedings of the 5th Workshop on Cloud Technologies in Education (CTE 2017), Kryvyi Rih, Ukraine, April 28, 2017. CEUR Workshop Proceedings 2168. http://ceur-ws.org/Vol-2168/preface.pdf (2018). Accessed 21 Mar 2019.
22. Semerikov, S. O., Striuk, A. M.: Kombinovane navchannia: problemy i perspektyvy zastosuvannia v udoskonalenni navchalno-vykhovnoho protsesu y samostiinoi roboty studentiv (Blended learning: problems

and prospects of improvement in the educational process and students' independent work). In: Konoval, O. A. (ed.) Teoriia i praktyka orhanizatsii samostiinoi roboty studentiv vyshchykh navchalnykh zakladiv, pp. 135–163. Knyzhkove vydavnytstvo Kyrieievskoho, Kryvyi Rih (2012).

23. Semerikov, S. O., Striuk, M. I., Moiseienko, N. V.: Mobilne navchannia: istoryko-tekhnolohichnyi vymir (Mobile learning: historical and technological dimension). In: Konoval, O. A. (ed.) Teoriia i praktyka orhanizatsii samostiinoi roboty studentiv vyshchykh navchalnykh zakladiv, pp. 188–242. Knyzhkove vydavnytstvo Kyreievskoho, Kryvyi Rih (2012).
24. Semerikov, S. O., Teplytskyi, I. O., Yechkalo, Yu. V., Markova, O. M., Soloviev, V. N., Kiv, A. E.: Computer Simulation of Neural Networks Using Spreadsheets: Dr. Anderson, Welcome Back. In: Ermolayev, V., Mallet, F., Yakovyna, V., Kharchenko, V., Kobets, V., Korniłowicz, A., Kravtsov, H., Nikitchenko, M., Semerikov, S., Spivakovsky, A. (eds.) Proceedings of the 15th International Conference on ICT in Education, Research and Industrial Applications. Integration, Harmonization and Knowledge Transfer (ICTERI, 2019), Kherson, Ukraine, June 12–15 2019, vol. II: Workshops. CEUR Workshop Proceedings 2393, 833–848. http://ceur-ws.org/Vol-2393/paper_348.pdf (2019). Accessed 30 Jun 2019.
25. Slovak, K. I., Semerikov, S. O., Tryus, Yu. V.: Mobilni matematychni seredovyshcha: suchasnyi stan ta perspektyvy rozvytku (Mobile mathematical environments: current state and development prospects). Naukovyi chasopys Natsionalnoho pedahohichnoho universytetu imeni M. P. Drahomanova, Seriia 2 Kompiuterno-oriientovani systemy navchannia 12 (19), 102–109 (2012).
26. Syrovatskyi, O. V., Semerikov, S. O., Modlo, Ye. O., Yechkalo, Yu. V., Zelinska, S. O.: Augmented reality software design for educational purposes. In: Kiv, A. E., Semerikov, S. O., Soloviev, V. N., Striuk, A. M. (eds.) Proceedings of the 1st Student Workshop on Computer Science & Software Engineering (CS&SE@SW 2018), Kryvyi Rih, Ukraine, November 30, 2018. CEUR Workshop Proceedings 2292, 193–225. http://ceur-ws.org/Vol-2292/paper20.pdf (2018). Accessed 21 Mar 2019.
27. Tereshchuk, H. V., Kuzma, I. I., Yankovych, O. I., Falfushynska, H. I.: The formation of a successful personality of a pupil in Ukrainian primary

school during media education implementation. In: Kiv, A. E., Soloviev, V. N. (eds.) Proceedings of the 6th Workshop on Cloud Technologies in Education (CTE 2018), Kryvyi Rih, Ukraine, December 21, 2018. CEUR Workshop Proceedings 2433, 145–158. http://ceur-ws.org/Vol-2433/paper08.pdf (2019). Accessed 10 Sep 2019.