

**EEIA-2017**  
**2017 International conference**  
**"Education Environment for the Information Age"**

**TEACHERS IT COMPETENCE STRUCTURE AND CONTENT IN  
THE FIELD OF CLOUD COMPUTING**

Magomed M. Abdurazakov (a)\*, Jean H. Aziyeva (b), Peter Yu. Romanov (c),  
Albina R. Sadykova (d)  
\*Corresponding author

(a) Dr.Sc. (Education), Associate Professor, Senior Researcher, Centre of Theory and Methods of Teaching Mathematics and Informatics, Institute for Strategy of Education Development of the Russian Academy of Education, Makarenko str, 5/16, Moscow, Russia, [abdurazakov@inbox.ru](mailto:abdurazakov@inbox.ru), +7(495) 625-4410\*

(b) Senior Lecturer in Mathematics and ICT, Russian Ingush State University,  
Nazran, Russia.

(c) Dr.Sc. (Education), Professor, Department of Mathematics, Magnitogorsk State Technical University,  
Magnitogorsk, Russia,

(d) Dr.Sc. (Education), Associate Professor, Senior Researcher, Centre of Theory and Methods of Teaching Mathematics and Informatics, Institute for Strategy of Education Development of the Russian Academy of Education, Makarenko str, 5/16, Moscow, Russia, +7(495) 625-4410

***Abstract***

Cloud technologies are one of the manifestations of smart technologies, a product of Smart society, which many people consider to be the state of modern society. The development of Smart education implies the expansion of the area of cloud technologies use in education. Mobile learning provides the opportunity to introduce the interactive forms of learning in the educational processes to provide easier and faster access to knowledge, on the one hand, and the formation of the competence of proficiency in modern IT-technologies for solving the communication tasks, on the other hand. The article discusses the structure and content of cloud space, its communication with Smart environment and Smart education. Cloud technology can be used both by teachers and students in the classroom and in extracurricular learning activities, in work with the information-educational environment, with media resources. The authors discuss the content and problems of educational work with cloud technologies in teachers and students' cooperation; the content of the required competencies of the modern teacher.

© 2017 Published by Future Academy [www.FutureAcademy.org.UK](http://www.FutureAcademy.org.UK)

**Keywords:** Smart technologies, cloud technologies, Internet, social media, competence, skills.



This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 Unported License, permitting all non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## **1. Introduction**

We proceed that the information educational environment is the representation of the educational environment in the form of information, its image in the media, resources, technologies, training and control systems, expressed in the documented form and adapted methodically for education. The main purpose of the information educational environment is to ensure the transition of education to a new quality, respectively, into a state corresponding to the information society 0; Grigorev, & Andrijushkova, 2016).

## **2. Problem Statement**

Modern methods, means and forms of learning, continuously improving, objectively achieve the information-technology stage of its development. In this regard, the organization of training in information and communication educational environment (ICEE) and the choice of educational technologies put forward new requirements for the training of future teacher. His ability to absorb new knowledge, to improve constantly, to navigate in the information field, using ICT tools, to solve the practical problems and in communication becomes an important criterion of assessing the competence of teachers, therefore, the "professional ICT-competence of future teachers can be specified as the ability to solve professional problems in the new ICEE" (Abdulrasheed, Shamsuddeen, & Abdullahi, 2017; Shevchenko, 2013).

Under the influence of the universal telecommunications, the expansion of ICEE by media environment of the society containing digitized objects of its social culture (media objects) and being supported by media tools and media technologies. Adapted and specialized media resources make up the educational media environment. The education goes into a new form, the status of media education, the aim of which is the formation of meta-competence and media culture of subjects, and the education based on them, and the resources of media education, 0).

Consequently, meta-competence and media culture of subjects act both as a product and as an intellectual means of education. They are also necessary for self-education and self-development of a person, 0; Dzamyhov, Nimatulaev, & Romanov, 2016;0 Korotekov, 2014).

## **3. Research Questions**

Sets of "smart" media devices with built-in intelligence allow the subject using them not just to read the information from them, but to conduct an interactive dialogue with them, to build constructive interaction with them in real-time. They are smart phones, tablets, interactive Smart boards, etc., working independently or autonomously under the control of their own operating systems. These Smart systems combining a Smart device and appropriate Smart technologies which ensure their operation, create not only the new look of media information, but the new state of the society – Smart society presented by Smart subjects, Smart objects and Smart relations 0;0 Korotekov, 2014).

It reveals great opportunities not only for the forming Smart society, but also for Smart education, the projections of the Smart society on the sphere of education. Dealing with "advanced" Smart technologies, the subjects of education considerably promote themselves in their Smart development. It

remains only to create and implement appropriate pedagogical Smart technologies. Although the system of education will have a lot of difficulties, of course, that can be overcome.

Based on the requirements of the Federal State Educational Standards (FSES) and, in accordance with modern directions of modernization of the education system, we consider the efficiency of forming ICT-competencies in the field of cloud technologies in professional and pedagogical activity of future teacher of Informatics.

#### 4. Purpose of the Study

The purpose of the study is to reveal the content and problems of educational work with cloud technologies in teachers' and students' cooperation.

#### 5. Research Methods

The use of cloud technologies and network services based in the learning process and also the construction of methodical system of training based on them will be an effective tool for creating not only the regulatory competencies, but also the competences in the field of cloud technologies **Error! Reference source not found.** In addition, it is necessary to determine the most effective conditions and forms of organization of educational students' activity using cloud-based technologies. In these circumstances, the ICT-competence of teachers of computer science (Georgios, Dafoulas; Grandon, Gill, 2006; Shevchenko, 2016) in the field of cloud technologies allowing to improve the quality of education in general, in particular his knowledge and ability to organize his professional and teaching activities at ICEE becomes popular, which implies the ability to select and use effectively Wikis, web services of Internet-based cloud technologies which are modern and advanced for learning.

Cloud technologies are one of the manifestations of smart technologies, a product of Smart society, which many people call the state of modern society. Generally speaking, society does not cease to be information society. Smart society is its technological characteristics, reflecting the trends and nature of development.

People as subjects who have mastered the basic operation of the Smart system are not yet Smart subjects but they are Smart consumers. Real Smart subject is Smart creator, not necessarily able to create new Smart resources, but necessarily managing to use the new Smart systems for his/her self-development, development of his/her personal knowledge and culture, personal cognitive environment. That is, it is the consumer not in sense of consumption, but in the meaning of satisfying their information-cognitive and socio-cultural needs.

Smart systems make the learning process *dynamic*. The interaction of subjects of education with media tools becomes more structured and meaningful.

The intelligent ("smart") Smart systems (Smart resources, Smart technologies) suggest the interactive participation of all the subjects of teaching in the dialogue with them. In this dialogue, Smart resource not only can be reproduced but also *modified*, changed. Or the shape and the order of reproduction can be changed. Moreover, the teacher can, in the presence of the audience, re-build (recreate) the Smart object according to the previously prepared model. A teacher can modify, change, complement and save it as a Smart object, perhaps, a Smart resource.

On the one hand, the teacher in Smart education becomes a kind of coordinator, navigator. The teacher helps the students to create individual learning paths, coordinates their implementation and, thus, partially becomes free from routine work. On the other hand, however, it also means the increasing of differentiation and individualization, on the basis of differences in individual learning interests and needs, abilities, peculiarities of information perception (Smart resources), the motivation of subjects of education for cognition and learning for Smart learning, self-education. Therefore, the actual load on the teacher is greatly increased: traditional classroom lessons are supplemented by individual lessons, the process of navigation, coordination and control.

In addition, the models of IEE, media environment, appropriate for the learning, models of personal environments, their technological and Smart-support are required. In this regard, it is necessary to note that at present organizational models of combined learning (blended learning, MOOC– mass open online courses) receive the wide spread that incorporate the convenience and economy of e-learning with the effect of personal influence on the student, which is inherent in traditional learning 0; Korotekov, 2014).

Mobile learning provides the opportunity to introduce the interactive forms of learning in the educational processes to provide easier and faster access to knowledge, on the one hand, and the formation of the competence of proficiency in modern IT-technologies for solving the communication tasks, on the other hand. The development and mass implementation of mobile applications is one of the trends of development of information technologies over the past six years, starting in 2011, according to the research of the analytical company "Gartner, Inc." (URL: <http://www.gartner.com/>), that teachers need to possess. This trend is reflected in the organization of educational process in professional education in the form of mobile learning, which is currently gaining more popularity (Korotekov, 2014; Raab, Chandra, 2013).

Currently, significant progress in the implementation of mobile learning is achieved with the use of cloud computing technology, which becomes a key strategy for the development of IT industry, applies to many areas of any organization, including human capital management to improve its efficiency (Korotekov, 2014).

The concept of "the cloud" is not a product of Smart technologies. Many network systems in communication environment, in the sphere of Internet offer to store information in the "cloud" allocated to a specific user or group of users in the space on a network server. This space seems to be fixed for them and becomes a supplement to their material carriers of information. The benefit is obvious, although the security of the stored information may decrease, both physically and in terms of privacy. Therefore, appropriate differentiation is needed. Especially since the volume of disk space on desktops and laptops are large enough. So the information stored in the cloud is not the most valuable one, but "routine". The valuable information is better to store on fixed drives, creating backups for it. In addition, cloud space is "tied" to a specific network system, which is independent of its user. Therefore, the reliability and privacy of storing information in the cloud is only relative.

## **6. Findings**

Cloud technologies have developed in the Smart environment. Communication is gradually shifting to Smart devices, tablets, phones (smart phones), etc. They are more mobile both on a physical level, and in the communication plan: they are available both anywhere and anytime. However, they do not have large amounts of external memory. It is hard and not very comfortable to increase it due to the removable media. Therefore, the cloud becomes necessary and required in Smart environment and actually gets the second life. The subject of Smart environment, the owner of the Smart device has the ability to "throw" his information to the cloud, and use it if necessary.

However, the essence of cloud technology in the Smart environment does not consist or consists not only in the fact that allows the subject of Smart environments to record and read information in the cloud and from the cloud. Cloud technologies provide an opportunity for collective use of cloud space allocated to a specific group of Smart subjects. Each of them, having the appropriate rights can record, read, and realize its dynamic editing. However, the right to access to this information may be differentiated.

The dynamic editing means the following. It is better to create and edit documents (more effective, more efficient) on the stationary computer: Smart devices do not have such opportunities. But they present the opportunities for dynamic change, correcting documents.

There is no need to store necessary editing tools, mobile and "normal" with a wide set of functions and operations on the Smart devices with insufficient amount of RAM. *Cloud technologies provide all that is necessary* - it is their main advantage. Users only need to access the required technology, tool, functions. We only need to have the necessary literacy in the field of cloud technologies, Smart competence.

Cloud storage of information and technology are real. They are created and supported by the proper specialists. However, they are virtual for the user, being outside of his reality. The user enjoys ready one and is not interested in "routine". This is a clear advantage of Smart technologies, however, blending smoothly into their lack. Smart technologies are beyond the control of the user, the results of their activities are also virtual for him.

Because of the relative reliability and security of cloud-based information and the products of cloud computing, we need a periodic backup to a physical media of information, if it is really an important information to be stored for a long time and wide spread in the social media environment.

The development of Smart education implies the expansion of the area of cloud technologies use in education. Cloud technology can be used both by teachers and students in the classroom and in extracurricular learning activities, in work with the information-educational environment (IEE), with media resources. The peculiarities of using the Internet resources are described in the works of foreign authors (Georgios, Dafoulas; Grandon, 2006; James, & Weber, 2016; Korotnikov, 2014; Misevicien, & Budnikas 2011; Shevchenko, 2013; Makarchuk, Minakov, Artemyev, 2013) including cloud-based technologies, for educational purposes, and the recommendations for their use in training are provided. Examples of such work are the following:

- The introduction of electronic diaries and class-books. Teacher leads mobile changes, corresponding to the mobile learning process and to its differentiated results for each student on ready forms, prepared in a standard computer environment. Mobility of changes means their rapid introduction in electronic class-book from any available Smart device (phone, tablet), on

the way, in the bus, in the subway. Students watch their diaries, intended to record the assessment, introduce personal information in accordance with the rights for it in mobile mode. Parents as indirect subjects of education receive current information from the cloud about their son, daughter, have the opportunity of rapid response also in the mobile mode.

- Organization personal accounts of the subjects of education for interactive cooperation, communication, exchange of training information. Personal accounts allow the user to store in the cloud the personal information having confidentiality to the extent of providing cloud-based technologies, operating information being collected by the subject to perform a specific job, task, project, essay.
- The organization of extracurricular activities of subjects of education both individual and collective, under the direct or indirect supervision of the teacher. It can be planning, discussion of the home or other tasks, the progress of its implementation.
- Execution of project work, essays. Students receive the themes of projects from the teacher, selecting them according to their learning interests, create appropriate groups, assign duties, choose the leader. The team leader creates the necessary electronic documents and defines the forms of access to them to the other members of the group and the teacher too (links, addresses, passwords). Students (with the help of the teacher) work on the content of electronic documents at home or at school. The advantage of this form of work on the project is that the teacher can track the progress and history of the changes in the content of a project in the mobile mode, can comment, estimate the prepared electronic documents of the project to ensure their rapid correction, determines and evaluates the contribution of each group member working on them.
- Distance learning or training according to individual plans. The teacher gives tasks to the students, placing them in the "cloud" diary. It can be any writing task, implementing a training programme of the learning. Students should create an electronic document by themselves and work with it according to a certain plan. Or work with a document created by a teacher, fulfilling specified for them tasks. Teacher can monitor the students' work in the mobile mode and, if necessary, adjust the implementation.

All of the training documents stored in the cloud, are subject to mandatory periodic duplication with the placement of their copies in the personal archives of subjects of education or in the standard IEE repositories or in the media systems. Cloud documents are just the versions of the training documents that could potentially become resources of IEE or media environment.

## 7. Conclusion

The work of teachers with the cloud technologies implies the presence of good enough information training, the availability of relevant IT *competencies*.

Firstly, the presence of the teacher's Smart-competence as a Smart subject who can use Smart resources and create new ones with the help of Smart technologies. Moreover, the teacher must possess

Smart-competence of the subject of competence of Smart-education, which is necessary for the teacher of the modern school.

Secondly, it is an ability to work, and productive interaction in the Internet environment, efficient and safe work with resources of this environment, sites, portals (search, copy); the ability to use communication environments, e-mail servers; the ability to work with the Internet in its implementation in the Smart-environment.

Thirdly, it is the ability to work with IEE and the media environment, finding the necessary electronic resources, media resources, their implementation into the area of subject teaching.

Fourthly, it is the competence in the field of the standard computer technologies, the ability to work with text, tabular, graphic editors, with the appropriate file types.

Fifthly, it is the ability to work with cloud technologies to the extent referred to in this article.

Modern teachers in a greater volume have to solve information and computer tasks necessary for the information security of the environment of the subject security.

Education is entering such a phase when the teacher with all his functionality and skills cannot cope with all the ups and downs and learning problems: he/she cannot and does not have to be an expert in all related fields relevant to his subject matter and the learning processes. We need a team of like-minded persons thinking in the interrelation, but differently. "In general terms, you can select the specialization of "the collective teacher": the specialist subject teacher, the specialist in the development of courses (the designer), the specialist on interactive presenting of training courses (tutor), the specialist on methods of monitoring the results of learning (invigilator), programmer-technologist, creator of educational multimedia products and environments, the administrators and coordinators of training centres and venues" (Korotenko, 2014).

## Acknowledgements

The work has been done within the framework of the State Assignment of the Institute for Strategy of Education Development of the Russian Academy of Education (No. 27.6122.2017 / BCH).

## References

- Abdulrasheed, M., Shamsuddeen H., Abdullahi, S. (2017). *Massive Open Online Courses. Success of Cloud Computing in Education*, Retrieved from [https://www.researchgate.net/publication/312525236\\_139-148\\_Massive\\_Open\\_Online\\_Courses\\_A\\_Success\\_of\\_Cloud\\_Computing\\_in\\_Education](https://www.researchgate.net/publication/312525236_139-148_Massive_Open_Online_Courses_A_Success_of_Cloud_Computing_in_Education)
- Abdurazakov, M., Dzamyhov, A. (2015). Psycho-pedagogical and technological components of the preparedness of teachers of mathematics and Informatics to the profession. *Historical and socio-educational thought*, Vol. 7, No. 3, 162-165. [in Rus.]
- Abdurazakov, M.M., Korotenko, Y.G., Mukhidinov, M.G. (2016). *Educational space representation in cyberspace*. SHS Web of Conferences, V. 29, C. 01001. DOI. Retrieved from <http://dx.doi.org/10.1051/shsconf/20162901001>
- Dafoulas, Georgios, Shokri, Azam. *Investigating the educational value of social learning networks: a quantitative analysis*. Retrieved from [https://www.researchgate.net/publication/310504576\\_Investigating\\_the\\_educational\\_value\\_of\\_social\\_learning\\_networks\\_a\\_quantitative\\_analysis](https://www.researchgate.net/publication/310504576_Investigating_the_educational_value_of_social_learning_networks_a_quantitative_analysis)

- Dzamyhov, A.Kh, Nimatulaev, M.M., Romanov, P.Yu. (2016). *Aspects of the methodology of pedagogy in the information society*. Collection of materials of the international scientifically-practical Conference "Educational space in the information age" (EEIA-2016). Institute for Strategy of Education Development, 57-67.
- Grandon, Gill. (2006). 5 (really) hard things about using the internet in higher education. *Magazine*, Vol. 3, 1. Retrieved from <http://delivery.acm.org/10.1145/1130000/1126019/p1-gill.html>
- Grigorev, S.G., Andriushkova, O.V. (2016). Criteria for effective use of Blended Learning. *Informatics and education*, No. 8 (277), 16-19. [in Rus.]
- James, C.N., Weber, J. (2016). *Cloud Computing in Education*. *Cloud Computing in Ocean and Atmospheric Sciences*. Retrieved from [https://www.researchgate.net/publication/304803518\\_Cloud\\_Computing\\_in\\_Education](https://www.researchgate.net/publication/304803518_Cloud_Computing_in_Education)
- Korotkov, Yu.G. (2014). *Smart-society and smart-education*. Materials of the X International scientific and practical conference «trends of modern science - 2014», 17-20. [in Rus.]
- Les, Pang. Applying Cloud Computing in the Classroom. *Graduate School of Management and Technology*. Retrieved from <http://deoracle.org/online-pedagogy/teaching-strategies/applying-cloud-computing.html>.
- Makarchuk T, Minakov V.F., Artemyev A.V. (2013). Mobile learning based on cloud services. *Contemporary problems of science and education*, V. 2, 319. [in Rus.]
- Misevicien, R., Budnikas, D. (2011). Application of Cloud Computing at KTU. *Informatics in Education*, Vol. 10, No. 2. Retrieved from [http://www.mii.lt/informatics\\_in\\_education/pdf/INFE194.pdf](http://www.mii.lt/informatics_in_education/pdf/INFE194.pdf)
- Moore, M.G. (2013). Independent Learning, MOOCs, and the Open Badges Infrastructure. *American Journal of Distance Education*, Vol. 27, Issue 2. Retrieved from <http://www.tandfonline.com/doi/abs/10.1080/08923647.2013.786935>
- Pitcher, S. *Information, communication, audio-visual technology and new educational paradigm of the 21st century*. Retrieved from [http://edcommunity.ru/press/articles/tezis\\_int\\_konf.php#2](http://edcommunity.ru/press/articles/tezis_int_konf.php#2)
- Shevchenko, V.G. (2013). Cloud technology as a means of creating an ICT competence of the future teachers of Informatics. *Informatics and education*, V. 8 (277), 55-57. [in Rus.]