

Formation of Research Competence of Students by Means of Mobile Education

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Abstract—The article outlines the need of reforming the higher education system, which should be aimed at educating graduates who are able to coordinate their future professional activities independently by means of mobile education. The authors conclude that this is impossible without the formation of research competence of students during their studies at the university. One of the main tasks of higher education is not only to present information to students, but to form the ability to obtain it independently, to be able to process it and to look for non-standard solutions. Motivational, communicative, reflexive, personal components within the structure of research competence are revealed in the article. The results of experimental work of formation of research competence of students by means of mobile education are presented. The authors conclude that educational activity becomes more continuous and motivated within formation of research competence of students by means of mobile education.

Keywords—Research competence, mobile education, ICT, mobile technologies, students.

1 Introduction

The most important goal of modern education is not only the need to give a certain set of knowledge and skills to a future specialist, but also to create an attitude for his / her self-study and self-organization, expanding and deepening his / her knowledge and skills continuously, which is the key of lifelong learning [3, 10, 11].

If a student acquires knowledge within the educational process independently, relying on his / her own experience, he / she will do the same within his / her future professional activity. Education of creative-thinking specialists is possible within students' research work [7, 15, 19].

Specialist, who obtains research competence, is able to analyze factual information actively and productively, to create and to select new efficient algorithms, resources, technologies, and not just to use ready-made algorithms and facts. However, level of formation of skills in research activities of students does not fully meet modern requirements and challenges of modernization of education yet [21, 22, 23].

In addition, it should be noted that massive spread of mobile technologies is changing the whole paradigm of education. Today, a university cannot be limited by transferring a certain set of knowledge and skills which become obsolete and lose their practical value very quickly. Nowadays a modern person of any age needs to develop his / her skills using the most affordable and effective mobile technologies in order to be successful in profession [9, 12, 18].

Therefore, the main task of education is to teach and to motivate a student to learn independently. It should be noted that practically each student has his / her own mobile device (smartphone, tablet or laptop) with the Internet access. However, educators use mobile devices and applications within the educational process very rarely [16, 20, 24].

Many universities are still building their educational programs based on using printed textbooks. There is a rather negative attitude towards using mobile devices during the lessons. Some educators even ban using mobile devices during the lessons as they consider that they can serve as the way of deceiving a teacher during the test or as a factor of distracting attention from educational material. High cost of professional network resources and Learning Management Systems (LMS) does not contribute to the mass introduction of advanced educational technologies as well [1, 5, 17].

We consider, that creative and responsible teachers, who are open to the new ideas and competent in their professional use of accessible and effective mobile applications, are largely capable of correcting the situation today.

2 Methodology

Formation of research competence of students by means of mobile education is a relatively new method of teaching [28]. Mobile education for the formation of research competence of students becomes successful method in implementation of their research work.

Scientists [2, 4, 33] highlight such advantages of mobile learning:

2.1 Mobility

Modern smart gadgets make it possible to organize and to optimize educational process regardless of place and time. There are two aspects of this kind of mobility.

Firstly, it is possibility of implementing educational programs despite the location of a qualified specialist. Secondly, ease of access from different devices due to the use of cloud storage systems makes it affordable. Students can have access to all previously available information even in case of changing of their cell phones. In addition, student can easily use different devices to complete tasks of different degrees of difficulty [27, 29, 31].

2.2 Continuous education

Application of information technologies is focused on stationary devices comparing to the previous years. Information technologies require continuous access to the information base at this stage of development of educational process. Since mobile devices are often belong to the same owner, they make educational process continuous. Therefore, it is possible to complete tasks at any convenient time, and teachers can transfer part of instructions outside the classroom [25, 30].

2.3 Personalization of education

Mobile applications provide students with the choice of the content of certain courses and level of complexity. They also give opportunity to advance to the next level of difficulty depending on personal preferences and acquired knowledge, to evaluate the results independently and to perform additional tasks for consolidating material. In addition, a mobile phone allows each student to study the material in the form in which it is more convenient. Creator of educational software should adapt information and methods of its reproduction (text, graphics, video, audio) in order to improve quality of services and to increase efficiency of educational process [8, 13, 32].

2.4 Improving the quality of communication

Mobile devices provide fast and high-quality communication between teachers and students. Feedback allows teachers to track students' improvement in learning [6, 14, 26].

The use of mobile technologies for the formation of students' research competence allows to provide a number of interactive opportunities:

- Keeping interest in research
- Offline learning and sharing of information in group
- Sorting of information to facilitate the search according to the certain criteria
- Access to all kinds of materials
- Overview of materials of various types of formats (educational video and audio materials).

3 Materials and Methods

Experimental work took place in 2018–2019 at universities (Southern Federal University, Rostov-on-Don; Military Educational and Scientific Center of "The Air Force Academy named after Zhukovsky N.E. and Gagarin Y.A.", Voronezh) within the training course on the development of research competence. 217 students participated in the study. Respondents were from 18 to 22 years of age. The experimental group consisted of 109 participants. The control group included 108 participants.

Students of the experimental and control groups carried out research projects which were aimed at the formation of scientific type of thinking. They were focused on the study and analysis of a significant amount of literature.

Students of the control group carried out projects within traditional method.

Students of the experimental group carried out projects using mobile learning. Students of the experimental group used the didactic capabilities of social networks (Facebook, VKontakte) and messengers (Viber, Telegram, WhatsApp) during the experiment.

One of the most attractive functions of communication in real time was “chat” which was implemented within VKontakte social network application.

Each member of the experimental group communicated with each other simultaneously using mobile phones. In addition, they gave access to the texts and multimedia resources. This function was also used by teachers in order to download the tasks and necessary announcements for the group. They used such function as chat in VKontakte to optimize lecture-type classes. They used Microsoft PowerPoint application and its free analogues such as Google Presentations, Mail.ru Presentations, Prezi, etc.

The teachers suggested the students to use the “chat” function to answer the questions and to give the comments on the topic of lecture in order the students to be active listeners at the lectures. At the same time, students were required to write at least one sentence each time. Students, who gave their own ideas and didn’t just copy other students’ comments were encouraged by the teaches. Our experience showed significant and steady increase in the attention of students during the entire lecture. The teachers looked through the activity of the students after the lecture, noting the most interesting answers.

Teachers used Google cloud services, which main advantages included accessibility, universality and the presence of an intuitive interface. Such free online analogue of the Microsoft Office application as cloud service Google Docs suited for working with various types of documents (texts, spreadsheets, multimedia presentations, etc.) and served as a virtual space for storing and exchanging files.

Special value of Google Docs was possibility of joint work of several users with one document simultaneously when each student had seen the actions of the partners. Teacher saw who and how performed the learning activities in real time. At the same time, students had an opportunity to communicate in a text chat and teacher commented on their actions and corrected their mistakes, if it was necessary.

Teachers used Google Docs application regularly in order to improve the efficiency of written exercises. During the traditional lessons on writing students wrote an essay during the lessons or at home and then handed over it to the teacher for checking it. Implementation of written task in Google Docs format was changing the approach essentially. Teacher monitored the work of all the students in real time and gave advice within in the process of writing the work. Then, during the next lesson students checked each other's texts (peer review). The results of this work were visible to everyone. The advantages of organizing a lesson in this format were obvious and educational activity took place in the format of network cooperation.

4 Results

Initial study was conducted to identify the initial level of research competence in the experimental and control groups at the beginning of experimental work. Research competence involves the development of ability to develop an urgent scientific problem at the micro and macro levels, to obtain knowledge in various ways that were significant for the development of theory and practice of education. We have identified motivational, communicative, reflexive, and personal components within the structure of research competence. Motivational component includes formation of interest in research activities, need for this activity and focus on achieving its results in group and individually. Communicative component is ability to organize and to carry out productive communication within the course of research activities, ability to find non-standard ways for solving problems, to make decisions based on personal and social consequences. Reflexive component is willingness and ability of student, which is expresses in recognizing, evaluating and analyzing research phenomena, situations that arise in life; ability to analyze the progress of research work and to agree on the ways of further improvement of the work. Personal component involves skills of self-organization, independence, self-education, self-regulation, self-determination and self-development within the implementation of research activities. The data obtained were summarized and converted to percentage. The empirical data were quantitatively processed and analyzed at a qualitative level. Dynamics of step-by-step development of research competence was established and the obtained data are revealed in Table 1 and Table 2.

Table 1. The results of the assessment of the level of research competence in the experimental and control groups before the experimental work

Research competence	Experimental group			Control group		
	Low level, %	Middle level, %	High level, %	Low level, %	Middle level, %	High level, %
Motivational component	41.2	39.0	19.8	40.6	39.1	20.3
Communicative component	56.2	28.5	15.3	37.9	40.3	21.8
Reflexive component	43.0	33.4	23.6	42.3	29.9	27.8
Personal component	58.4	29.5	12.1	42.9	36.1	21.0

Table 2. The results of the assessment of the level of research competence in the experimental and control groups after the experimental work

Research competence	Experimental group			Control group		
	Low level, %	Middle level, %	High level, %	Low level, %	Middle level, %	High level, %
Motivational component	12.6	38.5	48.9	42.1	39.3	18.6
Communicative component	7.1	27.2	65.7	35.6	43.8	20.6
Reflexive component	7.4	24.2	68.4	34.3	38.9	26.8
Personal component	3.9	28.7	67.4	42.7	37.2	20.1

Comparative analysis of the results of input and final diagnostics of the formation of research competence in control and experimental groups showed a significant dynamic of the development of research competence in experimental group, which indicates the effectiveness of the experimental work.

5 Conclusion

Research activity allows the students to enter the cultural space of self-determination. Student find themselves in situation of designing of their own objective activity in the chosen field and are faced with the need to analyze the consequences of their activity. Each achieved result gives rise to a new stage of reflection, which has a consequence of emergence of new ideas and creative plans.

Educational activity becomes more continuous and motivated within formation of research competence of students by means of mobile education. High level of formation of research competence of students allows them to reach the “colleague” functional position in relation to other members of the group, since this position suggests possibility of self-reflection and presence of one's own attitude to the surrounding reality.

Mobile devices penetrate all educational activity and research activity in particular. Mobility becomes one of the key requirements for the students. Mobile learning is a new educational strategy based on which a learning environment is created where students can access learning materials anytime and anywhere. Formation of students' research competence by means of mobile education makes the learning process comprehensive and motivates the students for lifelong learning.

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