

# M-Learning as a New Interactive Technology in Education

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## ABSTRACT

The field of information technology, in particular, the development of mobile applications, is by far the most dynamically developing in the world. The development of mobile technologies is associated with constant challenges aimed at meeting the needs of customers, providing the most modern and relevant services. This is especially true for education. The relevance of the topic is predetermined by the strategic course of action of Russia - special attention was paid to the significance of the topic for Russian reality, since the Russian economy is aimed at developing both the knowledge economy and improving its competitive position in countries with developed economies. The article presents the author’s vision of how mobile learning is changing the vector of the educational environment, complementing the existing generally accepted educational process with new digital software technologies, involving both teachers and students themselves to keep up with the times. The aim of the work was to study the most modern mobile technologies presented on the educational services market, which have a beneficial effect on the development of soft skills and related competencies among the younger generation in accordance with new and modern requirements of personal and professional development and compatibility with innovative economic initiatives. The provision of results and coverage of the topic will provide an essential basis for further actions to develop soft skills programs and integrate them into the educational process. The materials of this article are of theoretical and practical importance and will be useful to teachers when developing their courses.

**Keywords:** *education, educational technology, mobile learning, M-Learning, mixed learning, educational software product, interactive educational technology, BYOD concept*

## 1. INTRODUCTION

The education model of the 21st century has changed dramatically [1]. The educational environment around the world has moved to a new stage of its development. Teenagers can’t imagine their life without digital technologies, almost everyone in the family has a TV, a computer with access to the Internet, and other gadgets in the form of mobile phones, smartphones, iPads, tablets, etc. From birth, these teenagers are ready for the rapid development of various types of IT-technologies.

Modern teenagers spend more time preparing for classes using interactive applications, no longer studying the mountains of textbooks on paper. For example, without directly leaving your home, you can watch a historical-historical movie in the YouTube video hosting, listen to a teacher’s video lecture, get acquainted with physical or chemical experiments, study the material for your future report on the data presented in open or closed access by subscription from various libraries around the world, create independently interactive presentations, including multimedia, etc. More and more people traveling by

transport read books or news from electronic devices or other mobile gadgets.

Education with the active use of information and communication technologies has become closely associated with the development and dissemination of mobile communications, curricula and applications using gesture interface technologies that will improve the quality of education and expand its capabilities.

### **1.1. Paper Structure**

The structure of the article consists of two sections.

The first section describes the use of M-learning in the educational process, discusses the advantages and disadvantages.

The second section is devoted to the description of the most successful, in the opinion of the authors, mobile technologies that can be useful both to the teachers themselves in their educational activities, and in the process of teaching the student himself.

In the presented article, the main emphasis is placed on educational mobile applications, which include various

highly specialized thematic applications, the purpose of which is clear in advance.

## 1.2. Methodological Framework

### 1.2.1. Method of research

In the course of the study, the following methods were used: analysis, synthesis, system analysis, field research, systematization and generalization of facts, method of comparison, description, analogy, component and factor analysis.

### 1.2.2. The stage of the research

The theoretical basis of the study is formed by the fundamental and applied works of foreign and domestic scientists studying the patterns of using mobile learning technologies in the educational environment.

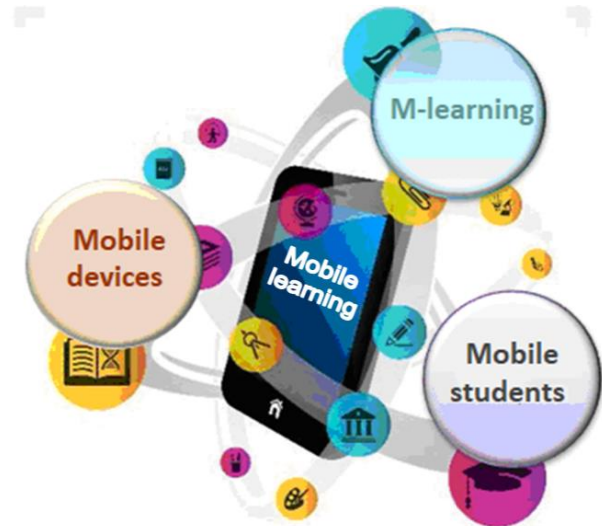
## 2. RESULTS AND DISCUSSION

### 2.1. The use of M-learning in the educational process: advantages and disadvantages

In the modern developing world, a great many different digital technologies have been invented, allowing people of different ages (young and old) to improve their knowledge and acquire new competencies in various fields of science [2].

In the Russian and international markets of mobile applications for study, now there is simply a real boom. A large number of educational digital software products in the field of education are offered to choose from - video lessons, virtual trips to museums and countries, electronic libraries and dictionaries, various online directories for both the school curriculum and the university, quizzes, educational games, tests, remote skype -training, sites for mass open online courses (MOOCs), etc., with which you can spend time usefully, test your knowledge in a variety of subjects, fixing these skills and getting new ones on a permanent basis [3].

The development of mobile technologies presents us with certain challenges. Mobile technologies are increasingly being integrated into the system of traditional education with the help of which it is transformed and optimized [4]. The popularity of the so-called mobile learning (M-Learning) helps to realize the growing needs of a modern person, providing the opportunity to learn, whenever and wherever, from anywhere in the world, regardless of place and time [5] (Figure 1).



**Figure 1** Mobile application example

Source: *Information Technology Center of the Minsk City Institute of Education Development, 2019.*

It can be safely stated that mobile training is closely connected with electronic distance learning and implies the use of mobile technology both individually and together with other information and communication technologies to organize the educational process, regardless of place and time [6]. Today it can be organized in different ways, it can be M-Learning organization using mobile learning management systems (platforms for developing mobile courses), for example, Litmos, LearningCart, Saba, Blackboard Mobile Learn (mobile version of Moodle). Another way to use mobile devices for training is to use mobile applications.

In general, training can take various forms: with the help of mobile devices, students can access educational resources, connect with other users, create content in the classroom and beyond. Mobile learning includes activities necessary to achieve learning goals, for example, effective management of school systems and university education, improving the interaction between educational institutions, students themselves and their families [7]. This learning format allows the student to be involved in continuing education for the future prospects of lifelong learning.

The latest trends in learning is blended learning, which combines different types of learning to make learning more effective and interesting. Blended learning combines the benefits of different forms of learning and is best suited to the learning context of an interactive learning environment. Mobile learning can be combined with other types of learning, providing an interactive learning environment for pupils and students.

Consider the advantages of introducing M-learning in the educational process (Table 1).

**Table 1 The key benefits of implementing M-learning in the educational process**

No	Benefits of M-learning
1.	Does not exist separately and integrates harmoniously into a traditional training system.
2.	This is the desire for independent choice: what to study, what subject? How and in what way and with what resources?
3.	This desire to be in trend using modern digital technologies as a tool for training.
4.	Using M-learning is flexible and convenient.
5.	M-learning allows you to expand the boundaries of learning, make them flexible, allows you to engage the student in continuous learning for the future prospects of learning throughout life.
6.	It is possible for students to choose their time, place, pace and learning tools
7.	This is a growing mobility of the population, involving people with disabilities in the social and professional life.
8.	Distance learning supported at the state level.
9.	The intensity of mobile learning is much higher than that of traditional.
10.	M-learning does not depend on the "geographical location" of the student and teacher.
11.	M-learning provides the opportunity to communicate not only with classmates, but also with children from other schools, universities, from other areas, from other regions of Russia and other countries.

Source: *composed by authors*

If we consider the issue regarding the problems and shortcomings of the introduction of mobile learning, then they can be enlarged into two components: these are directly the technical problems themselves and the problems of a

socio-educational nature. They are described in more detail in Table 2.

**Table 2 Key problems & disadvantages of implementing M-learning in the educational process**

No	Problems & disadvantages of M-learning
1.	Small screens and keys on mobile devices.
2.	There are problems with access to the Internet.
3.	The amount of memory available on mobile devices.
4.	Existing mobile devices work only from chargers, and if you do not charge it in time, the battery will drain and a person will not be able to use this gadget at the right time.
5.	There are information security issues, including issues related to the security of personal information.
6.	Lack of uniform standards in connection with mobile platforms, device characteristics.
7.	Risk of possible loss (loss) of the mobile device or its breakdown.
8.	Not all students can afford the right mobile device.
9.	Bandwidth may decrease with a large number of users using wireless networks.
10.	Mobile development too fast.
11.	Underdeveloped pedagogical theory for mobile learning.
12.	It's hard to use graphics, especially with mobile phones, although 3G and 4G ultimately allow this.
13.	Too frequent use of gadgets leads to the risk of various oncological diseases and can harm the person's eyesight.
14.	There is a dependence on a mobile phone and other gadgets, which leads to a decrease in the communication skills of the student.
15.	In mobile learning, teamwork is missing or lost.
16.	It is necessary to constantly search for the most useful and convenient learning programs and helper programs that saturate the market.
17.	Many programs are provided for free use in a reduced version of the reduced version. To use the program in full access, you need to buy it.

Source: *composed by authors*

Based on the foregoing, the development of educational content for m-learning should be implemented taking into account such features as: dividing content by level of complexity, delivering content in small portions, using "light" graphics, audio and video. Particular attention should be paid to information security and intellectual

property protection. In connection with the continuous development and improvement of mobile devices and network technologies, we believe that all of the above problems will be resolved in the near future [8].

## 2.2. The use of mobile technology in the educational process and self-learning

Today on the market there is a huge variety of mobile applications of both educational and non-educational types. One of the most, in our opinion, attractive and useful mobile application programs for schoolchildren, students and other users today, which can be installed not only on your smart phone, but also on your computer, tablets and other modern gadgets, are:

- test translators from various languages;
- software products for the study of foreign languages;
- Programs using game technologies for children from zero and older;
- calculators and other physical and mathematical simulators;
- Interactive guides to the school curriculum, where you can get acquainted with topics in mathematics, the Russian language, physics, chemistry, history and other subjects;
- online cards;
- programs for maintaining and controlling personal finances;
- scanners;
- voice memos;
- photo editors;
- others.

It is important to note that abroad, mobile training has long been using the BYOD concept - "Bring Your Own Device" [9], where the gadget has become not only a toy or a means of communication, but a learning tool, like a ruler or pencil. A lesson in any subject, be it geography, history, mathematics, physics, chemistry, biology, a foreign language, etc., becomes more informative and interesting if you choose the right tools. Children show excellent results, they have a motivation to increase their knowledge in school and improve them throughout their life's journey. Consider the four main reasons why students prefer mobile learning (Figure 2) [10].



**Figure 2** Why do learners want to learn on the mobile?

Source: *Mobile Learning Infographic 2014, E-Learning infographics*

Today there are a large number of interactive applications that allow you to spend time with benefit and test your knowledge in a variety of subjects.

We give examples of the use of BYOD, taking as a basis the most interesting and useful, in our opinion, mobile services that can be used during school classes, student learning or used for self-study.

An example is the interactive guide to all school disciplines from grades 4 to 11 - "*Foxford. Textbook*", prepared with the participation of teachers from Moscow State University, Moscow Institute of Physics and Technology, HSE and other leading Russian universities. The textbook has analyzed thousands of topics that are presented at different levels of difficulty: basic, advanced and Olympiad. In this application, you can study submitted articles, watch videos, add topics to your favorites for quick access, etc. [11].

You can also note the mobile interactive application "*Castle quiz*", the database of which is loaded with hundreds of questions on such subjects as: history, geography, biology, mathematics, computer science, chemistry, physics, Russian, etc., many of which are directly related to the program Unified State Exam (USE). During the battle, you can solve problems of varying difficulty, challenge your opponent to a duel or start an aimed bombardment of the castle, for which you get the most points. After each intellectual battle, you can find the correct answers, and for some subjects - get an explanation [12].

A very convenient electronic service offering a non-standard approach to the study and teaching of pedagogy is "*Pedagogical World Map*", which brings together the main scientific theories and their authors. The basis of this electronic service is detailed biographies of the great Russian and foreign educator-thinkers. The information is visual and contains the main dates, abstracts of scientific ideas, the main publications and video lectures of modern scientists. A special tool has been created on the portal for self-assessment of pedagogical theories.

When studying geography, you can use "*Google maps*". Thanks to the convenient service with their help, it is easy to find the desired object, "walk" around the city in 3D mode or make your own route.

A good helper is "*The Atlas World Map*" application, which contains all the information about any country in the world. One of the interesting educational technologies is the so-called detailed *scratch cards*, for example, "*Travel Map Black World*", made in the design style, which can be useful both for travellers with experience and for those who are just discovering the world in the field fascinating travels. Such scratch cards are a good assistant in the study of geography and the world.

However, these same types of maps can also be created in the form of interactive mobile applications in economic theory, regional economics, industrial economics, etc.

At biology lessons, "*The iMolecule: DNA Biology*" applications that open up the wonderful world of cell biology will be useful. From them you can learn a lot of useful information about the structure and functions of DNA and RNA molecules, protein synthesis, as well as get acquainted with such concepts of biology as: complementarity, replication, mutation and transcription.

For those who are interested in anatomy, there is an excellent application *"Anatomy 4D"*. The application allows you to see how a person works literally in layers: at the level of muscles, vascular system and internal organs. All images are three-dimensional, so that the entire structure of a person can be perfectly viewed from all sides. Unfortunately, Russification is not yet available. And the application has age restrictions (17+).

*"The Biology Tutor"* application will help you learn biology on your own. The process of learning with him will turn into an exciting game: to open a new topic for study, you need to score a certain number of points for the previous one. Such a system additionally motivates and allows you to move faster from topic to topic.

The role of educational mobile applications in the study of foreign languages is also great.

By studying a foreign language, students can install a mobile dictionary on their gadget, whose advantage over the paper version is obvious: you can not only quickly find the right word, but also listen to the correct pronunciation. Unlike paper dictionaries, electronic versions are often free. In our study of English, one of the most successful applications, in our opinion, is the free Russian-English dictionary *"Reservo Context"*.

As an application for learning English on an Android or iPhone, the *"HelloTalk"* service will be indispensable. This is an educational platform where teachers are native speakers from around the world. With it, you can talk with them and exchange text messages.

Mobile application *"The Puzzle English"* helps to develop listening comprehension of English, understand the rules, develop translation skills and replenish your vocabulary. In addition, the Puzzle English application has interactive games with which you can easily pump your level of English.

The software product *"English Grammar Exercises"* allows you to learn English grammar anywhere, anytime. It contains more than three thousand grammatical topics and questions.

The application *"Enguru: Spoken English App"* focuses on spoken English, which will help you get an interview at a foreign company or simply conduct business correspondence with colleagues from abroad.

There are many interactive web services for learning English in a playful way. The most popular applications today are *"Lingualeo"*, *"Simpler"*, *"Duolingo"*, etc. The advantages of these applications are that new words are given with matching pictures, and associative thinking is turned on. There is sound accompaniment - it is very convenient, you can hear words and sentences without guessing about the correct pronunciation. The online learning process is built in a playful way: easily, naturally, dynamically, points are earned for the right answers, time tasks are solved, and your level rises. Exciting activities, form a habit of learning and repeating words, pronunciation of words can be heard.

*"The Duolingo"* software product will help in learning not only English, but also other foreign languages. Currently, the database includes 31 languages, including Russian. We also recommend using another good tool.

Easily pull up the English and French language will help the mobile application *"Lingvist"*. It offers to study the most used words and phrases, knows how to make hints, adapt to the user's level and monitor his progress. Also in the application there is a section of grammar rules and tables, the possibility of voice input and other useful goodies for those who study English or French.

For those who want to get basic knowledge about programming, we recommend installing the universal *"Code academy"* application. This program with the help of a robot distributes tasks, and he, along the way, reassuring, gives tips on how to complete the tasks. The duration of the course is only a couple of hours.

An interactive atlas of the starry sky *"Star Walk"* will be helpful in exploring astronomy issues. This is a high-quality interactive toolkit for observing the location of stars, planets, constellations, satellites and other space objects on a smartphone's display in real time. Detailed information is provided for all celestial objects. Additionally, it is recommended to install a compass and a gyroscope on a mobile device.

For a chemistry teacher, if there are not enough reagents for carrying out such complex experiments as fluorescence, an Egyptian night or an acetone flashlight, you can look at *"YouTube"*, where many scientists specially shoot the most spectacular experiments and post them on the Internet. Sometimes the videos tell in such detail about the experience that you can try to do a little lab work on them. A good mobile application for studying chemistry is the *"Chemik"* program.

In addition, one more chemical application, *"Chemical"*, which is ideal for studying chemistry in high school, which can count the molar masses of substances, equalize chemical reactions, solve equations, and perform other useful actions, can be noted. You can hone knowledge on tests and tasks.

In order to never forget the periodic table for a lesson in chemistry, it is better to download it on your smartphone. The *"Interactive Periodic Table"* is good in that it contains a huge amount of additional information that will be useful to both beginners and pros.

For those who study the history of painting, we can recommend using an application such as *"The Timeline Art Museum"*, where more than 80 of the most famous artists are located on the timeline, so you can not only read their biographies and view paintings, but also observe how art has changed over the years. You can also find out about each painting when it was painted, where it is stored, what period of the artist's creative work belongs, and so on.

*"The Artsy"* mobile app contains stories of people of any age who find new ways to be successful in non-traditional art formats.

Indispensable applications - helpers for everyone who teaches mathematics are calculators - ordinary, fraction calculator, etc. [13].

By installing *"The Photomath"* magic application on your gadget, it will help you quickly and accurately scan examples (not only printed, but also handwritten) and solve them. Photomath supports arithmetic operations, integers, fractions, decimal numbers, roots, knows how to solve

equations, knows trigonometry, understands functions, integrals and much more.

For mathematicians, designers, planners and programmers, *"The GeoGebra"* program will also be useful - this is a free dynamic mathematical environment, a software shell where there is a whole set of necessary tools for the full-fledged design of graphs and various figures. The choice of points, vectors and figures (including graphs and tables) is in the "Tools" tab, and all objects can be dynamically changed or new components created. The latest GeoGebra updates provide access to work with 3D objects.

It is also worth highlighting useful mobile applications for taking notes of educational material. For example, preparing for an exam, a test, or simply learning new concepts becomes easier with *"The Quizlet"* application, with which you can create cards and training modules, search for and use cheat sheets created by other users. *"Masthead"* for the study of foreign languages, history, vocabulary and the natural sciences.

For those who are familiar with the concept of *"Mind maps"*, he definitely either draws them in notebooks or creates them in special mobile applications like *"XMind"*. Mind maps is a visual display of information in the form of a tree diagram. Such smart cards help structure educational material and memorize it faster.

The application *"Vkontakte"* also can rightfully boast a huge number of educational groups and publics. With it, you can prepare for school exams, CT, Unified State Exam, improve your foreign language skills and generally learn everything that is possible.

To get feedback when interacting with parents and students themselves, you can use such software products as: mail services (Mail, Yandex ...), WhatApp, Viber, Skype chat applications, Social networks: Twitter, Facebook and Survey Maker - by Loop Survey Let's take a closer look at *"Survey Maker's"* online survey software, which is designed to quickly create online surveys, complex quizzes, and mobile user profiles. The advantages of this application are that feedback is obtained immediately. Counting of votes takes place using e-mail, text messages, links, accounts on Twitter and Facebook.

Summing up the above, I would like to note that working with innovative technologies in the form of mobile applications allows you to build conflict-free pedagogy and turn the educational process into effective creative activity.

### 3. CONCLUSION

Today, a huge variety of mobile applications of both educational and non-educational types are presented all over the world. The Russian mobile application market is also continuously growing and is one of the fastest growing segments of the digital market. This fact is evidenced by the annual growth rate. On average for the period 2014-2018 growth rates amounted to 15.2%. However, despite the fairly significant positive dynamics, the Russian market is somewhat inferior to the growth rate of the world market. For comparison, we can cite data for the period 2015-2018, where the average growth rate of the global market for

mobile applications amounted to 30.6%, which is almost two times less than the corresponding Russian figure. In 2018, the volume of the Russian mobile applications market amounted to 42.5 billion roubles. and over the year increased by 16.4%. According to experts, in the period 2019-2021. the growth rate of the Russian mobile application market will be about 14-16%. In 2021, the market volume can reach about 64 billion roubles [14].

The main driver of the growth of the mobile applications market will be the development of 4G (LTE) technology, an increase in the bandwidth of communication channels and the speed of Internet connection on mobile devices.

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