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Mobile Devices in Higher Education, Byod Technology

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Abstract: Today, a mobile device is not only a means of communication and entertainment, but also a means of education. In the field of education, technology such as BYOD (bring your own device) is emerging and gaining popularity. The article discusses the main aspects of implementing BYOD technology in higher education.

Keywords: educational technologies, e-learning, virtual environment, distance education, m-learning, BYOD technologies.

One of the main tasks of education in the context of digitalization is to prepare a person for life in a digital society, to launch the process of mass training in competencies that are relevant in the digital economy. It is important for educational systems to provide students and teachers with the tools to acquire the knowledge and skills necessary for a person in the digital economy; this requires new educational technologies [10,405].

Distance learning, as the name suggests, is learning at a distance. Distance learning is based on the use of distance educational technologies, without the use of virtual educational environments. This is training in conditions of indirect interaction between students and teaching staff. Previously, distance learning was more like classic distance learning. The use of computers and digital resources is secondary when describing this form of learning; it's just that these technologies are currently the most convenient for implementing distance learning [29].

Electronic learning (e-learning) involves interaction between students and teachers using electronic educational resources contained in any e-learning system (structured database of digital educational resources). To implement e learning, it is important, first, to have a complex of systematized and classified information used in the educational process and the means for its processing and delivery - information technology, equipment, and communications. E learning can also be organized face-to-face. The current generation of youth has grown up with mobile devices. Students are now among the most proficient users of modern mobile devices [10,406]. If we analyze the functionality of a mid-price smartphone, we will find that in many respects it corresponds to personal computers that were produced just a few years ago; in fact, a smartphone is a full-fledged personal computer, which is in the pocket of every second person.

Mobile learning (m learning) is learning implemented using mobile portable devices such as mobile phones, laptops and tablets. M-learning technology is closely related to E- learning and distance education technologies, and mobile learning is expected to become an integral part of most educational technologies in the near future. The use of mobile technologies makes it possible to implement various mechanisms for supporting E-learning; it is characterized by the following features:

- providing indirect, geographically distributed communication for joint activities without reference to the location of participants in the educational process;
- use of a mobile device as a personal library of educational, methodological and reference materials;
- increased student involvement in the educational process;

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- learning becomes student-centered, thanks to mobile technologies, students have the opportunity to adjust the content of educational content, they can ask questions and conduct research, rather than just listen to lectures;
- personalization of education, students can learn at their own pace, using multimedia content on their mobile devices, anywhere;
- Student cooperation and communication increases - collaboration is the key to successful learning, students use technology to communicate with their peers and with the teacher, mobile learning technologies can provide students with many more opportunities to interact with teachers and work with other students on assignments, projects and creation content. The main advantage of mobile technologies is that they are not tied to specific workplaces. A smartphone and a computer tablet make it possible to connect to the information environment in almost any arbitrary place, which allows them to be used in places previously unprepared for working with ICT. There are two main approaches to implementing mobile learning: BYOD (bring your own device), in this case, students and teachers use, their own mobile devices and GYOD (give your own device, in foreign literature the designation 1:1 or 1-to- is more often used). 1) When they are given mobile devices.

The main advantages of GYOD include uniform integration of mobile technologies into the educational process, uniformity of devices and platforms used, which reduces the possibility of failures in the operation of certain applications, maintenance and updating of already installed applications can also be centralized. The main problems in introducing this approach into the educational process are: the large financial burden on educational institutions for the purchase of devices and software, the cost of maintaining and upgrading devices, the need to train students and teachers to work with specific devices [10]. BYOD technologies are a natural continuation of the GYOD approach; they have been used in foreign universities for more than 10 years. Providing students with mobile devices is an expensive undertaking, so rather than investing in computer hardware, it makes more sense to allow students to use their own devices to access educational content. Let's consider the features of using BYOD technologies in the educational process. From a student's point of view, BYOD brings many benefits, including: the comfort of working with your own device; using technology that students are already familiar with can completely eliminate the additional cognitive load associated with learning; a sense of responsibility for the learning outcome and collaboration in projects. But perhaps the greatest benefit for students is that they can learn at their own pace, accessing content outside the classroom on their own devices when and where it suits them.

It should be noted that implementing BYOD means working with educational content on various operating systems (Microsoft, iOS, MAC OS, various Android variants) and hundreds of different devices. There is a lack of compatibility between operating systems and devices, which can lead to unusable devices, so BYOD needs a platform that can secure and unify different devices and operating systems. With or without the use of mobile technology, classes will be attended by “absent” students who are using their device for non-learning purposes [29]. BYOD platforms allow the teacher to control the learning process by providing feedback to the student in real time, providing analysis of each student's performance on learning tasks, which makes it possible to improve teaching methods and offer individual assistance to lagging students. And while these systems can't guarantee that every student will study, they can eliminate online distractions. A general network access restriction policy at the network level can control the content that students require [30]. In the traditional teaching model, the teacher can only guess whether a particular student is learning at all and whether he is mastering the material. Control measures and certifications record the learning outcome, but cannot proactively identify students who need help long before the exam or test. The use of mobile technologies can eliminate these problems by predicting sections of the curriculum that may cause difficulties for the student, allowing the teacher to make changes to the proposed content. One way to identify lagging students is real-time testing, which allows you to determine not only who answered incorrectly, but also those who simply did not answer for some reason. If the number of students who answered incorrectly and refused to answer is too large, the teacher may revise the relevant part of the curriculum [1,576].

An important issue when implementing BYOD is the issue of security. Because students use their own devices, applications for personal and educational use are installed simultaneously on the same device. Applications installed for personal use may hide malicious software and may distract students from their studies. The educational institution will have to constantly monitor the material accessed by students. It should also be noted that not all students own the latest state-of-the-art devices, this may result in some students having lower levels of BYOD usage. In addition, students' use of their own mobile devices can serve as a basis for property division among students [29]. Therefore, when implementing any BYOD solution, there are three key areas to pay special attention to: strategy and governance, network readiness, and security. Strategy and management: before starting to implement the BYOD architecture, the university must define goals, formulate requirements for the content of education and formulate an implementation strategy. This should include future plans for desktop virtualization, mobile collaboration, and other technology solutions that support next-generation learning. The next step is to develop a BYOD strategy and governance model to define the technical and policy requirements for a specific solution implementation. Network readiness: The number of end users accessing wireless networks could triple with a BYOD strategy that allows multiple devices, so a secure network architecture must be selected [3,133]; clearly identify the types of mobile devices that can be used; determine the number of Wi-Fi access points and network bandwidth, organize centralized data storage, etc. Security: Careful planning and implementation of security is critical to managing network access, maintaining compliance and protecting vital university data, and a security policy must be developed that clearly governs the actions of students and university staff [5, 1091]. The following can be recommended as learning platforms or virtual learning environments that can be used in m learning:

LearningApps.org is a Web 2.0 application to support learning and teaching through interactive modules. Existing modules can be directly incorporated into training content and can be modified or created on the fly. Moodle is a learning platform or course management system (CMS) - a free, open-source software package designed to help educators create effective online courses based on sound pedagogical principles [12, 11].

A QR code is a graphic image that is easily recognized by a mobile device equipped with a webcam, in which a small piece of information is encoded. The QR code scanner in education can be used both online and offline. For example, in offline mode, a QR code scanner can be used: for self-testing or mutual testing of test tasks, to encrypt the codes of the correct answers; when conducting tests and exams (or oral surveys), exam questions can be offered in the form of QR codes, etc. **Quizlet.com** is a free online service for creating and using flashcards and educational games. To visualize the learning process, you can create cards in any discipline using visual, text and audio support.

Google forms are a convenient tool for testing; they allow you to personalize filling out the form; when recording responses to the form, the author, date and time of completion are always recorded; the results are recorded in a table, which is convenient for data analysis and processing; the student can look at his results and analyze his mistakes.

However, to summarize, we can conclude that the BYOD model is promising; the success of its implementation depends on the readiness of both the teacher, students, and university administration to use personal mobile devices for educational purposes. The teacher is required to have a high level of information culture, knowledge of the technical characteristics of mobile devices, software and network services.

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