

Advantages and Disadvantages of M-Learning in University Teaching

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Abstract: *In the context of contemporary university teaching, the questions of the characteristics, advantages and disadvantages of m-learning have attracted increasing interest, especially in regard to the importance of this type of learning for students' initial education and their professional work in the future. In view of this, research was conducted with the aim of investigating the students' attitudes towards the advantages and disadvantages of m-learning in university teaching, as well as the impact of sociodemographic and educational variables on the students' attitudes. The sample comprised 308 students from the faculties of education and philosophy from 4 universities in Serbia. The survey technique was used for data collection, and the instrument was a questionnaire with the assessment scale designed specifically for the purposes of this research study. The research results show that the surveyed students see the availability and possibility of free use of mobile applications, as well as the access to current topics and content as the greatest advantages of m-learning, while the difficulties in assessing the validity of knowledge tests, mobile device addiction and the Internet access are seen as its greatest disadvantages. The obtained results also imply certain recommendations as to how the students can better recognize the importance of m-learning as an aid to the learning process, the ability to follow lectures and learn content.*

Keywords: *mobile devices; teaching; higher education; learning; mobile applications*

1. INTRODUCTION

Although the use of mobile devices as a support for learning is not new [1], the concept of mobile learning has been introduced into the wider scientific discourse in education over the last two decades. Various reasons have contributed to this, and in particular the following ones: an increase in wireless internet access [1, 2], an increase in the number of mobile device owners in both student and general population [2, 3, 4], the increased use and improvement of mobile technology functions [1, 5], and their ubiquity in everyday life [1].

M-learning has the potential for transforming and innovating education systems, primarily because of its ability to increase the usability of information and communication resources, reduce costs, overcome the disadvantages of traditional teaching, and achieve educational outcomes [6]. It is also thought that the use of m-learning improves the quality of higher education, thus making it more efficient and more available [7]. Although there is no standard attitude about the definition of m-learning, its relationship to other related terms, the importance or possibilities of its integration into teaching, it is indisputable that mobile devices and technologies play an increasingly important role in initial education and academic life of students.

Various mobile devices are used in m-learning: mobile phones, smartphones, tablets, e-readers, players, netbooks, cameras and digital cameras [3, 8, 9].

M-learning is defined as a form of distance learning based on mobile technology [5], i.e. a form of e-learning delivered through various mobile devices [10]. It is also defined as learning that is delivered through social and content resources, by using personal electronic devices in various contexts [11], and sometimes [6] as a "type of hybrid teaching supported by mobile devices, applications and web tools" (p. 1046)". In the early stages of m-learning development, some authors questioned its use and definitions [12], while others thought it was a term that needs to win credibility within the existing network of scientific terms [1].

Differences in the definition of m-learning exist not only with regard to its range (e.g. whether it is an autonomous form of learning or simply a subtype of e-learning), but primarily as regards its content, i.e. whether it is a type or form of learning [5, 10, 11, 13, 14], an approach to learning or a type of teaching [6].

Within the contemporary definitions [11, 13, 14, 15], four constructs of m-learning are emphasized: educational, technological, contextual and social;

therefore, m-learning is understood as learning across different contexts, through social and content interactions, by using personal, i.e. mobile devices and technologies. Taking into consideration the existing definitions, in this paper, m-learning is understood as a subtype of e-learning in which learning takes place through interactions with other people and content in formal, non-formal and informal contexts by using mobile devices and technology. These different approaches and definitions support the fact that m-learning is constantly being developed and redefined, as a result of the intensive development of mobile devices and technologies, and new approaches to teaching and learning.

1.1. Advantages and disadvantages of m-learning: a literature review

Ever since m-learning came into wider use in higher education, the research focus has been on considering the advantages and disadvantages of its use, most commonly through self-evaluation [16, 17, 18] and systematic reviews [2, 3, 19, 20]. Within the context of higher education, the results of many studies [2, 8, 11, 16, 17] suggest that m-learning can be used as a support for learning. Research results [2] show that m-learning significantly improves learning efficiency, communication and collaboration between students and teachers, and interaction in content creation. The most important characteristics that recommend mobile devices as a support for learning are: portability, collaboration, ubiquity, usability, perception and acceptance [8]. Chetri [11] emphasizes the following possibilities of m-learning: it enables personalized learning (e.g. content and assignments are sent to students on a personalized level), it enables individualized (student-oriented) and collaborative learning, which is tailored to students' individual needs and interests, it promotes students' problem-solving skills, communication, creativity, and motivation. The advantages of m-learning are also visible in its potential to combine learning in formal and non-formal contexts, encourage active learning and student-oriented learning [20].

In one study [16], the students stated that the most useful aspects of m-learning are a simple approach to course resources and materials and improved communication with other students and teachers. In addition, m-learning helps students develop analytical and note-taking skills. M-learning provides a fast and flexible approach to various educational content types and information sources, anytime, anywhere. This characteristic of m-learning provides students with the possibility of choosing the place, time and dynamics of learning in acquiring and applying knowledge. Similar results were obtained in other studies. Rysbayeva et al. [17] found that the students consider a fast

and flexible approach to information and relevant content, anytime, anywhere, as well as the possibilities of using a variety of learning methods to be the greatest advantages of m-learning. Based on the students' attitudes, mobile applications for learning increase motivation, facilitate learning and are also useful, whereas disinformation, the need for mobile support and their high price are seen as disadvantages.

Research results [21] show that m-learning positively influences the acquisition of knowledge, as well as the development of skills and attitudes of prospective teachers during initial education. Students who used educational software during m-learning demonstrated greater knowledge of the course content than those who did not use such advanced educational tools [9].

M-learning contributes to greater education availability, especially for those individuals who live in the communities with low socio-economic conditions, limited infrastructure and resources, since the use of mobile devices and technologies reduces the costs of learning, thus providing unlimited access to information [7, 22].

One of the advantages of m-learning is its potential to facilitate and improve communication of those students who suffer from anxiety as they can anonymously participate in learning activities [23, 24]. It was found that the use of mobile applications in anatomy teaching can be an efficient method not only for improving learning, but also for reducing students' anxiety [23].

As regards the integration of mobile technology in educational activities [25], the students reported the following advantages: *technological advantages* (e.g. access to materials and other resources, portability, e-courses, fast data storage, online books, etc.), *efficient communication* (exchange and flow of information, in-group and student-teacher communication), *information* (access to information, diversity of information sources, information quality and quantity), *opportunities of educational process* (effective learning, collaborative learning, interactive teaching, knowledge application, knowledge assessment and feedback), *personal development* (personal time optimization, cognitive, moral and social development, regulatory process development, possibilities of sharing personal experience), *economic and ecological advantages*.

Given all of the above, m-learning offers many advantages: a fast and flexible approach to information and learning resources [16, 17, 25, 26], improved academic performance [9, 18, 23, 27, 28], increased motivation [3, 16, 27, 29], self-regulated learning [25, 30], social interaction and collaboration with other students and teachers [2, 8, 11, 16, 25].

Despite many advantages m-learning has in higher education, there are some factors that directly

influence the acceptance and use of mobile devices and technologies. The following factors are particularly emphasized: small screen size, limited processing power, reduced input capacity [31], prejudices against and bans on mobile devices [10, 32], costs associated with mobile devices [17, 33], incompatibility of operating systems [33], and personal data protection and security [34]. The use of m-learning is also faced with the problems related to interface, costs and dependence on infrastructure [20]. The use of mobile phones in education meets resistance of a social and educational community, which is why their use is banned in many educational institutions [10], or teachers reluctantly encourage students to use mobile devices for learning. Besides, it was found that obstacles to using mobile technologies in education can be categorized into 6 groups: negative influence on students' personal development (health issues, sedentary behavior), technology-related issues (technology addiction, prejudices against m-learning), information quality and credibility, reduced communication and social skills, negative effects on the educational process, economic, ecological and ethical disadvantages [25]. The use of mobile devices in education is also associated with the existence of some behavioral problems in young people such as cheating, disruption, cyberbullying, accessing and sharing inappropriate content and the like [35]. One other disadvantage of using mobile phones in teaching is related to the avoidance of academic responsibilities (e.g. texting in class, cheating on exams, taking photos, etc.) [36]. There are many obstacles to successful integration of m-learning into teaching. Some challenges are also due to lack of self-efficacy to integrate technology, negative attitudes towards technology and lack of pedagogical strategies [37]. In their analysis of the concept of personal mobile devices in higher education, Trivunović and Gajić [38] concluded that their use is faced with two key problems: technical requirements and teachers' non-acceptance of the concept.

The literature review on m-learning provides an insight into the main research areas and questions that need to be addressed. Students' attitudes towards mobile technology are one of the key factors in accepting and using mobile devices in education. Therefore, we considered the investigation of students' attitudes towards the advantages and disadvantages of m-learning in higher education to be an important issue.

2. RESEARCH METHODOLOGY

2.1. Research aims and tasks

Considering the importance of m-learning for initial education and students' professional work in the future, the aim of this paper was to investigate students' attitudes towards the importance of m-

learning in higher education, i.e. the advantages and disadvantages of m-learning in university teaching. The general *aim of the research* was specified through two tasks:

- (1) investigate the advantages and disadvantages of m-learning in university teaching; and
- (2) determine whether there are any significant differences in the students' attitudes with regard to sociodemographic and educational variables (sex, year of study, study programme, university, frequency of use of mobile applications, course type and status).

Based on the previous research results, *two research hypotheses* were formulated and tested in this paper:

Hypothesis 1: The students highly value the advantages and disadvantages of m-learning in university teaching. We hypothesize that their evaluations of the advantages and disadvantages of m-learning will be related more to the characteristics regarding its ease of use than the usefulness of mobile devices and technologies.

Hypothesis 2: There are significant differences in the students' attitudes with regard to sociodemographic and educational variables (sex, year of study, study programme, university, frequency of use of mobile applications, course type and status).

2.2. Research sample

The sample comprised 308 students from the faculties of education and philosophy in Serbia, aged 19–33, of whom 89.3% were females and 10.7% males. The sample comprised students from 4 universities: Kragujevac (48.7%), Niš (25.6%), Belgrade (13.0%) and Novi Sad (12.7%). 44.5% of the students were enrolled on the Preschool Teacher programme, 31.5% of the students were enrolled on the Primary School Teacher programme, and 24.0% of the students were enrolled on the Pedagogy programme. 33.1% of the students were first-year students, followed by fourth-year students (20.5%), first-year MA students (20.5%), third-year students (14.3%), and second-year students (11.7%).

2.3. Research methods, techniques and instruments

A survey research method, survey and scale techniques were used in this study. The research instrument was a questionnaire with the assessment scale.

The first part of the questionnaire included questions about the students' sociodemographic and educational characteristics (sex, year of study, study programme, university, frequency of use of mobile applications, adequacy of courses (as regards their type and status) for the use of m-learning).

The second part of the instrument, i.e. the Likert-type scale, included 29 statements, grouped into two subscales. The first subscale – *Advantages of m-learning in university teaching* – included 17 statements (e.g. *By using m-learning, students learn at their own pace, anytime, anywhere; Mobile devices reduce learning and studying costs*). The second subscale – *Disadvantages of m-learning in university teaching* – included 12 statements (e.g. *M-learning contributes to the display of socially unacceptable behavior in class (disruption, cheating); The data and content amount in m-learning is limited*). The initial scale and the two subscales meet the theoretical reliability requirements ($0.7 \leq \alpha < 0.9$) as the calculated values of Cronbach's Alpha coefficient are: 0.87 for the whole scale, 0.89 for the first subscale, and 0.83 for the second subscale. The students were asked to state their agreement with the statements on the five-point scale (1 – *Strongly disagree*; 5 – *Strongly agree*). A higher score on the scale indicates that students highly value not only the advantages of m-learning, but also its disadvantages.

2.4. Data collection and analysis

A group and online survey (via Google Forms) was conducted during the summer term of the 2023/2024 academic year. Student participation in the survey was voluntary and anonymous. The following descriptive statistics measures were used in data analysis and interpretation: frequency, percentage, standard deviation, and skewness and kurtosis measures. For investigating statistically significant differences in the students' attitudes towards the advantages and disadvantages of m-learning, we used a one-way analysis of variance for non-repeated measures (ANOVA). T-test was used to test the differences in the students' attitudes with regard to sex. One sample t-test was used to test the significance of the value of the calculated arithmetic mean compared to the theoretical range of the scale.

3. RESULTS AND DISCUSSION

The results obtained by descriptive statistics (Table 1) indicate that the students have a moderately high attitude ($M=106.23$; $SD=14.71$) towards the advantages and disadvantages of m-learning in university teaching. The same direction and strength of the students' attitudes are found on both subscales, where the advantages of m-learning are considered separately from its disadvantages. The results of one sample t-test confirm the significance of the difference between the arithmetic mean ($M=106.23$; $SD=14.71$) and the theoretical arithmetic mean of the scale (min.29; max.145; $t(307)=18.981$, $p<0.01$). The obtained results suggest that our first research hypothesis can be accepted. Other studies [16, 17]

have also found that students have positive attitudes towards the use of m-learning.

Table 1. Descriptive parameters for the advantages and disadvantages of m-learning scale and related subscales

Dependent variables	M	SD	Scale range
Advantages and disadvantages of m-learning scale	106.23	14.71	29-145
Advantages of m-learning	60.85	11.19	17-85
Disadvantages of m-learning	41.57	8.22	12-60

Legend: M – arithmetic mean; SD – standard deviation

Considering the individual statements (Table 2), the results show that the greatest level of agreement was for the following advantages of m-learning: online availability of mobile applications ($M=4.15$; $SD=0.91$), free use of mobile applications ($M=4.03$; $SD=1.07$), and access to current topics and content ($M=4.02$; $SD=1.04$).

Table 2. Descriptive parameters for the advantages of m-learning in university teaching

Items	M	SD
M-learning is more suitable for shy and more reserved students.	3.04	1.17
M-learning motivates students to study harder.	3.31	1.13
By using m-learning, students learn at their own pace, anytime, anywhere.	3.69	1.09
Learning through mobile devices is easier than traditional learning from books.	2.94	1.26
Learning through mobile devices is faster and more interesting than traditional learning from books.	3.18	1.21
M-learning fits the needs and interests of all students.	3.53	1.07
M-learning contributes to better academic performance (high grades, overall performance, etc.).	3.36	1.08
M-learning improves the learning process, thus providing a continuing support for learning.	3.54	1.01
Mobile devices reduce learning and studying costs.	3.61	1.20
M-learning improves student-teacher communication.	3.58	1.24
M-learning improves communication among students.	3.74	1.21
M-learning provides a considerable support for learning, following lectures and understanding learning content.	3.68	1.07
Current topics and content are more accessible via m-learning.	4.02	1.04
M-learning helps students better prepare for their future professional work.	3.53	1.09
There is no time limit for most mobile applications.	3.93	0.98
Most mobile applications are free.	4.03	1.07
Most mobile applications are available online.	4.15	0.91

Legend: M – arithmetic mean; SD – standard deviation

The average scores for most items are higher than the neutral values (2.50–3.49), except for the five statements. The obtained results are in line with the previous research results [25, 39, 40]. Based on the students' attitudes, the greatest advantage of mobile applications in foreign language learning is their availability, the fact that they are usually free and do not involve additional costs, whereas

the greatest disadvantages have to do with the quality of the available grammar exercises [39]. The research results [40] show that, according to students, the availability and ease of use of mobile applications are the most desirable characteristics of m-learning. It is also interesting that the characteristics related to the perceived ease of use of m-learning are seen as the greatest advantages by the students. According to the determinants of the Technology Acceptance Model (TAM) [41], the basic assumption is that the ease of use and usefulness of technology shape students' attitudes to and intention in using technology for learning.

On the other hand, the results in Table 3 show that the students see the following items as the greatest disadvantages of m-learning: validity of online tests, i.e. its potential for assessing acquired knowledge (M=3.81; SD=1.17), the impossibility of using mobile applications offline (M=3.69; SD=1.21), and mobile device addiction (M=3.66; SD=1.04). From the pedagogical, and more narrowly, docimological perspective, it is extremely important that grades and knowledge tests are valid, i.e. that students' achievements reflect the actual level of acquired knowledge [42], and not their improvisation skills in those assessment situations which are not uncommon in the digital environment [35][42]. The dependence of mobile applications on the Internet access [20] and mobile device addiction [25] have been seen as challenges of m-learning in previous studies as well.

Table 3. Descriptive parameters for the disadvantages of m-learning in university teaching

Items	M	SD
M-learning reduces student-teacher interaction.	3.45	1.25
M-learning is not suitable for all academic courses.	3.65	1.20
It is more difficult to assess learning results.	3.60	1.14
It is more difficult to assess the validity of online knowledge tests.	3.81	1.17
Some teachers do not allow students to use mobile devices for learning and following lectures.	3.56	1.28
M-learning contributes to the display of socially unacceptable behavior in class (disruption, sharing inappropriate content, etc.).	3.45	1.19
Mobile devices negatively influence students' concentration.	3.54	1.19
Most mobile applications require Internet access.	3.69	1.21
The speed of processing data and connecting mobile devices is low.	2.94	1.08
Screen size – a good layout of data – is a disadvantage of m-learning.	3.17	1.14
M-learning increases students' addiction to mobile devices.	3.66	1.04
The data and content amount in m-learning is limited.	3.05	1.02

Legend: M – arithmetic mean; SD – standard deviation

As part of the second research task, we aimed to investigate the significance of the differences in the students' attitudes towards the advantages and disadvantages of m-learning in university teaching with regard to some characteristics of the students. Table 4 shows only statistically significant differences in students' attitudes. It is determined that only two observed variables possess significant

influence: the frequency of use of mobile applications for learning and the adequacy of use of m-learning in different academic courses (general academic and professional application courses).

Table 4. The significance of differences in the students' attitudes towards the advantages and disadvantages of m-learning with regard to independent variables

Variables	Modalities	M	F
Frequency of use of mobile applications for learning	Very often	64.16	F=7.230 p=0.00 * LSD test 1-3; 1-4;
	Sometimes	60.73	
	Very rarely	56.38	
	Never	55.19	
Adequacy of use of m-learning in general academic courses	Strongly disagree	95.75	F=17.956 p=0.00* LSD test 1-4; 1-5;
	Mostly disagree	94.92	
	Neither agree nor disagree	102.11	
	Mostly agree	110.11	
Adequacy of use of m-learning in professional application courses	Strongly disagree	99.36	F=15.445 p=0.00* LSD test 1-5; 2-4; 2-5;
	Mostly disagree	98.55	
	Neither agree nor disagree	101.74	
	Mostly agree	109.56	
	Strongly agree	116.16	

Legend: M – arithmetic mean; F – one-way analysis of variance for non-repeated measures; * – statistically significant at 0,01 level; LSD test – the least significant difference test.

The students who use mobile applications for learning very often (M=64.16) more positively value the advantages and disadvantages of m-learning compared to those who use them very rarely (M=56.38) and those who never use them (M=55.19). It is observed that the students who use mobile applications more frequently, more highly value the advantages and disadvantages of m-learning. This was expected as only by using mobile applications more frequently are they able to better evaluate all the advantages and disadvantages of m-learning.

Statistically significant differences were observed in the students' attitudes towards the advantages and disadvantages of m-learning with regard to the adequacy of use of m-learning in general academic courses (F=17.956; p=0,00). The subsequent pairwise comparison tests (The least significant difference test – LSD test) indicated significant differences between the following pairs of students: a) those having a positive attitude (M=115,14) and those having a moderately negative attitude (M=94,92); and b) those having a positive attitude (M=115,14) and those having a negative attitude (M=95,75). The students who expressed greater agreement with the advantages and disadvantages of m-learning also expressed greater agreement with the adequacy of use of m-learning in general academic courses compared to the students who have a negative and moderately negative attitude.

There is a statistically significant difference in the students' attitudes towards the advantages and disadvantages of m-learning with regard to the adequacy of use of m-learning in professional application courses ($F=15.445$; $p=0.00$). The subsequent pairwise comparison tests indicated significant differences between the following pairs of students: a) those having a positive attitude ($M=116.16$) and those having a negative attitude ($M=99.36$); b) those having a moderately positive attitude ($M=109.56$) and those having a moderately negative attitude ($M=98.55$); and c) those having a positive attitude ($M=116.16$) and those having a moderately negative attitude ($M=98.55$). The students who more highly value the advantages and disadvantages of m-learning tend to have a significantly more positive attitude towards the adequacy of use of m-learning in professional application courses. Regarding the fact that general academic courses are introduced in the earlier stages of initial education, and professional application courses in the final years of undergraduate and master's studies, it is necessary to more intensively work on the integration of mobile devices and technologies into all years of study and courses (regardless of their type, so that students can evaluate the advantages and disadvantages of m-learning more critically. Besides, the studies on the efficiency of m-learning [9, 18, 23, 27, 28] suggest the need for a more frequent use of m-learning in higher education and provide ample evidence on the many possibilities for its use in various courses. Therefore, m-learning does not depend on the educational content and can be used in a wide variety of academic courses.

4. CONCLUSION

Although m-learning has long been used in higher education, in the context of the Serbian education system, it is still being developed, which is why research studies on students' attitudes are scarce. The fulfillment of m-learning potential is not possible unless all elements (student, teacher, environment, content and assessment) and characteristics of this learning type (ubiquitous, spontaneous, mobile, personalized, interactive, collaborative) are carefully considered, together with the knowledge of the environment and learning activities [43].

Based on the research hypotheses and the results obtained, the following conclusions can be drawn: a) The first research hypothesis is fully accepted. Students have a moderately positive attitude as regards evaluations of the advantages and disadvantages of m-learning in university teaching; and b) The second research hypothesis is partially accepted. There are significant differences in the students' attitudes towards the advantages and disadvantages of m-learning with regard to the frequency of use of mobile applications for learning

and the adequacy of use of m-learning in general academic and professional application courses.

The obtained results imply the following *recommendations for teaching practice*: students' familiarization with various possibilities and limitations of m-learning and more intensive integration of mobile technologies into teaching, regarding the specificities of study programmes.

Implications for future research include: investigating students' attitudes towards the advantages and disadvantages of m-learning within theoretical models of technology acceptance and use; investigating determinant factors of students' attitudes towards m-learning that remained outside the scope of this paper such as: the frequency of use of mobile applications in general academic, theoretical-methodological and professional application courses. There is also a perceived need to replicate the research by using larger and more representative samples which would include other universities of different scientific fields.

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