

# The Use of M-Learning in Teaching Methods Courses at Faculties of Education

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**Abstract:** *The paper presents the results of the research conducted with the aim of investigating the university students' attitudes towards the use of m-learning in teaching methods courses. The theoretical background of the research study includes previous knowledge of the importance and use of m-learning in professional application courses at faculties. The sample comprised 161 final-year students of undergraduate and master's studies from the faculties of education from 4 universities in Serbia. The survey technique was used for data collection, and a research instrument – A Questionnaire with the Assessment Scale – was specifically designed for the purposes of this research study. The research results indicate that within the Primary School Teacher study programme m-learning is most frequently used in Teaching Methods of the Serbian Language and Literature, Teaching Methods of Mathematics, and Teaching Methods of Nature and Society, while the students of the Preschool Teacher study programme use m-learning most frequently in Teaching Methods of Environmental Studies, Teaching Methods of Speech Development, and Teaching Methods of Developing Initial Mathematical Concepts. The research results imply that it is necessary to shift the focus from lesson planning onto the practical implementation of lessons and activities in teaching methods courses.*

**Keywords:** *primary school teacher; preschool teacher; professional application courses; mobile devices; faculties of education*

## 1. INTRODUCTION

Owing to new technologies as well as a growing number of multimedia software types and mobile applications, learning has become contextualized, more authentic, ubiquitous and mobile [1]. Namely, mobile technology development offers many possibilities as regards multimedia experience and resources that transform learning: "from formal to informal, from static to dynamic, and from personal to shared" (p. 306) [2].

The integration of m-learning into study programmes at universities promotes the development of lifelong learning as these study programmes often fit neither the needs of students nor the stage of technological development [3]. The quality of contemporary university teaching is reflected in creating conditions for students' individualized and collaborative activities, which suit their abilities, interests, learning styles and motivation, and such concept of teaching is not possible without the assistance of contemporary information and communication technologies [4].

In the early definitions of m-learning [5, 6], the focus was more on technology. Therefore, m-learning was defined as an extension of e-

learning, using mobile devices, i.e. as a form of learning delivered through mobile devices (personal digital assistants (PDAs) and mobile phones, etc.). Baran [7] emphasizes that the early definitions of the concept were focused on the availability, mobility and utility of mobile devices, while contemporary definitions tend to focus more on exploring the possibilities that result from the technological characteristics of mobile devices. Contemporary definitions [8, 9, 10, 11] tend to focus on various aspects, including not only technical aspects, but also educational, social and contextual aspects. One of the most frequently cited definitions [9] defines m-learning as "learning across multiple contexts through social and content interactions using personal electronic devices" (p. 4). A similar definition was given by Sharples, Taylor and Vavoula [11] who define m-learning as "the processes of coming to know through conversations across multiple contexts amongst people and personal interactive technologies" (p. 5).

In this paper, we focus on the use of m-learning in initial teacher education, and in professional application courses in particular, which are most closely connected with their future educational work and teaching practice. For today's teachers

to be able to satisfy the educational needs of their future students, it is necessary to develop new ways of teaching and learning in initial teacher education, which are based on contemporary technologies [12]. Namely, improving initial teacher education provides a basis for the development of educational approaches that will influence and transform educational practices, from early childhood education and preschool education to higher education. Given all of the above, it is necessary to determine the extent to which m-learning is used in initial teacher education and also which segment of initial education (planning and implementation of practical lessons, pre-exam requirements, training in teaching methods, revising for exams, etc.) it is most frequently used in.

### 1.1. The use of m-learning in initial teacher education

The potential and use of m-learning have been studied in various contexts, with regard to educators such as: teacher training [13], teachers' professional development [12], early career of teachers [14]. Over the past few decades, the research focus has increasingly shifted onto exploring the possibilities of using m-learning in teacher education, i.e. in the education of students majoring in education [15, 16]. This tendency is reinforced by a growing number of projects aimed at using m-learning in teacher education. Various m-learning projects have been developed and implemented around the world: *MITE: Mobile Technology in Teacher Education* (Ireland); *MTTEP: Mobilizing and Transforming Teacher Education Pedagogies* (the Netherlands, Norway, Germany and Australia); and *DEIMP: Designing and Evaluating Innovative Mobile Pedagogies* [17].

In addition to international frameworks [18], strategic frameworks [19] and education policy documents in Serbia [20, 21, 22] emphasize the importance of developing (preschool) teachers' digital competences during all stages of their education and professional work (initial education, work-study programs, professional development). Within the newest digital competence framework [22], the knowledge and skills of teachers for a new age are categorized into 6 areas: digital environment, digital resources, teaching and learning, developmental evaluation, assisting learners in the learning process, professional engagement and development. The framework was developed with the aim of providing support for teachers in "the process of digital concepts, tools and content integration in everyday educational practice" (p. 7). Hence the need to innovate study programmes at faculties of education, in line with scientific and technological advancements and challenges of contemporary society. The use of m-learning in teacher

education has been reported in various research studies [15, 23, 24] and systematic reviews [7, 25, 26, 27].

In her systematic review of research on m-learning in teacher education, Baran [7] reports 6 main findings: (a) the integration of m-learning is on the increase; (b) the integration of m-learning is rarely associated with theoretical and conceptual perspectives; (c) there are variations in perceptions and attitudes of future teachers about m-learning; (d) benefits of using m-learning are especially emphasized; (e) challenges of m-learning are under-researched; and (f) specific educational means support the integration of m-learning.

In one other systematic review, Ngao et al. [25] identified 6 key topics related to the approaches used in the area of digital transformation of study programmes at faculties of education. The topics were categorized into three levels: a) *micro* – pre-service teachers conceptions about mobile technologies; b) *meso* – organizational levels; and c) *macro* – corporate issues on mobile technologies related to policies and financial support.

The study conducted by Burden & Hopkins [23] found that the first-order barriers in using iPad in initial teacher education are: access to technology, time, lack of technical and administrative support, and lack of training courses on the use of iPad. The study also identified the following second-order barriers in using iPad in initial teacher education: *pedagogical beliefs* (e.g. inability to perceive pedagogical purpose or fit with curriculum), *beliefs about technology* (e.g. concerns about rapid pace of change in technology), attitudes towards change (e.g. beliefs about ability to implement change) and *classroom practices* (e.g. distrust of students ability to manage devices in school).

Price et al. [24] found that nursing students have a positive attitude towards social media networks and that they perceive social media networks as a way to promote discussion and share information, as well as to increase awareness of nursing issues within their course.

Jorgić et al. [15] conducted research with the aim of identifying the differences in the frequency of use of mobile phones by students majoring in education with regard to their socio-academic variables. They found that there is potential for improving teaching at faculties of education, as well as the need for training students – future teachers to use mobile phones for the purpose of improving learning of their future students.

Based on the results of the study by Sebbowa and Muyinda [16], future history teachers identified the following key advantages of using mobile phone forums: enhanced interaction with other

students and teachers, collaborative learning and reflection on the past.

## 2. RESEARCH METHODOLOGY

### 2.1. Research aims and tasks

Starting from the importance of m-learning in higher education, and in professional application courses in particular, we conducted research with the aim of investigating the attitudes of students from faculties of education towards the use of m-learning in teaching methods courses. Accordingly, two research tasks were defined:

- (1) investigate the students' attitudes towards the frequency and the possibilities of use of m-learning in teaching methods courses; and
- (2) investigate the influence of sociodemographic and educational variables (sex, year of study, study programme, university, frequency of use of mobile applications) on the students' attitudes towards the use of m-learning in teaching methods courses.

Two research hypotheses were formulated and tested in this paper:

Hypothesis 1: The students highly value the frequency and the possibilities of use of m-learning in teaching methods courses.

Hypothesis 2: There are significant differences in the students' attitudes towards the frequency and the possibilities of use of m-learning in teaching methods courses with regard to sociodemographic and educational variables.

### 2.2. Research sample

The sample comprised 161 final-year students of undergraduate and master's studies from the faculties of education in Serbia, of whom 91.30% were females and 8.7% were males. The sample consisted of the students enrolled on two study programmes: Primary School Teacher programme (34.17%) and Preschool Teacher programme (65.83%). The students from the University of Kragujevac made up the largest percentage of the sample (37.88%), followed by the students from the University of Vranje (30.45%), the University of Novi Sad (17.39%) and the University of Belgrade (14.28%). With regard to the year of study, 45.34% of the students were fourth-year students, followed by third-year students (33.54%), and MA students (21.12%). Regarding the frequency of use of mobile applications, the students who use mobile applications very often made up the largest percentage of the surveyed students (64.60%), followed by those who use mobile applications sometimes (18.01%), those who use them very rarely (13.04%) and those who never use mobile applications (4.35%).

### 2.3. Research methods, techniques and instruments

A descriptive, non-experimental method, survey and scale techniques, and a questionnaire with the assessment scale were used in the research. For the purposes of the research, a special research instrument – a combination of a questionnaire and an assessment scale – was designed. The first part of the research instrument was used to collect data about the students' sociodemographic and educational characteristics (gender, year of study, study programme, university, frequency of use of mobile applications) and the frequency of use of m-learning in professional application courses. The second part of the research instrument included a five-point scale with 9 items which was used to investigate the students' attitudes towards the possibilities of using m-learning in teaching methods courses. A higher score on the scale indicates that the possibilities of using m-learning in teaching methods courses are valued more positively by the students, and vice versa, a lower score indicates that the students have a more negative attitude towards the possibilities of using m-learning. The initial scale had a satisfactory reliability, since the calculated value of Cronbach's Alpha coefficient was 0.87.

### 2.4. Data collection and analysis

The research was conducted in two ways: in person and online during the summer term of the 2023/2024 academic year. Student participation in the survey was anonymous and voluntary.

The collected data were processed and analyzed using descriptive statistics (frequency, percentage, standard deviation, and skewness and kurtosis measures) and inferential statistics (t-test, ANOVA).

## 3. RESULTS AND DISCUSSION

The first research task was aimed at investigating the frequency and possibilities of use of m-learning in teaching methods courses, from the perspective of the students majoring in education. The descriptive measures (Table 1) indicate that m-learning is used in teaching methods courses of the Primary School Teacher programme with varying frequencies and most frequently in the following courses: Teaching Methods of the Serbian Language ( $M=4.10$ ;  $SD=0.73$ ), Teaching Methods of Mathematics ( $M=3.89$ ;  $SD=0.81$ ) and Teaching Methods of Nature and Society ( $M=3.88$ ;  $SD=0.87$ ). In the Preschool Teacher programme, m-learning is most frequently used in the following teaching methods courses: Methods of Speech Development ( $M=3.78$ ;  $SD=0.95$ ), Methods of Environmental Studies ( $M=3.78$ ;  $SD=0.92$ ) and Methods of Developing Initial

Mathematical Concepts ( $M=3.77$ ;  $SD=0.93$ ). Since the average values for all items exceed the neutral values (2.50–3.49), the hypothesis that the students of both study programmes moderately highly value the frequency of use of m-learning in teaching methods courses at faculties of education can be accepted. Based on the students' attitudes, m-learning is used very often in all teaching methods courses of both the Preschool Teacher and Primary School Teacher programmes. Similar to our findings, Tong et al. [27] concluded that m-learning is used in various courses, and most frequently in foreign language courses.

**Table 1.** The frequency of use of m-learning in professional application courses

Professional application courses	Mean	SD
Teaching Methods of the Serbian Language and Literature	4.10	0.73
Teaching Methods of Mathematics	3.89	0.81
Teaching Methods of Nature and Society	3.88	0.82
Teaching Methods of Music	3.76	0.85
Teaching Methods of Art	3.83	0.85
Teaching Methods of Physical Education	3.55	0.90
Methods of Inclusive Education	3.73	0.82
Methods of Speech Development	3.78	0.95
Methods of Developing Initial Mathematical Concepts	3.77	0.93
Methods of Environmental Studies	3.78	0.92
Methods of Music Education	3.69	0.95
Methods of Art Education	3.69	0.99
Methods of Physical Education	3.61	0.96
Methods of working with children with special educational needs	3.57	0.97

The abovementioned is supported by the results regarding the average values for the whole scale (Table 2), which show that the students moderately highly value ( $M=33.59$ ;  $SD=6.29$ ) the possibilities of using m-learning in teaching methods courses.

The average scores for most items on the scale of the possibilities of use of m-learning in teaching methods courses (Table 3) are above the neutral values (2.50–3.49), thus indicating that the students moderately highly and highly value the use of m-learning in various course aspects: *planning and implementing of practical lessons, pre-exam requirements, training in teaching methods, exam revision, lesson/activity planning, etc.*

**Table 2.** Descriptive parameters for the scale of the possibilities of use of m-learning in teaching methods courses

M	SD	Sk.	K.	Theoretical range of the scale
33.59	6.29	-.466	.021	9-45

Note: M – arithmetic mean; SD – standard deviation; Sk. – Skewness; K. – Kurtosis

**Table 3.** Descriptive parameters for the items on the scale of the possibilities of use of m-learning in teaching methods courses

Items	Mean	SD
M-learning is suitable for planning practical parts of the lessons in teaching methods courses.	3.78	0.98
M-learning is suitable for implementing practical parts of the lessons in teaching methods courses.	3.92	0.99
M-learning is suitable for fulfilling pre-exam requirements in teaching methods courses.	4.08	0.91
M-learning facilitates revising for exams in teaching methods courses.	3.62	1.03
M-learning contributes to more interesting and easier content learning in teaching methods courses.	3.82	0.95
M-learning facilitates the implementation of training in teaching methods courses.	3.66	1.04
I use mobile devices in writing a lesson/activity plan mostly in its introductory part through experiential-cognitive motivation.	3.73	1.02
I use mobile devices in writing a lesson/activity plan mostly in its main part.	3.43	1.01
I use mobile devices in writing a lesson/activity plan mostly in its concluding part.	3.55	1.03

The greatest agreement among the students was for the possibilities of use of m-learning as regards the aspects of its usability and importance of using m-learning in professional application courses: *M-learning is suitable for fulfilling pre-exam requirements in teaching methods courses.* ( $M=4.08$ ;  $SD=0.91$ ); *M-learning is suitable for implementing practical parts of the lessons in teaching methods courses.* ( $M=3.92$ ;  $SD=0.99$ ); *M-learning contributes to more interesting and easier content learning in teaching methods courses.* ( $M=3.82$ ;  $SD=0.95$ ). Although the students' attitudes as regards the use of mobile devices in planning the introductory, main and concluding parts of lessons/activities are above the neutral values, these aspects are less represented: *I use mobile devices in writing a lesson/activity plan mostly in its main part.* ( $M=3.43$ ;  $SD=1.01$ ); *I use mobile devices in writing a lesson/activity plan mostly in its concluding part.* ( $M=3.55$ ;  $SD=1.03$ ); *I use mobile devices in writing a lesson/activity plan mostly in its introductory part through experiential-cognitive motivation.* ( $M=3.73$ ;  $SD=1.02$ ). Therefore, as suggested by the obtained results, the students believe that m-learning is important for revising exams, fulfilling pre-exam requirements, as well as for practical aspects in teaching methods courses, but they use it less frequently for writing lesson/activity plans.

The second research task referred to the investigation of the influence of sociodemographic variables (sex, year of study, study programme,

university, frequency of use of mobile applications) on the students' attitudes towards the frequency and possibilities of use of m-learning in teaching methods courses. The results (Table 4) suggest a significant influence of the year of study ( $F = 3.467$ ;  $p < 0.01$ ) and the frequency of use of mobile applications for learning ( $F = 3.514$ ;  $p < 0.01$ ) on the students' attitudes towards the possibilities of use of m-learning. Namely, we found that the students in the final years of study and those who more frequently use mobile applications for learning more positively value the possibilities of using m-learning in professional application courses. There is also an assumption that experience, thorough knowledge of and training in teaching methods of the fourth-year and MA students have a great influence on their attitudes, compared to those of the students in the third year, when teaching methods courses are introduced for the first time. Previous research studies [25, 26, 27, 28] also emphasized the importance of improving initial teacher education through the use of contemporary information and communication technology in the teaching process.

The results of the subsequent pairwise comparison tests indicate that there are significant differences in the attitudes of the MA students ( $M = 35.14$ ) and the third-year students ( $M = 31.15$ ).

Also, the subsequent pairwise comparison tests show that there are significant differences in the attitudes of the students who use mobile applications for learning very often ( $M = 35.23$ ) and those who use them very rarely ( $M = 30.37$ ).

**Table 4.** Students' attitudes towards the possibilities of use of m-learning in professional application courses and sociodemographic variables

Variables	Modalities	Mean	F
Year of study	Third year UAS	31.15	$F = 3.467$ $p = 0.09$ 1-3;
	Fourth year UAS	33.45	
	Master's studies	35.14	
Frequency of use of mobile applications in teaching	Very often	35.23	$F = 3.514$ $p = 0.01$ 1-3;
	Sometimes	33.44	
	Very rarely	30.37	
	Never	33.59	

#### 4. CONCLUSION

Previous research and systematic reviews point to not only the importance of using mobile devices and technologies in teacher education, but also to the many challenges in the implementation of m-learning and development of students' competences in using m-learning in their work with preschool children and children in younger grades of primary school.

Starting from the research aims and hypotheses, the following two conclusions can be drawn:

- (a) The students have moderately high attitudes as regards the frequency and possibilities of using m-learning in teaching methods courses. Namely, the students of both study programmes (Preschool Teacher and Primary School Teacher) emphasize the fact that m-learning is very frequently used in all teaching methods courses at faculties of education and in their various aspects such as: planning and implementing of practical lessons, fulfilling pre-exam requirements, training in teaching methods courses, revising for exams, lesson/activity planning, etc.
- (b) The students' attitudes towards the possibilities of using m-learning in teaching methods courses are significantly influenced by the frequency of use of mobile applications for learning and the year of study. It was found that the students of the final years of study and those who more frequently use mobile applications for learning more positively value the possibilities of using m-learning in teaching methods courses.

The research results also suggest some *pedagogical implications* with regard to the use of m-learning in teaching methods courses. Primarily, there is a perceived need to shift the focus from lesson planning onto the implementation of practical lessons and activities in teaching methods courses, by using various mobile devices and technologies. It is also necessary to provide support for educators in initial teacher education as regards developing, using and evaluating innovative mobile technology approaches to teaching and learning. Teaching methods courses at faculties of education may have an important role in the acquisition and development of the competences of prospective preschool and primary school teachers as regards the use of m-learning and mobile technologies in their work with preschool children and children in younger grades of primary school. If the knowledge acquired during studies is improved through later pedagogical experience, it becomes an important factor of the quality of future students' education, which is why it requires special attention [29].

The research conducted in this paper does not provide definitive answers to the initial research question; therefore, there are some *recommendations for future research*. Firstly, a relationship between various m-learning models in teaching methods courses and specific educational outcomes for some academic courses and subject areas within these courses may be investigated. Since (preschool) teachers are, along with other participants in the education process, the key factor in the implementation of innovations and changes in education policy, it is necessary to conduct more extensive research into the

contributions of study programmes at faculties of education to the development of (preschool) teachers' competences for using m-learning. A judicious, creative and safe use of mobile devices and technologies in preschool and primary education is not possible without competent (preschool) teachers. This implies not only a quantitative, but also a qualitative analysis of students', i.e. future (preschool) teachers' attitudes towards these questions, as well as the analysis of the study programmes. It is also possible to explore the influence of various social and cultural factors (an individual's relationship to certain activities within the fields of science, engineering, culture, art, media and sport) on the use of mobile technologies in teacher education.

## REFERENCES

- [1] Çakmak, F. (2019). Mobile Learning and Mobile Assisted Language Learning in Focus. *Language and Technology*, 1(1), 30–48.
- [2] Lam, J., Yau, J., Cheung, S.K.S. (2010). A Review of Mobile Learning in the Mobile Age. In: Tsang, P., Cheung, S.K.S., Lee, V.S.K., Huang, R. (eds) *Hybrid Learning*, 306–315. ICHL 2010. Lecture Notes in Computer Science, vol. 6248. Springer, Berlin, Heidelberg. [https://doi.org/10.1007/978-3-642-14657-2\\_28](https://doi.org/10.1007/978-3-642-14657-2_28)
- [3] Обухова, Л. Ю. (2019). Мобильное обучение: перспективы и проблемы. *Современная наука: актуальные проблемы теории и практики*, 12(2), 107–111. <http://www.nauteh-journal.ru/files/2d940e21-b6b1-4ffc-8535-05b069d22ede>
- [4] Trivunović, B. i Gajić, O. (2020). Primena koncepta BYOD – Bring Your Own Device (Donesi svoj sopstveni uređaj) u industriji i obrazovanju – implikacije za promenu prakse univerziteta. *Andragoške studije*, 1, 197–218. <https://10.5937/AndStud2001197T>
- [5] Rosman, P. (2008). M-learning as a paradigm of a new forms in education, *Informacni Management*, 1, 119–125
- [6] Quinn, C. (2000). M-learning: Mobile, Wireless and In-Your-Pocket Learning. *Line Zine*.
- [7] Baran, E. A (2014). Review of Research on Mobile Learning in Teacher Education. *Journal of Educational Technology & Society*, 17(4), 17–32. <https://www.learntechlib.org/p/156112/>
- [8] Cheon, J., Lee, S., Crooks, S., & Song, J. (2012). An investigation of mobile learning readiness in higher education based on the theory of planned behavior. *Computers and Education*, 59, 1054–1064.
- [9] Crompton, H. (2013). The benefits and challenges of mobile learning. *Learning and Leading with Technology*, 41, 38–39.
- [10] Kearney M., Schuck S., Burden K., & Aubusson P. (2012). Viewing mobile learning from a pedagogical perspective. *Research in Learning Technology*, 20. <https://doi.org/10.3402/rlt.v20i0.14406>
- [11] Sharples, M., Taylor, J., & Vavoula, G. (2007). A theory of learning for the mobile age. In R. Andrews & C. Haythornthwaite (Eds.), *The Sage handbook of elearning research* (pp. 221–247). London: Sage.
- [12] Lefoe, G., Olney, I., Wright, R. & Herrington, A., (2009). Faculty development for new technologies: Putting mobile learning in the hands of the teachers. In J. Herrington, A. Herrington, J. Mantei, I. Olney, & B. Ferry (Eds.), *New technologies, new pedagogies: Mobile learning in higher education* (pp. 15– 27). Wollongong: University of Wollongong. Retrieved from <http://ro.uow.edu.au/>
- [13] Seppala, P. & Alamaki, H. (2003). Mobile Learning in teacher training. *Journal of Computer Assisted Learning*, 19(3), 330–335. <https://10.5937/AndStud2001197T>
- [14] Mantei, J., & Kervin, L. (2009). Using iPods to capture professional dialogue between early career teachers to enrich reflective practice. In J. Herrington, A. Herrington, J. Mantei, I. Olney, & B. Ferry (Eds.), *New technologies, new pedagogies: Mobile learning in higher education*, 63–74. Wollongong: University of Wollongong.
- [15] Jorgić, D., Marić, T., Obradović, M., i Partalo, D. (2021). Uloga mobilnih telefona u kontekstu fakultetskih obaveza studenata nastavničkih usmjerenja. U: *Banjalučki novembarSKI susreti*, 305–323. <http://doi.org/10.7251/FLZB2103305J>
- [16] Sebbowa, D. K., & Muyinda, P. B. (2018). The utilisation of a Mobile Phone Forum on the Winksite application in the teaching and learning of History: a case study of Pre-service Teachers at Makerere University. *Yesterday and Today*, 20, 124–147. <https://doi.org/10.17159/2223-0386/2018/n19a>
- [17] Hall, T. & Connoly, C. (2019). Mobile learning in Teacher Education. *Teach Trends* 63, 644–646. <https://doi.org/10.1007/s11528-019-00438-7>
- [18] UNESCO (2012). *Mobile learning for teachers: Global themes*. Paris: UNESCO.
- [19] *Strategy for the Development of Education in Serbia by 2030* [Strategija razvoja obrazovanja i vaspitanja u Republici Srbiji do 2030. godine] (2021). Ministarstvo prosvete, nauke i tehnološkog razvoja. [https://prosveta.gov.rs/wp-content/uploads/2021/11/1-SROVRS-2030\\_MASTER\\_0402\\_V1.pdf](https://prosveta.gov.rs/wp-content/uploads/2021/11/1-SROVRS-2030_MASTER_0402_V1.pdf)
- [20] *Digital Competence Framework for Preschool Teachers* [Okvir digitalnih kompetencija vaspitača u predškolskoj ustanovi] (2022). Beograd: Ministarstvo prosvete, nauke i tehnološkog razvoja, Zavod za vrednovanje kvaliteta obrazovanja

- i vaspitanja i Zavod za unapređivanje obrazovanja i vaspitanja. <https://ecec.mpn.gov.rs/wp-content/uploads/2023/06/Okvir-digitalnih-kompetencija-vaspitaca-u-PU.pdf>
- [21] *Digital Competence Framework – Teacher for a New Age 2019* [Okvir digitalnih kompetencija – Nastavnik za digitalno doba 2019] (2019). Ministarstvo prosvete, nauke i tehnološkog razvoja. [https://zuov.gov.rs/wp-content/uploads/2019/08/2019\\_ODK\\_Nastavnik-za-digitalno-doba.pdf](https://zuov.gov.rs/wp-content/uploads/2019/08/2019_ODK_Nastavnik-za-digitalno-doba.pdf)
- [22] *Digital Competence Framework – Teacher for a New Age 2023* [Okvir digitalnih kompetencija: Nastavnik za digitalno doba 2023]. Beograd: Zavod za vrednovanje kvaliteta obrazovanja i vaspitanja i Centar za obrazovnu tehnologiju.
- [23] Burden, K. & Hopkins, P. (2016). Barriers and Challenges Facing Pre-Service Teachers use of Mobile Technologies for Teaching and Learning. *International Journal of Mobile and Blended Learning (IJMBL)*, 8(2), 1–20. <http://doi.org/10.4018/IJMBL.2016040101>
- [24] Price, A. M., Devis, K., LeMoine, G., Crouch, S., South, N., & Hossain, R. (2018). First year nursing students use of social media within education: Results of a survey. *Nurse education today*, 61, 70–76. <https://doi.org/10.1016/j.nedt.2017.10.013>
- [25] Ngao, A., Sang, G., Tondeur, J., Kihwele, J. E., & Chunga, J. O. (2023). Transforming Initial Teacher Education Program with Mobile Technologies. A synthesis of qualitative evidences. *Digital Education Review* 43, 18–34. <http://doi/10.1344/der.2023.43>
- [26] Olpak, Y. Z., & Ates, H. (2022). Review of Trends in the Use of Mobile Learning in Teacher Education. *Bilgi Ve İletişim Teknolojileri Dergisi*, 4(1), 1–25. <https://doi.org/10.53694/bited.1076330>
- [27] Tong, D. H., Nguyen, T.-T., Uyen, B. P., & Ngan, L. K. (2023). Using m-learning in teacher education: A systematic review of demographic details, research methodologies, pre-service teacher outcomes, and advantages and challenges. *Contemporary Educational Technology*, 15(4), ep482. <https://doi.org/10.30935/cedtech/13818>
- [28] Muchnik-Rozanov, Y., Frei-Landau, R. & Avidov-Ungar, O. (2022). Mobile-learning adoption in teacher education amidst COVID-19: Identifying two critical stages by exploring teachers' emotions. *Front. Educ.*, 7:1077989. <https://10.3389/feduc.2022.1077989>
- [29] Stojanović, B. i Mitić, Lj. (2009). Metodička praksa na učiteljskim fakultetima trenutno i moguće. In Meri M. (Eds.), *Special edition Proceedings of the international conference held No. 8/1*, 233–243. Jagodina: Pedagoški fakultet u Jagodini Univerziteta u Kragujevcu.