http://jates.org

Journal of Applied Technical and Educational Sciences jATES

ISSN 2560-5429

JATES Journal of Applied Technical and Educational Sciences

Possibilities of using mobile phones in the educational process

Katalin Sipos [1], László Bottyán [2]

[1] *University of Pécs, Vasvári Pál utca. 4., Pécs 7622, Hungary, fzkata025@gmail.com*

[2] *University of Pécs, Vasvári Pál utca. 4., Pécs 7622, Hungary, laszlo@bottyan.com*

Abstract: *M-learning offers countless opportunities to develop students' key 21st century competences, such as the development of problem-solving skills, cooperation, communication skills and creativity. The aim of our research is to learn about the opinions of secondary school teachers regarding mobile devices, as well as their attitudes towards their use. The one-sample T-test and Chi-square test were used to analyse the responses to the questions in the questionnaire, and the non-parametric Mann-Whitney test was used to compare the averages of the Likert scale after testing the normality of the responses. Based on our results, it can be said that teachers take advantage of the opportunities offered by mobile phones, and a significant proportion of those interviewed regularly include them in the teaching process, enriching the lessons with the use of innovative applications. According to the conclusions of our study, there is a positive, forward-looking trend in Hungary for the integration of m-learning into the learning-teaching process, in which further training aimed at developing the digital skills of teachers can be of particular importance.*

Keywords: *digitization; m-learning; mobile devices; motivation*

1. Introduction

In the information society, theoretical knowledge, technology, and information have become the most important commodities (Bell, 1979). Its main engine is the rapid development of computer technology and telecommunications, its most important milestones are the spread of personal computers and the emergence of broadband data transmission networks, and its symbolic technological innovations are the Internet and the mobile phone (Molnár, 2018) (Molnár et al., 2022). The quality demand of education sets the target of having and acquiring the actual skills, competences to meet the XXI. Century expectation for the employees to guarantee the continuous development and the existence of up-to-date knowledge. (Mészáros, 2013)

 License: CC BY 4.0

1.1. The history, concept, and connections of m-learning

The history of m-learning goes back to the end of the 1970s, when Alan Curtis Kay, the inventor of the "Smalltalk" programming language, created the Dynabook concept. His goal was to design a small, compact, portable computer that children could use and carry instead of paper (Kay, 1972). Although the device itself was never put into production, the concept played an important role in the design of smartphones and tablets.

At the beginning of the 2000s, the term mobile learning covered the personalized, connected, and interactive use of handheld computers in classrooms (O'Malley & Stanton 2002; Perry, 2003). In Brown's paper M-learning is showcased as a natural extension of e-learning, i.e. an opportunity to make learning more widely available than in the usual e-learning environment. From this aspect, m-learning is a subset of e-learning. E-learning is the macro concept that includes online and mobile learning environments (Brown, 2005).

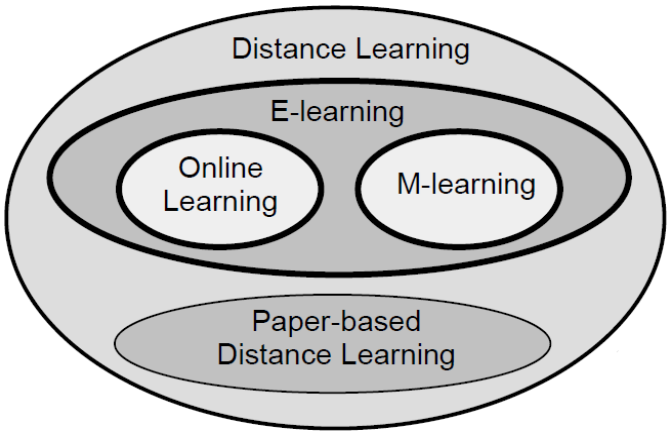

Fig. 1. The subsets of flexible learning

Source: Brown (2005)

It follows from the above that mobile learning is certainly not merely the conjunction of mobile and learning; it has always implicitly meant mobile e-learning and its history and development have to be understood as a continuation of conventional e-Learning (Mehdipour- Zerehkafi, 2013).

Molnár goes even further, and under the concept of m-learning, in addition to accessing learning-related content accessible anywhere - on any mobile device - he also includes related learning activities. (Molnár, 2018) It is; therefore, clear that today the mobile phone is no longer just a technology, a tool offered to span physical distances, but that it reveals new methodological dimensions of knowledge transmission (Molnár et al., 2017).

 License: CC BY 4.0

In addition, we assume that this conscious use of e-learning can help the students consciously prepare not only for the specific vocational employment but their own personal developement and they can acquire professional knowledge besides getting the applied knowledge. (Mészáros & Baróti, 2017)

1.2. Student's mobile phone usage habits

According to data from the Hungarian Central Statistical Office (KSH), 2021. III. at the end of the quarter, the number of active SIM cards was more than 13 million, of which four-fifths handled call traffic and two-thirds handled data traffic in the third quarter of 2021. The data traffic of the mobile network is constantly increasing. In the third quarter of 2021, it exceeded that of the previous year by 35%. The 4G network maintains its leading role, 96% of the data traffic took place via the 4G–LTE system. The data traffic per such active SIM cards which provide Internet access was close to 25 GBytes (KSH, 2021).

79% of the Hungarian population aged 16–74 are connected to the World Wide Web daily. The use of ICT tools is an almost indispensable part of the life of 16–24-year-olds, 97% of whom use the Internet every day.

More than 86% of domestic Internet users accessed the World Wide Web via a mobile device, and four-fifths of them used it every day or almost every day. In 2020, the restrictions introduced due to the pandemic, which affected all age groups, also led to the spread of the use of the World Wide Web in education, remote working, and communication between people (KSH, 2020).

From the above-mentioned data, we can conclude that the use of mobile phones is part of the everyday life of young people since almost all of them have in their pocket a device that is also suitable for data networking.

1.3. Application of mobile phones in education

Furthermore, researchers have indicated mobile learning as a promising way of improving students' competencies (Hwang et al., 2011; Sung et al., 2010). The use of mobile phones in education significantly improves students' academic performance and increases motivation (Chang – Hwang, 2019).

In their research, Hwang and Lai examined the effects of mobile learning on students' cooperation, communication, complex problem-solving, and creativity. According to their

 License: CC BY 4.0

results, those students who spent a long time on mobile learning activities displayed significantly better skills in communication, complex problem-solving, and creativity. This implies that participation time as well as learning strategies or tools could play an important role in improving these competencies (Hwang-Lai, 2014).

Kukulska-Hulme (2010) highlights the following key ideas regarding m-learning

- Learning outside the classroom: m-learning is a set of new communication tools and opportunities which make learning accessible outside of the school.
- Possibility of contact with distant (absent) students: a shared learning tool that provides an opportunity for the exchange of information and question-and-answer interaction in practice with students who, for some reason, cannot participate in classroom education.
- The students are the creators of knowledge and the controllers of the learning process. Due to their comments and the sharing of their content, they are given an interactive role. The traditional role of the teacher is increasingly shifting toward that of a collaborator and mentor.
- Experience fixation: formal and informal (non-formal) learning become connected.
- Lifelong learning: Over time, students will be able to acquire the habit of lifelong learning (Muhi – Kőrösi – Estzletecki, 2015) (Molnár, 2015).

2. Research

2.1. The purpose of the research

The purpose of our research was to explore the opinions of secondary school teachers regarding mobile devices, as well as their attitudes towards their use. Within the framework of the study, our goal was to learn how often teachers used mobile phones and tablets in their classes, and to what extent they used the opportunities afforded by digitalization. Our further aim was to map how teachers felt about the use of mobile devices in terms of their positive and negative effects, and at the same time to approach the aspects of applicability and trialability. Exploring the opinions and attitudes of teachers can provide guidelines for the necessary changes and improvements.

2.2. Methodology

Our research was based on a survey of 104 people, for which we collected the data in October 2021. With the help of an online questionnaire, we asked the teachers of the secondary schools

 License: CC BY 4.0

of six counties; participation in the study was voluntary, and the questionnaire was filled in anonymously. The sample is not representative, due to the online interface and the short time interval of the research, but our goal was not primarily to draw general conclusions, but rather to learn about the attitudes of teachers about mobile devices.

The questionnaire consisted of three parts, closed and semi-open questions, and also included a 4-point Likert scale. After the questions about the teacher, we examined the characteristics of the use of mobile phones and tablets in the classroom, and then in the third part of the questionnaire, we tried to explore the opinions of the teachers regarding the use of mobile devices for educational purposes.

The following methods were used during the analysis of the results:

- We used a one-sample T-test for examining the answers given to the questionnaire.
- We made use of a chi-squared test to examine the correlation.
- After having tested the normality of the answers given, we used a non-parametric Mann-Whitney test for comparing the average of agreement.

2.3. Sample characteristics

The majority of teachers who filled in the questionnaire were women, with the proportion of male respondents being 31%. According to the age structure, the proportion of those between 46 and 55 years old was the highest, and there were no teachers younger than 25 years old at all (*Fig. 2*).

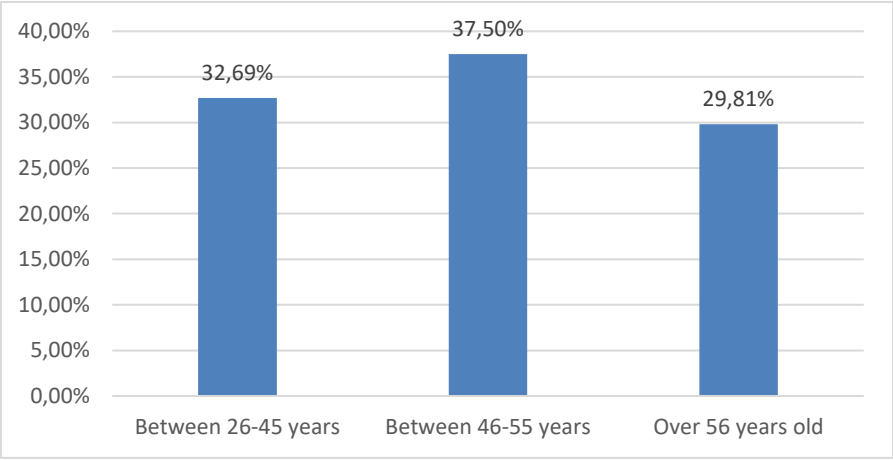

Fig. 2. Age distribution of the sample

From a training type perspective, the majority of those who completed the questionnaire taught in high school education (*Fig. 3.).* Taking into consideration the lower proportion of teachers

teaching in vocational education, we did not examine the attitude of teachers towards mobile devices divided according to different types of education.

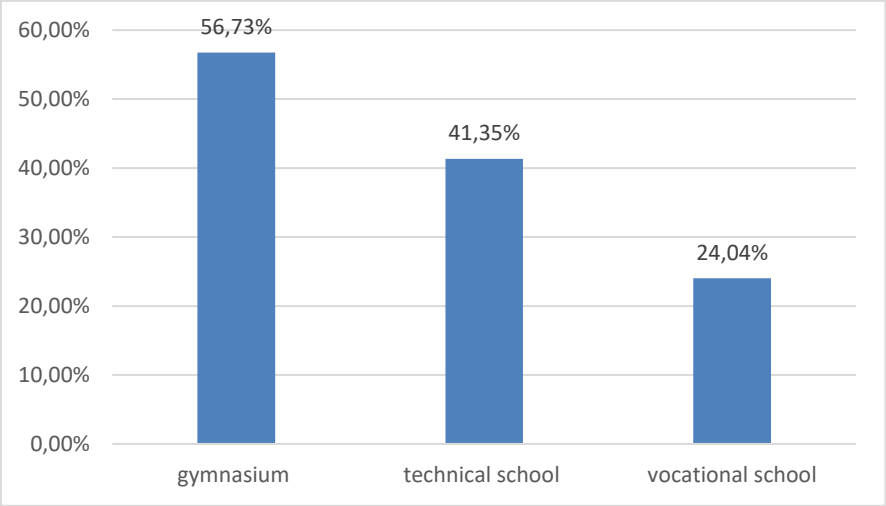

Fig. 3. Distribution of the sample by school type

The largest proportion of participants were teachers in Bács-Kiskun and Jász-Nagykun-Szolnok counties, while it was in Békés county that the questionnaire was filled in by the smallest amount of respondents (*Fig. 4*).

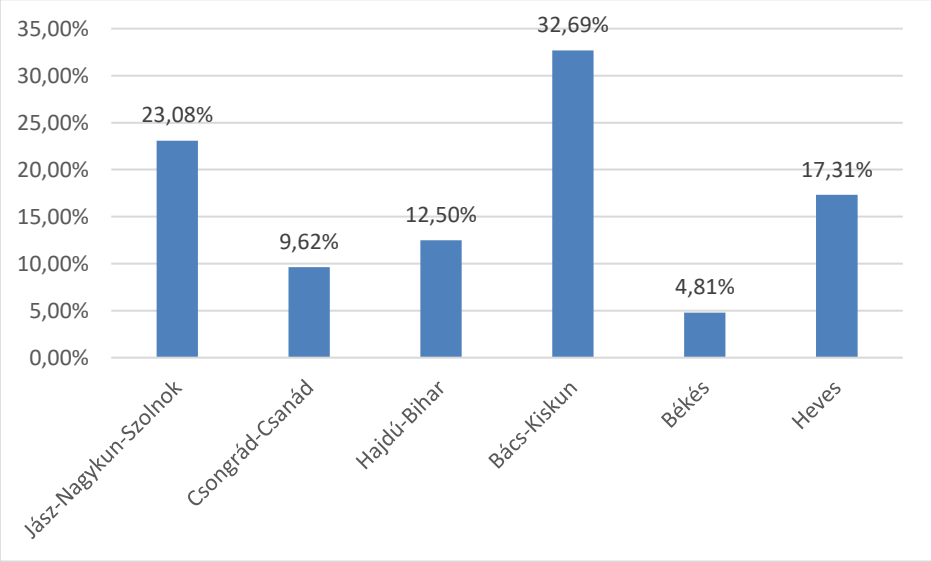

Fig. 4. Distribution of the sample by counties

 License: CC BY 4.0

3. Results

3.1. Results for the use of mobile devices

Regarding the frequency with which teachers use mobile phones in the classroom, we examined the difference by gender. The largest proportion of the women included the use of mobile phones in their lessons once or twice a month, while 26% stated that they used them more often, at least 1-2 times a week. In the case of the men, most of them integrated mobile phones into their lessons once or twice a week, although this proportion was almost the same as that of those who used them only a few times a month. From the point of view of both men and women, relatively few teachers used mobile phones daily, but at the same time, there was a similar proportion among those who used them only once or twice a year. There was a greater difference between men and women among teachers who did not use mobile phones at all, with 19% of the men not using them at all, or only on a try-out basis, while in the case of the women this proportion was 8% (*Fig. 5.*).

Given that the study did not only refer to the period of online education, we asked the teachers who included mobile phones in their lessons whether they had been open to using the device in the teaching-learning process before. 71% of the teachers who used mobile phones indicated that they had already been open to using them in class.

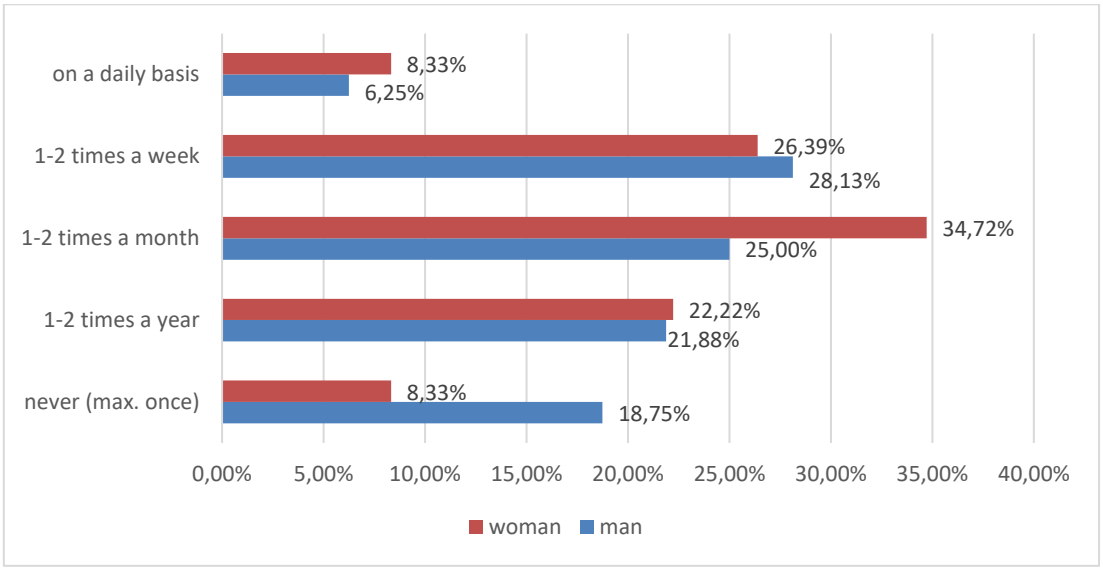

Fig. 5. The frequency of using mobile phones in class among teachers

 License: CC BY 4.0

We asked the teachers who filled in the questionnaire what applications they used to facilitate the learning process. Interactive presentations, LearningApp tasks, and learning games were selected in the largest proportion; however, Redmenta's interface was also used in a large proportion of blogs, and podcasts are also used in the teaching process to a lesser extent. Within other categories, it was also possible to select other applications that had already been tried, where the participants primarily indicated programs and interfaces that support learning specifically related to the subject as well as supporting materials (e.g., Geogebra, Photomath, smart textbooks). (*Fig. 6.)*

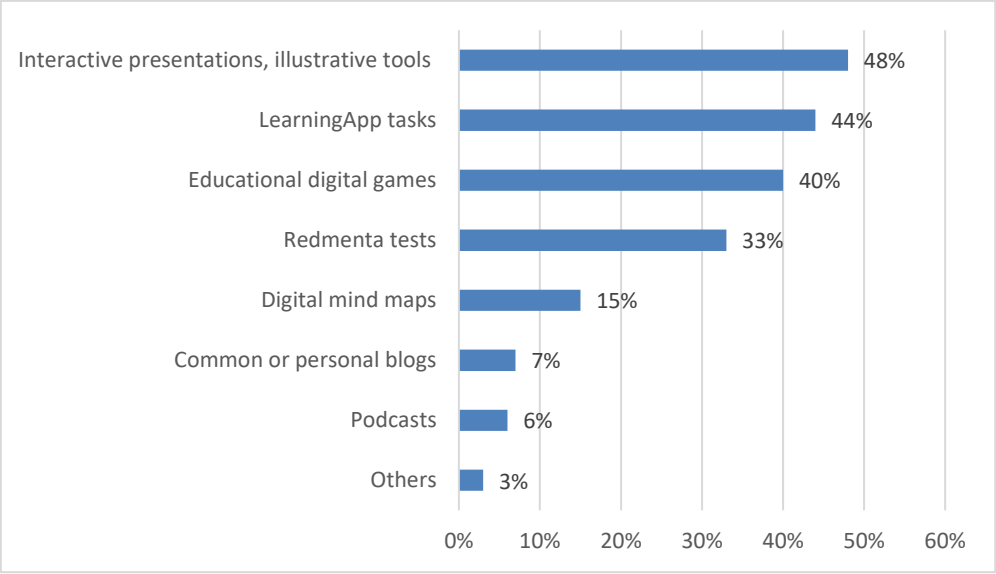

Fig. 6. Applications used by teachers

The frequency of tablet usage in class did not show significant differences between the men and the women, they were mostly used once or twice a month. That being said, it is important to note that the proportion of those who did not use tablets at all in class was significantly larger compared to those who used mobile phones. This ratio was almost the same between the men and the women (*Fig. 7*.). We can conclude from this that the provision of technical equipment in the schools might differ, that is not all institutions had tablets available for students to use in class. At the same time, mobile phones had spread much more widely among students, which contributed to their easier integration.

 License: CC BY 4.0

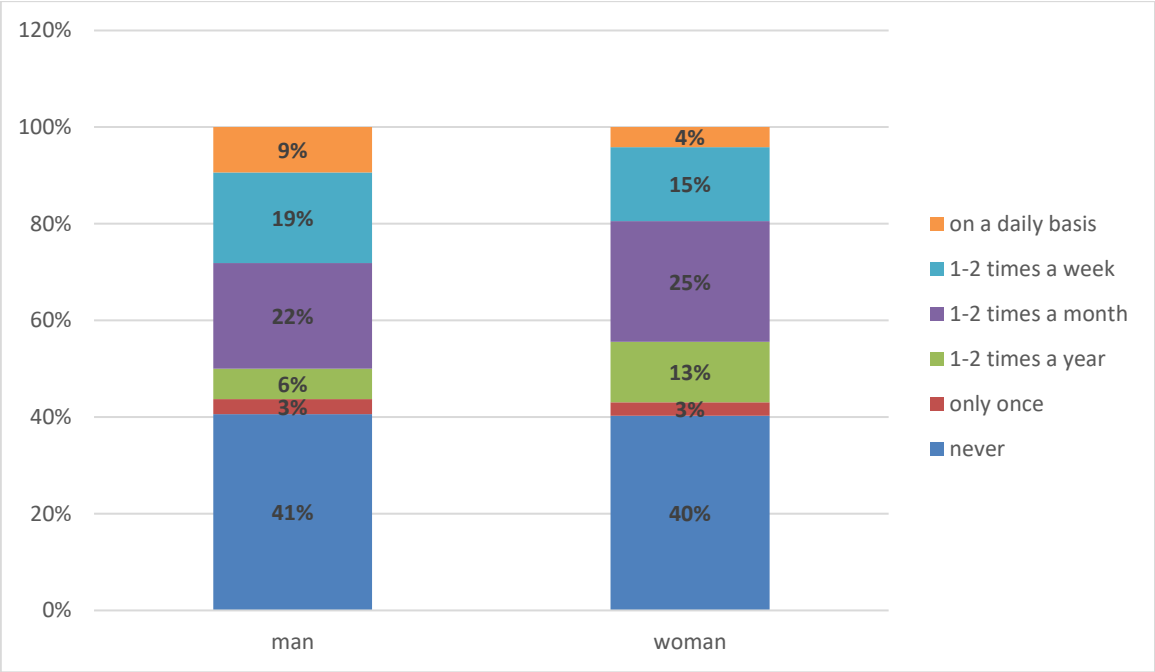

Fig. 7. The frequency of using mobile phones in class among teachers

3.2. The results of teachers' opinions regarding the use of mobile devices

In the second part of the research, we examined the attitude of the teachers, the exploration for which we formulated 11 statements. In the case of the 11 statements, we tested the average opinion of the teachers about them. Because we used a 4-point Likert scale during the survey, the theoretical value of the neutral answer is 2.5; thus, we compared the sample averages to this.

Teachers did not agree that mobile devices distracted students from learning; consequently, they were not of the opinion that these tools should not be used often (average:1,94; $p<0,001$). However, they agreed that they would try a new application even if they know that it would take time to make use of it at first (average:2,74; $p=0,018$), also by saying that the use of mobile devices and the accompanying creative activity motivated them as well. (Average: 3,03; $p<0,001$). Regarding the claim as to whether they were willing to search for new applications even at the expense of their free time, the average of teachers' answers does not differ significantly from the value indicating a neutral response (average:2,63; $p=0,206$), therefore, the average verdict tends neither towards agreement nor disagreement (*Table 1.*).

Table 1. The opinion of teachers regarding the use of mobile devices (1 - completely disagree, 4 - completely agree)

 License: CC BY 4.0

	Min	*Max*	*Mean*	*Std. Deviation*	*t*	*p*
In my opinion, it tends to distract students from learning, so these tools should not be used often.	1.00	4.00	1.9417	0.96837	-5.850671698	0.00000005963
I am willing to search for new applications in my free time.	1.00	4.00	2.6300	1.02154	1.2725937	0.20614292541
I try out a new application even if I know that it will take time to discover first.	1.00	4.00	2.7353	0.98430	2.414264791	0.01756682616
The use of mobile devices and the accompanying creative activity also motivate me.	1.00	4.00	3.0294	0.91690	5.831367706	0.00000006637

The values given to the variable were also compared according to the two genders, for which a non-parametric Mann-Whitney test was applied; since the number of male respondents in the sample is relatively low, normality cannot be assumed (*Table 2*.). From the perspective of average answers, two statements differed significantly between the two genders.

 License: CC BY 4.0

Table 2. The opinion of teachers regarding the use of mobile devices (1 - completely disagree, 4 - completely agree)

	Mann-Whitney U	***Wilcoxon W***	***Z***	***Asymp. Sig. (2-tailed)***	***Asymp. Sig. (1-tailed)***
I think it is important nowadays to include mobile devices in the educational process due to the students' changing needs of learning	968	1496	-1.353373499	0.175936339	0.08796817
In my opinion, it tends to distract students from learning, so these tools should not be used often.	831	3387	-2.308303251	0.020982276	0.010491138
Their application can be a great help in developing independent learning and problem-solving skills.	1048.5	1576.5	-0.67827684	0.49759618	0.24879809
Students can be motivated much more if they are allowed to use their own mobile phones during class.	912.5	1440.5	-1.693146745	0.090427538	0.045213769
I can also include those students in the lesson who are difficult to motivate and whose attention is hard to maintain.	847	1375	-1.990105609	0.046579303	0.023289652
I would like to use these tools in my classes if I could observe how to use them during demonstration classes.	924	1420	-1.34589447	0.178336552	0.089168276
Completing tasks using these applications is too time-consuming, so I rarely use them.	1026	3582	-0.564107892	0.572680707	0.286340354
The reason I do not use mobile devices in class is that there is no suitable device system for them	943	1439	-0.8817266	0.377924673	0.188962336
I am willing to search for new applications at the cost of my own free time.	1031	1527	-0.298945009	0.764982004	0.382491002
I also try out a new application even if I know that it will take time to create it first.	1031.5	1527.5	-0.523207911	0.600829577	0.300414788
The use of mobile devices and the accompanying creative activity also motivate me.	952.5	1448.5	-1.150369292	0.249991802	0.124995901

One of the statements related to the fact that the use of mobile devices distracts students from learning, so they should not be used often (*Fig. 8.*). In the case of the women, there were twice as many teachers who did not agree with this at all, and three times as many of the men felt that they completely agreed with this, as compared to the women. The largest proportion of the men only partially agreed with this statement. This clearly shows that the women were more open to the inclusion of mobile devices in the learning process and were less likely to agree that they should not be used in class.

 License: CC BY 4.0

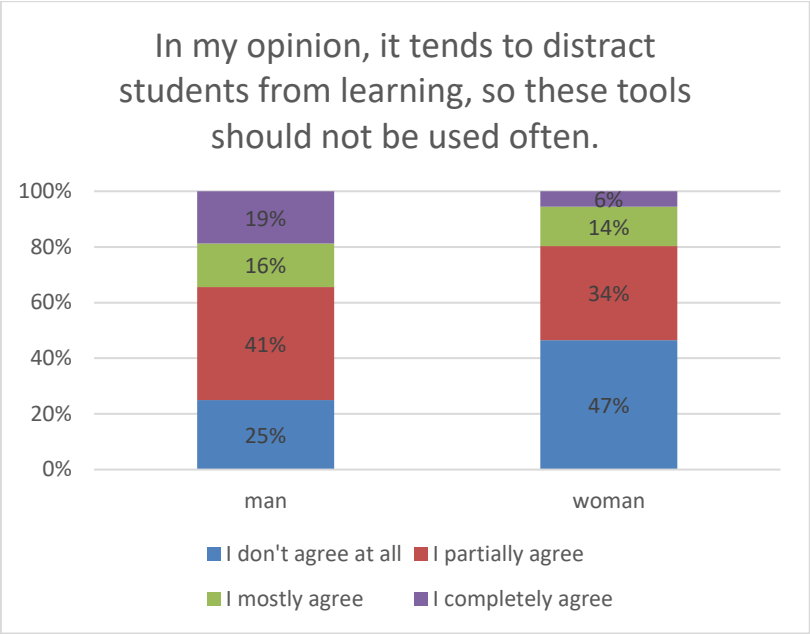

Fig. 8. Teachers' opinions on the use of mobile devices regarding students' attention

The other statement shows a significant difference related to the fact that by using mobile devices, teachers could also involve students whom they otherwise find difficult to motivate and whose attention is hard to maintain during the lesson (*Fig. 9.*). In the case of the women, the proportion of those who completely agreed with this statement was three times higher than that of the men.

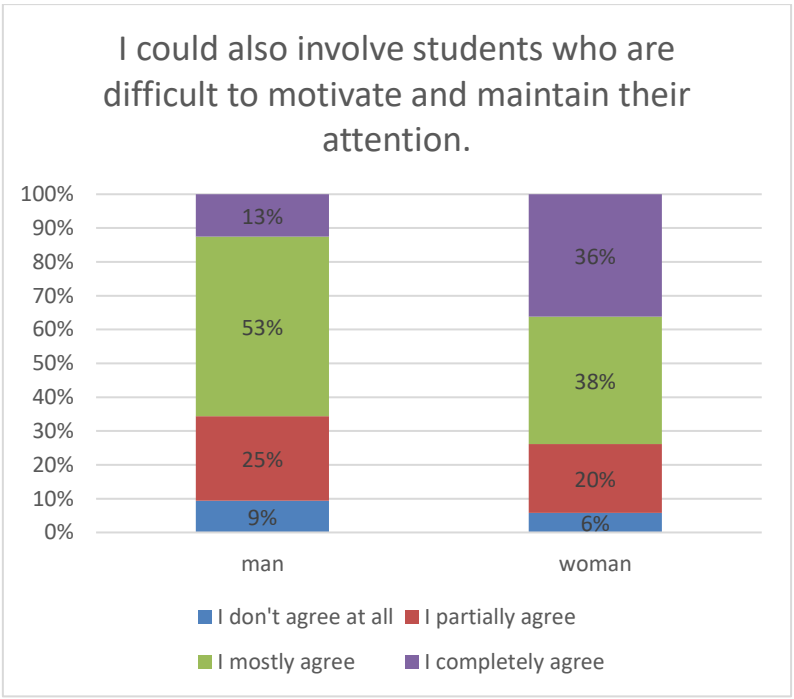

Fig. 9. Teachers' opinions on mobile devices about its effect on motivation

 License: CC BY 4.0

5 percentage points more of the men partially agreed, and 3 percentage points more did not agree at all as compared the women. Half of the men mostly agreed with this statement. It can be said in this aspect as well that women tended to experience the positive, motivation-promoting effect of mobile devices, while men only partially did.

4. Summary, conclusions

Overall, it can be said that teachers take advantage of the opportunities offered by mobile phones, a significant proportion of those interviewed regularly involved them in the teaching process, and there were relatively few who did not at all. Compared to mobile phones, the use of tablets lagged significantly, and a large proportion of the participants in the study stated that they did not use tablets at all during class.

The teachers primarily used mobile phones in class to share and use presentations, LearningApp tasks, and learning games, but also tried innovative applications, created blogs, podcasts and used a special subject-related application. As teaching methods affect each student differently, the observed methodological diversification helps to engage and motivate students. (Mészáros& Baróti, 2015)

According to the teachers, these devices did not distract students from learning; therefore, they did not think the frequency of using mobile devices should be reduced. The use of mobile devices and the accompanying creative activity motivated teachers, and they were willing to try out a new application even if they knew that it would take time to discover it at first. So, developing teachers' skills in information and communication technologies (ICT) requires a whole new set of methodological procedures. (Baróti & Mészáros, 2011; 273 p.)

Opinions differed between the women and men teachers, with the men tending to think that mobile devices distracted students' attention from learning, while women were more likely to say that using these devices could also motivate students whose attention was hard to maintain.

These results are not suitable for generalization, since our research is not representative, but our goal was not to draw general conclusions.

We believe that, based on the conclusions of our study, there is a positive, progressive trend in our country to integrate m-learning into the learning-teaching process. Although in today's practice in Hungary, the use of mobile phones is generally still prohibited in schools, this will soon change in our opinion.

 License: CC BY 4.0

References

Baróti, E., Mészáros, A. (2011): Módszertani diverzitások megjelenése a műszaki felsőoktatásban In.: Hegedűs Judit. Közoktatás, pedagógusképzés, neveléstudomány - a múlt értékei és a jövő kihívásai: XI. Országos Neveléstudományi Konferencia, program és összefoglalók. (2011)

Brown, T. (2005). Towards a model for m-learning in Africa. International Journal on E-Learning, 2005, 4(3), pp. 299–315.

Brown, T. H., & Mbati, L. S. (2015). Mobile learning: Moving past the myths and embracing the opportunities. The International Review of Research in Open and Distributed Learning, 16(2). https://doi.org/10.19173/irrodl.v16i2.2071

Chang, C. Y., & Hwang, G. J. (2019). Trends in digital game-based learning in the mobile era: a systematic review of journal publications from 2007 to 2016. International Journal of Mobile Learning and Organisation, 13(1), 68. https://doi.org/10.1504/ijmlo.2019.10016603

Kay, A. C., & Palo, C. (1972). A personal computer for children of all ages. Xerox Palo Alto Research Center.

Kovari, A. (2022). Digital Transformation of Higher Education in Hungary in Relation to the OECD Report. In DIVAI 2022, 14th International Scientific Conference on Distance Learning in Applied Informatics (pp. 229–236).

Központi Statisztikai Hivatal. (2021). Távközlés, internet, televíziószolgáltatás, 2021. III. negyedév. https://www.ksh.hu/docs/hun/xftp/idoszaki/tavkint/20213/index.html

Központi Statisztikai Hivatal. (2020). A háztartások információs- és kommunikációseszköz-használatának főbb jellemzői.
https://www.ksh.hu/docs/hun/xftp/idoszaki/ikt/2020/01/index.html

Lai, C. L., & Hwang, G. J. (2014). Effects of mobile learning time on students' conception of collaboration, communication, complex problem-solving, meta-cognitive awareness and creativity. International Journal of Mobile Learning and Organisation, 8(3/4), 276. https://doi.org/10.1504/ijmlo.2014.067029

Mehdipour, Y., & Zerehkafi, H. (2013). Mobile Learning for Education: Benefits and Challenges. International Journal of Computational Engineering Research, 3(6), 93–100. ISSN 2250-3005

Mészáros, A. (2013): The culture assessment of the Széchenyi István University and the structural training of professors and leaders In. 2010-2012 built on the assessment. 8th Research/Expert Conference with International Participation Zenica: University of Zenica Faculty of Mechanical Engineering, pp. 373-378,

Mészáros, A, Baróti, E. (2015): (Szak)ember képzés rendszerelméletű megközelítése a felnőttképzésben és a felsőoktatásban: A felsőoktatás és felnőttképzés kultúrájának a megváltoztatásáért. Széchenyi István Egyetem, Győr

 License: CC BY 4.0

Mészáros, A, Baróti, E. (2017): Designing an FR-Soft-Skill Measurement System to Be Used in Adult- or Higher Education. Advances in Human Factors, Business Management and Leadership. Springer International Publishing, Cham pp. 406-417,

Molnár, Gy. (2015) Lifelong learning stratégia szerepe az oktatási és képzési rendszerben Magyarországon, In: Torgyik, Judit (szerk.) Százarcú Pedagógia, Komárno, Szlovákia : International Research Institute (2015) 513 p. pp. 403-409. , 7 p.

Molnár Gy. et al (2017) IKT alapú mobilkommunikációs eszközök és alkalmazások módszertani lehetőségei a felsőoktatásban, In: Mrázik, Julianna (szerk.) A tanulás új útjai, Budapest, Magyarország : Magyar Nevelés- és Oktatáskutatók Egyesülete (HERA) (2017) 639 p. pp. 285-297.

Molnár, Gy. (2018) Hozzájárulás a digitális pedagógia jeleneéhez és jövőjéhez (eredmények és perspekítvák). MTA-BME Nyitott Tananyagfejlesztési Kutatócsoport Közlemények, 4 (1). pp. 1-70. ISSN 2498-8820

Molnár, Gy. (2022): Current Issues and Possible IT Solutions for Digital Competence Development, In: Milan, Turčáni; Zoltán, Balogh; Michal, Munk; Martin, Magdin; Ľubomír, Benko; Jan, Francisti (ed.) DIVAI 2022, 14th International Scientific Conference on Distance Learning in Applied Informatics, Wolters Kluwer pp. 267-276.

Muhi B., B., Kőrösi, G., & Esztelecki, P. (2015). Az m-learning alkalmazásának pedagógiai lehetôségei. Információs Társadalom, 15(1), 95. https://doi.org/10.22503/inftars.xv.2015.1.6

O' Malley, C and Stanton, D (2002). Tangible technologies for collaborative storytelling. Proceedings of the 1st European Conference on Mobile and Contextual Learning (MLearn 2002), pp3-7

Perry, D., & Britain., G. (2003). Handheld computers (PDAs) in schools: Report, March 2003. British Educational Communications and Technology Agency.

About Authors

Katalin SIPOS is a PhD student at the „Education and Society" Doctoral School of Education Sciences at the University of Pecs. Her research interest is online learning, especially focused on innovation processes in practices and the knowledge of teachers.

Laszlo BOTTYAN is a PhD student at the „Education and Society" Doctoral School of Education Sciences at the University of Pecs. He absolved his master's studies at the Budapest University of Technology and Economics. His research focuses on digital learning and its information security aspects.

 License: CC BY 4.0