BETTER LEARNING AND INCREASED MOTIVATION TO LEARN WITH MOBILE TECHNOLOGY (DEVICES): A PRELIMINARY STUDY

Vincentas Lamanauskas, Violeta Slekiene
University of Siauliai, Lithuania

Gabriel Gorghiu
Valahia University Targoviste, Romania

Costin Pribeanu
Academy of Romanian Scientists, Romania

Abstract

Mobile technology is now part of the everyday life of teachers and students and thus tends to become an inseparable part of the educational activities. Teachers and students are increasingly using mobile technologies in teaching and learning. Therefore, it is purposeful to responsibly integrate technologies into the educational process. However, technical and pedagogical support is necessary in order to facilitate both teacher and students' understanding of this educational potential. Besides, it is still very little known and there is very little evidence about the effectiveness of the application of these technologies in the teaching/learning process. This research aims to explore the perceptions of Romanian and Lithuanian teachers regarding the use of mobile technologies in education.
Keywords: *motivation to learn, mobile technology, preliminary study, science education, science teachers.*

Introduction

Technology development recently has been very rapid. It is obvious that mobile technologies are changing our reality. Mobile technologies become dominating not only in all life spheres but also in learning. On the other hand, these technologies become more portative, carriable, available, moderate in price, efficient, effective and quite easy to use. Applying to teach based on such technologies, in many cases creation of learning conditions is assured for today's learner, taking into consideration individual pace, time, place, learning possibility and autonomic individualized learning principles (Abromavičienė, Teresevičienė, & Volungevičienė, 2013). Research shows that mobile technologies allow to increase teaching process effectiveness, to enrich teaching/learning environment, they help to use the newest resources and to integrate various topics, to develop critical thinking abilities and other (Burianova & Turčáni, 2016; Parigi, 2016).

Mobile technologies also create an opportunity to individualize the teaching process. Every student can choose the amount of material and learning pace according to his needs and abilities. It is thought that these technologies provide unlimited possibilities: to learn various subjects, read e-books, to put down ideas and remarks, gather the text, share information, take photos, draw, create and others. Researchers also point out such advantages as increased individual support and opportunities for personal development, better methods of collaborating and communicating (Eschenbrenner & Fui-Hoon Nah, 2007), higher interest in learning (Blasco, 2016).

On the other hand, research carried out in Portugal showed that mobile technology is used more as a tool than as a teaching methodology (Ferreira, Moreira, Pereira, & Durão, 2015). According to Dias and Victor (2017), the benefits of using mobile technologies overshadow the challenges.

Thus, one can basically assert that technology use in educational practice becomes an inseparable part of educational activity. Both teachers and students increasingly use mobile technologies in teaching and learning. However, despite this, technical and pedagogical support is necessary in order to facilitate both teacher and students' understanding of such technology educational potential and effective usability (Montrieux, Vanderlinde, Schellens, & De Marez, 2015). Besides, it is still very little known and there is very little evidence about the effectiveness of the application of these technologies in the teaching/ learning process. It is purposeful to responsibly integrate technologies into the education process and to seek evidence-based integration.

Thus, the aim of this research was to ascertain what mobile technologies natural science teachers use, how they value the importance of such technology for the education process, and what factors promoting/limiting the use they discern. In order to do this, a qualitative approach has been taken, that is, based on a questionnaire with six open-ended questions. The questionnaire has been administrated to eight Romanian teachers and eight Lithuanian teachers.

Related Work

Huizenga et al. (2009) studied the effect of game-based learning history on engagement, knowledge and motivation. The idea is that combining situated and active learning with fun leads to better students' motivation and engagement. Based on a comparison with regular project-based learning they found that game-based learning is increasing engagement and knowledge acquisition. However, their results showed no difference as regards the motivation to learn history. They also found that students benefiting more from the game-based learning were those with an initial low History ability and those from higher educational level.

Pegrum et al (2013) reported on the adoption of mobile technologies in ten shools from Australia, based on teachers' and staff's opinions. They found that in some schools, the use of mobile devices has led to better learning outcomes, especially for learning a foreign language. Also, in some schools, they found that mobile learning brings particular benefits for students with special needs. The most important benefit mentioned by the interviewees was the increased level of students' engagement and motivation.

The study of Barhoumi (2015) analyzed the effectiveness of blended learning on mobile devices by comparing the post-test results and the answers to an attitude questionnaire of an experimental group (70% face-to-face coursework + 30% discussions on WhatsApp) with a control group (70% face-to-face coursework + 30% face-to-face discussions). The comparison showed that students in the experimental group had better test scores and scored higher the items in the questionnaire.

Another controlled experiment has been conducted by Furio-Ferry et al. (2015) in order to compare the effectiveness and satisfaction of learning with an iPhone game vs. traditional learning. Based on the analysis of pre-test and post-test results, the authors concluded that students in the experimental group achieved higher knowledge (although not statistically significant) and were more satisfied with mobile learning.

Nikou and Economides (2015) analyzed the impact on learning performance and motivation of mobile-based micro-learning and assessment (MBmLA) on a sample of 108 high-school students. Their findings show that students in the experimental group had significantly better post-test scores as regards factual knowledge and self-reported greater learning satisfaction than students in the controlled group (paper-based homework). They also found that students taking the MbmLA approach scored higher the questionnaire items as regards the perceived autonomy, competence and relatedness.

The study of Lai and Hwang (2015) analyzed the mobile learning strategies used by science education teachers in Taiwan. The mobile learning strategies relate to a blending learning model provided by the study that includes three components: traditional instructions, classroom mobile learning, and in-field mobile learning. In order to investigate the teachers' approach, a total of ten mobile learning strategies have been developed: guided learning, video sharing, inquiry-based learning, peer assessment, issue-based discussion, project-based learning, computers as Mindtools, digital story-telling, synchronous sharing, and contextual mobile learning. They found that most teachers preferred to integrate guided learning and used mobile technology to provide supplementary material. The next two preferred strategies were video sharing and inquiry-based learning.

Research Methodology

General Background

The research was qualitative, of a preliminary type. A preliminary study can be small and quick such as a qualitative study to ask potential participants to review the specific topic/subject (Smith, Morrow, & Ross, 2015). The research was carried out in September 2019. This preliminary research is part of a larger study aiming to understand the use of mobile technologies in the educational process. On the basis of this research, primary research hypotheses and research questions will be formulated and a quantitative research instrument will be developed. From a methodological point of view, it is a good practice to start with a small-scale preliminary research in order to formulate research questions and hypotheses. This development of the research concept during the study is the usual mixed research procedure, expressing its openness.

Sample

The questionnaire was answered by 8 different qualification natural science (physics, geography, chemistry, biology, engineering, ICT) teachers from different Lithuanian schools.

Table 1. Lithuanian teachers' demographic data.

Teacher No.	Professional rank	Subject	Gender, age
1.	Teacher	Geography	Female, 45
2.	Teacher	Biology-chemistry	Female, 50
3.	Teacher	Chemistry-physics	Male, 42
4.	Teacher	ICT-engineering	Female, 45
5.	Senior-teacher	Physics	Female, 40
6.	Teacher-methodologist	Geography	Female, 30
7.	Teacher-expert	Physics	Male, 42
8.	Teacher-expert	Geography	Male, 45

In Romania, the questionnaire was answered by 8 different qualification natural science teachers (areas: physics, chemistry, sciences).

Table 2. Romanian teachers' demographic data

Teacher No.	Professional rank	Subject	Gender, age
1.	Teacher	Physics	Female, 60
2.	Teacher	Physics	Female, 50
3.	Teacher	Physics	Male, 48
4.	Teacher	Chemistry	Female, 45
5.	Teacher	Physics	Male, 48
6.	Teacher	Chemistry	Female, 63
7.	Teacher-expert	Sciences	Female, 36
8.	Teacher-expert	Sciences	Female, 45

The research sample was in total 16 practising science teachers. According to Fink (2003) the minimum number for a pilot study is 10. In the light of the preliminary study, such a sample is considered appropriate.

Instrument

In the research, the authors' prepared instrument was used, in which several open-ended questions/tasks were presented. This research is focusing on three research questions:

Are mobile technologies/devices driving better learning?

Do mobile technologies/devices increase students' learning motivation?

Write your opinion on the use of mobile technology (devices) in the teaching process is an important aspect for you.

Data Analysis

The research data were expressed in written form. The qualitative research data were processed using content analysis. In the content analysis, the resulting data are analysed in depth to allow for the generation of previously unfamiliar themes and dimensions (Yıldırım & Şimşek, 2011).

Research Results

Lithuanian Teachers Position

All the respondents in different levels are using mobile technologies/devices in the teaching/ learning process and positively value their application.

However, almost everybody notices that giving permission to use mobile phones in the teaching process, students very often overindulge in this, i.e., do not work with the program that is needed, but, e.g., go to social networks (Facebook), or some other game programs. Below (in Table 3), there are generalized teachers' comments on the aspect of every variable.

Table 3. Lithuanian teachers' position.

Variable	Answer
The importance of mobile technologies/devices for better learning	**All teachers agreed that mobile technologies/devices encourage to learn better:** • Such education is more acceptable for students; • Information is more memorable; as students claim themselves, mobile technology use quickens knowledge mastering; • The tasks are performed creatively, most of them encourage problem-solving, provide a lot of possibilities for more varied reflection. Help to consolidate creative students' abilities – e.g., be able to convey the collected material in an impressive and interesting way; • Nowadays students have perfectly mastered mobile phones, do not imagine their life otherwise. It is a more natural device for students than books. Students find a lot of new phone employment possibilities (applications not only for leisure time but also for learning). • However, some of them indicated certain restrictions as well: • Using not in every lesson I think has a positive influence on students' learning. • I don't think that it is some kind of stimulus for better learning. This is just an additional device, which can be purposefully used.

The importance of mobile technologies/ devices in increasing students' learning motivation	**All teachers agreed that mobile technologies/devices increase learning motivation:** • This increases motivation. It makes the teaching process interesting and vivid. • As I am school internal auditor, I can claim that students indicate every year that they want more virtual tasks, are happy being able to take standardized tests with the help of computer, they mention that they want more computers at school, the other devices, that the most interesting lessons are those, during which teachers use technologies or integrate lessons with an information technology subject. • Some of the students become more active, try to correctly perform as many tasks as possible. • Responsibility and personal obligation to learn grows because the student always has access to a certain task, I think that mobile technologies encourage interest. • Help to create a favorable environment for learning, when a student can use his technical knowledge and skills. • This device does not cause stress. The students accept learning as a game. • Without a doubt, it increases, because present generation students do not imagine the teaching process without these devices. Students wait for the lessons, in which tablet computers will be used.
Additional opinion on the use of mobile technology (devices) in the teaching process	• Technology use in the lessons or during projects purposefully develops multisided students' abilities and competencies encourage students to evaluate themselves. Actually, I can claim that pedagogues are interested in this actively, probably not all of them dare, not all of them have enough skills and knowledge to improve. Many schools already have computers with software equipment, projectors, interactive boards, tablet computers, and other, but there are such schools, which lack these technologies or do not conform to the number of students. As I have mentioned "different education" is inevitable and pedagogues should accept it as a challenge. • In the future, such education will become inevitable. • Due to technologies, one can perform experiments in the lesson, which naturally cannot be performed at school. Quickly and accurately perform various measurements. Model decisions to problematic questions. • During geography lessons, for some topics, it is very convenient to use mobile phones with internet access. For example, Kahoot or other, in which there are maps, or just expanding the topic using the newest information on the internet. • I think that in natural science lessons mobile technologies are very useful, these are various computer software programs, information, communication. These are virtual laboratory works. One can observe various phenomena in virtual space, even can perform practical works, carry out research activity. • Technology use is necessary, encourages students' creativity and activeness. However, all students must have corresponding mobile technologies. Mobile technologies give more possibilities to check the level of already acquired knowledge. Mastering the new material using mobile technologies is possible only when a teacher coordinates the work, and one lesson is not enough for this. • This is convenient. This is attractive to the students. It gives a lot of positive colors to the education process: tools for greater activity, evaluation and self-evaluation tools, quick information search and its conveyance; it is convenient to take photos, film, edit a video, model and even program (also including teaching robot control). • For me, mobile technologies help to make the teaching process more varied, more vivid and give additional visual material, which is not in the textbooks. Using computer tests, students' evaluation is made faster and one does not have to sit long hours checking writing works. Geography is such a subject, in which visuality is very important and in the rapidly changing world quickly changing new information which we wouldn't be able to reach without mobile technologies.

Romanian Teachers Position

Some teachers mentioned that mobile tech is useful, providing also its use in an in-excessive manner. Below (in Table 4), there are generalized teachers' comments on the aspect of every question.

Table 4. Romanian teachers' position.

Variable	Answer
The importance of mobile technologies/devices for better learning	**All teachers answered affirmatively:** • Increased interest in science education; • Increased interest for discovery and research; • Experiments that enable higher competencies; • More enjoyable and easier teaching; • Stimulates creativity. • However, some of them are afraid of: • Avoiding excessive use.
The importance of mobile technologies/devices in increasing students' learning motivation	**All teachers agreed that mobile technologies/devices increase learning motivation, provided that is not excessively used:** • Increased motivation due to new content and experiments. • Less passivity. • Mobile technology is attractive. • Enables continuous learning in class and outside.

Additional opinion on the use of mobile technology (devices) in the teaching process	• Mobile technology **might play an important role** in the educational process, if:
	  • Used for educational purpose in class and home
	  • Integrated with traditional teaching/learning methods
	  • Useful for students with special needs
	• Mobile technology is useful for **teaching support**:
	  • better communication with and between students as well as better collaboration.
	  • Saves time in teaching (increased teaching efficiency).
	  • A new way of evaluation
	  • Diversification of educational activities
	• Mobile technology is a useful **learning support**
	  • Increased independence in learning
	  • Increased participation and engagement with science education
	  • Increased students' autonomy in learning and responsibility
	  • Stimulates developing digital competencies and creativity
	  • Enables oriented and continuous learning.
	  • Increased motivation to learn

Generalising one can claim that all teachers acknowledge that appropriate MT usage encourages to better learn and increases learning motivation. They pointed out that teaching using MT becomes more available, information is more memorable, knowledge mastering increases faster, learning process becomes more interesting and livelier, students turn to be more active, they experience less stress accepting learning as a game. MT

provides education process with attractiveness tools, such as interactive evaluation and self-evaluation platforms, virtual experimental laboratories, quick information search and its transference, photographing, video footage assembling and modelling possibilities. Teachers indicate that teaching/learning using MT will become inevitable in future, and pedagogues should accept this as a challenge.

Conclusions

MT usage presupposes education process management problem, when students use mobile devices not for learning purposes during the lessons.

Proper MT usage in the education process encourages to better learn and increases learning motivation. Using MT, education becomes more available, information more memorable, knowledge mastering increases faster, teaching process becomes interesting and lively, students turn to be more active, they experience less stress.

Teachers indicate that MT usage in education process will become inevitable in future and this should be accepted as a certain challenge.

References

Abromavičienė, D., Teresevičienė, M., & Volungevičienė, A. (2013). Technologijomis grįsto mokymo dalyvių – andragogų ir besimokančiųjų – vaidmenų kaita [Changing roles of andragogues and learners in technology-enhanced teaching/learning]. *Andragogika 1* (4), 99–110. https://www.vdu.lt/cris/handle/20.500.12259/50648

Barhoumi, C. (2015). The effectiveness of WhatsApp mobile learning activities guided by activity theory on students' knowledge management. *Contemporary Educational Technology, 6*(3), 221-238. https://files.eric.ed.gov/fulltext/EJ1105764.pdf

Blasco, D. (2016). Student's attitudes toward integrating mobile technology into translation activities. *International Journal on Integrating Technology in Education (IJITE), 5*(1), 1-11. http://www.airccconline.com/ijite/V5N1/5116ijite01.pdf

Burianova, M., & Turčáni, M. (2016). Non-traditional education using smart devices. In: *DIVAI –2016 (11th international scientific conference on Distance Learning in Applied Informatics)* (pp. 77-86). Prague: Wolters Kluwer.

Dias, L., & Victor, A. (2017). Teaching and learning with mobile devices in the 21st-century digital world: Benefits and challenges. *European Journal of Multidisciplinary Studies, 2*(5), 339-344. http://journals.euser.org/files/articles/ejms_may_aug_17/Lina2.pdf

Eschenbrenner, B., & Fui-Hoon Nah, F. (2007). Mobile technology in education: Uses and benefits. *International Journal of Mobile Learning and Organisation, 1*(2). https://doi.org/10.1504/IJMLO.2007.012676

Ferreira, M. J., Moreira, F., Pereira, C. S., & Durão, N. (2015). The role of mobile technologies in the teaching/learning process improvement in Portugal. In Proceedings of ICERI2015 Conference 16th-18th November 2015, Seville, Spain. https://pdfs.semanticscholar.org/d68f/dd359f699609b33c33d71a5fec47b7ba7d00.pdf

Fink, A. (2003). *The survey handbook*. SAGE Publications. https://dx.doi.org/10.4135/9781412986328

Furió Ferri, D., Juan, M., Segui, I., & Vivó Hernando, R. A. (2015). Mobile learning vs. traditional classroom lessons: A comparative study. *Journal of Computer Assisted Learning, 31*(3), 189-201. https://doi.org/10.1111/jcal.12071

Huizenga, J., Admiraal, W., Akkerman, S., & Dam, G. T. (2009). Mobile game-based learning in secondary education: engagement, motivation, and learning in a mobile city game. *Journal of Computer Assisted Learning, 25*(4), 332-344. https://doi.org/10.1111/j.1365-2729.2009.00316.x

Yildırım, A., & Şimşek, H. (2011). *Sosyal Bilimlerde Nitel Araştırma Yöntemleri* (8th Edition) [Qualitative research methods in the social sciences]. Seçkin Publishing.

Lai, C. L., & Hwang, G. J. (2015). High school teachers' perspectives on applying different mobile learning strategies to science courses: The national mobile learning program in Taiwan. *International Journal of Mobile Learning and Organisation, 9*(2), 124-145. https://doi.org/10.1504/IJMLO.2015.070704

Montrieux, H., Vanderlinde, R., Schellens, T., & De Marez, L. (2015). Teaching and learning with mobile technology: A qualitative explorative study about the introduction of tablet devices in secondary education. *PLoS ONE, 10*(12), e0144008. https://doi.org/10.1371/journal.pone.0144008.

Nikou, S. A., & Economides, A. A. (2018). Mobile-based micro-learning and assessment: Impact on learning performance and motivation of high school students. *Journal of Computer Assisted Learning, 34*(3), 269-278. https://doi.org/10.1111/jcal.12240

Parigi, L. (2016). Balancing between ICT training and reflective practice in teachers' professional development. *TD Technologie Didattiche, 24*(2), 111–121. https://doi.org/10.17471/2499-4324/895.

Smith, P. G, Morrow, R. H., & Ross, D. A. (Eds). (2015). *Field trials of health interventions: A toolbox. 3rd Edition /Chapter 13, Preliminary studies and pilot testing/*. OUP Oxford. https://www.ncbi.nlm.nih.gov/books/NBK305518/.

Vincentas Lamanauskas
PhD., Professor, Senior Researcher, Research Institute, University of Šiauliai, 25-125 P. Višinskio Street, Šiauliai, Lithuania.
E-mail: vincentas.lamanauskas@su.lt
Website: https://www.researchgate.net/profile/Vincentas_Lamanauskas

Violeta Šlekienė
PhD., Associate Professor, Research Institute, University of Šiauliai, 25-125 P. Višinskio Street, Šiauliai, Lithuania.
E-mail: Violeta@fm.su.lt
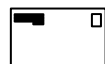Website: https://www.researchgate.net/profile/Violeta_Slekiene

Gabriel Gorghiu
PhD., Professor, Teacher Training Department, Valahia University Targoviste, 35 Lt. Stancu Ion Street, 130105 Targoviste, Romania.
E-mail: ggorghiu@gmail.com
Website: https://www.researchgate.net/profile/Gabriel_Gorghiu

Costin Pribeanu
PhD., Professor, Senior Researcher, Academy of Romanian Scientists, Splaiul Independentei no. 54, sector 5, 050094 Bucharest, Romania.
E-mail:
Website: https://www.researchgate.net/profile/Costin_Pribeanu