SEMARAK ILMU PUBLISHING

Journal of Advanced Research in Applied Sciences and Engineering Technology

Journal homepage:
https://semarakilmu.com.my/journals/index.php/applied_sciences_eng_tech/index
ISSN: 2462-1943

Mobile Learning Readiness Among Malaysian Students at Higher Education in Learning Mathematics

Amy Ling Mei Yin[1,*], Yop Kim Jeok[1], Lai Chai Yan[1]

[1] Department of Computing and Information Technology, Tunku Abdul Rahman University of Management and Technology, Jalan Kolej, Taman Bandar Baru, 31900 Kampar, Perak, Malaysia

Article history:
Received 18 January 2024
Received in revised form 25 September 2024
Accepted 7 October 2024
Available online 30 November 2024

Keywords:

Mobile learning; readiness; mathematics; higher education

ABSTRACT

Mobile learning offers many advantages for students. It provides easy access to learning materials, increases student engagement, encourages collaboration, and allows for more personalized learning. The accessibility of mobile devices does not ensure that students will use m-learning in education, especially in mathematics. One way mathematics has been studied is through traditional classroom sessions where a teacher teaches students one-to-one. This approach is time-consuming and can be difficult for some students to follow. Therefore, this study's objective is to determine the readiness of students in higher education to use mobile learning in learning mathematics. In total, 128 students voluntarily participated in this study. The survey was divided into three sections: section A is for personal information, section B is for mobile devices, and part C is for readiness to use mobile learning. The result showed students were ready, willing, and welcome to use mobile devices and technology to support their learning, but it is important to note that most of the scores were average. To further enhance students' engagement and motivation towards m-learning, addressing any potential barriers or challenges hindering their readiness may be helpful. At the end of this study will contribute to the body of knowledge on mobile learning readiness and promote the use of mobile technology in education.

1. Introduction

Mobile technologies are widely used in various aspects of society, including everyday life, the economy, business, management, and also in education [1]. Mobile learning has changed the way we learn. It is more personal and interactive than traditional learning methods, allowing students to maximize their education [2]. It also allows educators to provide high-quality education to a broader audience by making it available anywhere, anytime. It has already significantly impacted the educational landscape [3,4]. It has revolutionized how students learn and access information. In addition, it has made it possible for educators to reach a wider audience, providing them with new opportunities to teach and engage with students [5].

* *Corresponding author.*
E-mail address: lingmy@tarc.edu.my

https://doi.org/10.37934/araset.53.2.122129

Mobile learning offers many advantages for students. It provides easy access to learning materials, increases student engagement, encourages collaboration, and allows for more personalized learning. Mobile learning is also suited for academic settings since it provides flexible scheduling and location, which improves and meets students' needs in various situations [6]. Besides, mobile learning can be used to learn mathematics, languages, skills, etc., through apps and online courses. Mathematics is the study of numbers, quantities, shapes, and patterns. It is a broad field covering many areas, including algebra, geometry, calculus, and topology. It is used to solve problems, understand the world, and explore new ideas [7]. Mobile technologies have generated significant interest and excitement among both practitioners and researchers in the field of education, particularly when it comes to mathematics teaching and learning [8].

One way mathematics has been studied is through traditional classroom sessions where a teacher teaches students one-to-one. This approach is time-consuming and can be difficult for some students to follow. In addition, some students may find it challenging to take notes during class sessions or engage with the teacher. Mobile learning offers a new way for students to learn mathematics. Mobile learning is where students access educational materials and resources on their mobile devices without being restricted to a specific time and place [9]. This approach can be more engaging for students, as they can work independently and not rely on someone else to provide instruction.

One of the significant advantages of mobile learning is its ability to be used in various settings. For example, mobile learning can be used in classrooms, at home, or on the go. This flexibility makes mobile learning an ideal platform for delivering mathematics education to students anytime and anywhere. For example, Khan Academy is an online resource that provides free education in mathematics and other subjects. Khan Academy has become extremely popular, with over 2 million students using its resources monthly [10]. Other apps, such as Mathway, Photomath, and Math Quiz, provide interactive lessons and practice problems to help students learn and improve their math skills. Even so, few academic studies look into mobile learning in higher education, particularly in learning and teaching mathematics to undergraduate students [11]. The majority of mobile device users are 18-29 years old, which is also the average age of college students [12-14] but the accessibility of mobile devices does not guarantee that students will utilize them in the classroom; the first step must be to determine whether students are ready for mobile learning [15-18]. Therefore, the objective of this study is to determine students' readiness to use mobile learning in higher education to learn mathematics.

2. Methodology

This survey makes use of a questionnaire to collect data. A questionnaire survey is proven to obtain user demographic information and opinions [19]. The questionnaire was adopted from Ahmad Abu *et al.,* [11], and the demographic information part has been modified based on this study's suitability. The questionnaire is split into three sections: Section A: personal details; Section B: mobile device; and last is Section C: The readiness to use mobile learning. A five-point Likert scale, with 5 denoting strongly agree, 4 agree, 3 neutral, 2 disagree, and 1 indicating severely disagree, was used in the questionnaire design. The Likert scales distinguish statements by depicting a range of possible opinions [19]. A sample size of 30 to 500 was sufficient to produce significant results in the study [20]. Therefore, the total number of 128 respondents was acceptable.

2.1 Procedure for Conducting Research

Figure 1 shows the steps of the procedure for conducting this research. The initial step in the evaluation process was to conduct a literature review. The purpose of the literature review was to retrieve all the relevant studies about mobile learning. A literature review critically analyses and synthesizes published research on a particular topic. It comprises identifying, assessing, and integrating significant literature to provide an overview of current knowledge on the issue. From the literature review, the questionnaire was designed. Next, the researcher identified the potential group of students. The students are those with mobile phones who take mathematics subjects. The questionnaire was distributed, and students were required to fill in the questionnaire. After collecting the data, the process continues cleaning it to ensure that it is accurate, complete, and consistent. This step involves checking for errors, missing values, outliers, and inconsistencies in the data. Descriptive statistics summarize the data and provide an overall picture of the data set. This includes mean, standard deviation, and range measures. For the data visualization, charts, graphs, and tables proved effective in visually presenting the data in a manner that was visually engaging and easily comprehensible. Data visualization helped in making complex information more accessible and understandable to the readers. The final step is finding and discussion. This step is to interpret the results of data analysis and report the findings clearly and concisely. This involves summarizing the key findings, drawing conclusions, and making recommendations based on the results.

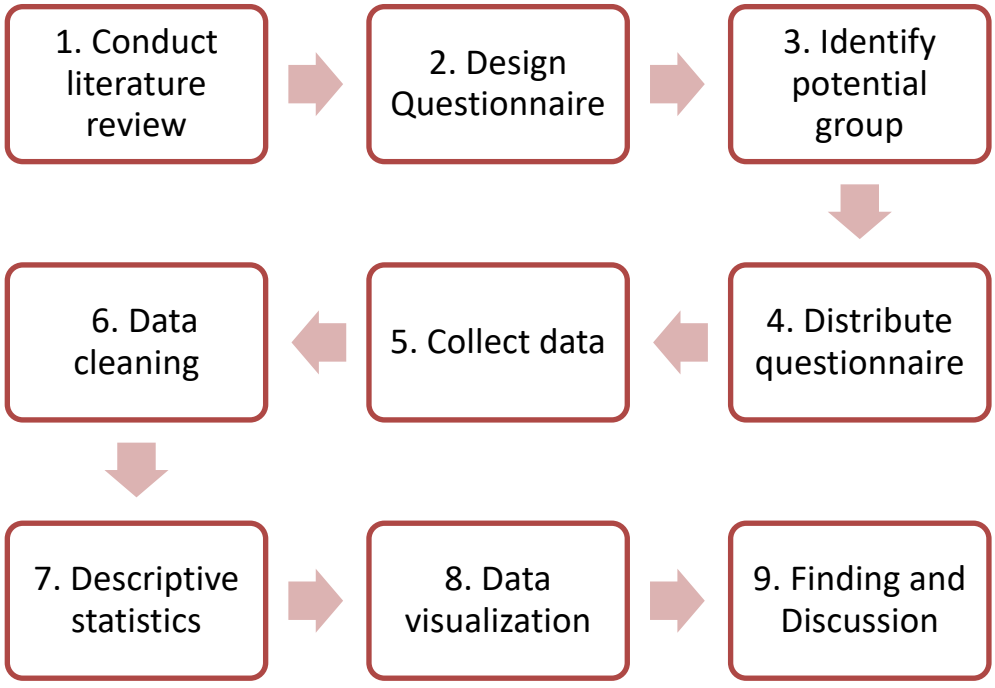

Fig. 1. Steps of procedure for conducting research

3. Findings and Results

A total of 128 respondents, 57% males, and 43% females, participated in the survey. 71.9% of the respondents were 18-20 years old, and 28.1% were 21-25. Regarding the level of education, there were 81.3% from diploma, and 18.8% had a Bachelor's level. For the programme, 39.8% were from Accounting/Business, 37.5% were from IT, 6.3% were from Communication and Media, 5.5% from Hotel Management, and 10.9% were from E-Marketing. Figure 2 shows that 82.8% of respondents have smartphones with advanced computing capabilities and connectivity, 33.6% have mobile

phones for calls and texts, 32.8% have tablet computers, 3.1% have PDAs, and 0.8% have other gadgets.

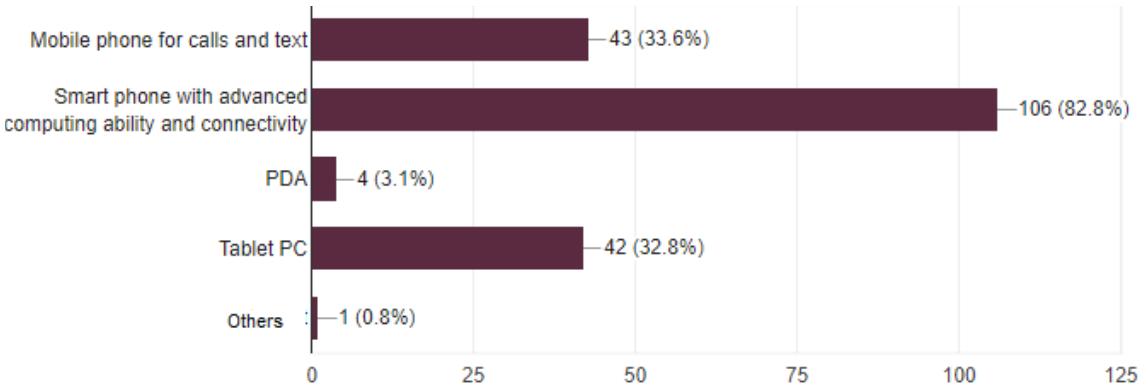

Fig. 2. Types of mobile devices owned by students

To determine how this might impact m-learning implementation, the study also looked into where and how participants access the internet. 96.9% of respondents constantly accessed the internet, and only 3.1% did not. Besides, 97.7% of respondents use the internet from their mobile devices daily, and only 2.3% every week. Figure 3 shows the pie chart of how often they use the internet from their mobile device. The fact that 97.7% of respondents use the internet from their mobile devices daily indicates that mobile internet usage has become ubiquitous today. This trend highlights the growing importance of mobile devices as a primary means of internet access. Only 6.3% of respondents said they did not use the internet outside of the institution, while 93.8% did so at home, in public libraries, cafes, etc.

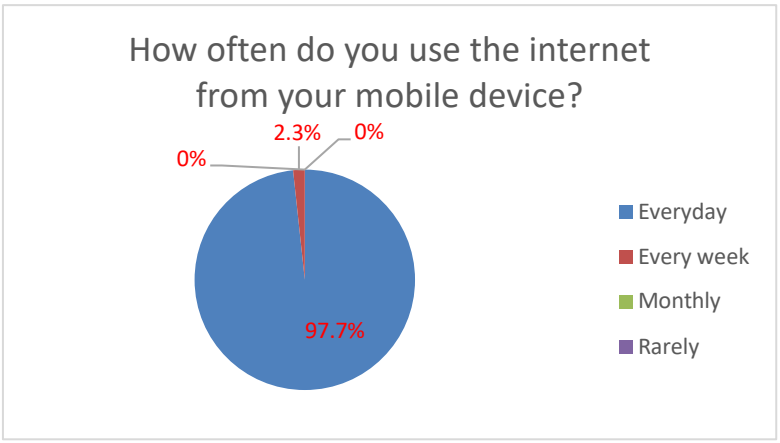

Fig. 3. How often do students use the internet from their mobile devices?

Figure 4, shows that 16.4% of the respondents took Probability and Statistics, 33.6% were Calculus and Algebra, 15.6% for Discrete Mathematics, 44.5% for Quantitative Studies, 7% for Statistical Analysis for Business, 6.3% each for Quantitative Methods and Statistics for Communication Research and last but not least general mathematic only 0.8%.

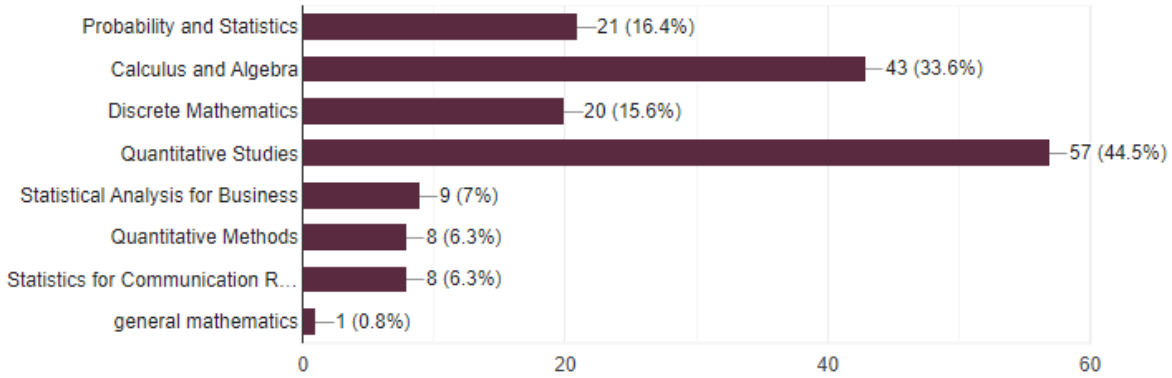

Fig. 4. Students take mathematics subjects

87.5% of respondents believe using a mobile device to access online mathematics materials (notes, exercises, etc.) is helpful, while 12.5% disagree. 59.4% of the respondents had heard about mobile learning before, and 40.6% had never heard about mobile learning. When asked about their opinion of mobile learning, 68.6% said they thought it was a good idea and would use it, while 35.9% said they thought it was a nice idea but would not use it. Only 0.8% of respondents said they had never heard of it, and 4.7% said they did not believe it was a good concept.

Table 1
The mean score and standard deviation for each statement

No	Statements	Mean	SD
1.	I know well about m-learning.	3.04	1.15
2.	I would like to download mobile applications that could help me study mathematics.	3.61	1.01
3.	I believe that using a mobile device to learn mathematics will increase the flexibility to learn the subject inside and outside the classroom.	3.5	0.98
4.	I believe that implementing and using m-learning as part of teaching and learning mathematics will make the educational process more accessible and more enjoyable.	3.56	0.97
5.	I believe that using m-learning to learn mathematics will help me obtain good grades in the subjects.	3.51	1.00
6.	I believe that implementing m-learning in the educational process will increase communication between educators and learners.	3.48	0.96
7.	I believe that implementing m-learning in mathematics will enable me to have independent learning.	3.52	0.97
8.	I believe that m-learning would allow me to learn and study mathematics in places where I couldn't usually learn or study.	3.52	1.02
9.	I believe that learning mathematics on my mobile device would be easy because I am already familiar with its functions.	3.40	0.98
10.	I am looking forward to engaging in m-learning to learn mathematics.	3.48	0.97

For section C, readiness for m-learning, the first question asked: "if they know well about m-learning". The mean of the responses was 3.04, located within the 'Neutral' area. A score shows that most students in the survey give a positive view of m-learning and realize that they understand it to some degree. Many students may already be familiar with the concept and potentially receptive to using mobile devices for learning. For the second question, students were asked if they would like to download mobile applications that could help them in studying mathematics. The mean score was 3.61, between 'Neutral' and 'Agree.' The students have a positive attitude towards using mobile applications for learning mathematics. A score above 3 on a scale of 1 to 5 indicates agreement with the statement, so a score of 3.61 suggests that most students are interested in using mobile applications to support their mathematics studies.

Question 3 asked whether they believe learning mathematics using a mobile device will improve the flexibility to learn the subject, whether in or out of the classroom. The mean was 3.5, equal to 'Neutral' and 'Agree.' Moderate agreement with this question indicates that most students believe mobile devices can provide flexibility in learning mathematics in and out of the classroom. The results reveal that students are receptive to using mobile devices for mathematics learning and see the potential benefits of increased flexibility in their learning experience. Afterward, the participants were asked if they believed using m-learning in the teaching and learning of mathematics would improve accessibility and enjoyment of the learning experience. The mean score fell between "Neutral" and "Agree," at 3.56. The results for this question indicated that students have a positive attitude towards using m-learning in mathematics education. Most students believe in the potential benefits of m-learning in making the educational process much more straightforward and enjoyable.

For the fifth question, students were asked if using m-learning to learn mathematics would assist them in achieving good grades. The mean score for this question was 3.5 in the same area. They believe that m-learning can positively impact their academic performance in mathematics. Moderate agreement with the statement shows that most students surveyed believe that using mobile devices and technology to support their learning can help them achieve good grades in mathematics. Students believe m-learning can positively impact their academic performance, which may motivate them to engage fully with m-learning strategies.

Next, students were asked if m-learning would improve communication between educators and learners in the educational process. The mean score was 3.48, between 'Neutral' and 'Agree.' They believe m-learning can potentially improve communication between educators and learners. Most of them think that m-learning can facilitate communication between educators and learners. It suggests that students see the potential benefits of using mobile devices and technology to support communication between educators and learners, which may help to foster a more collaborative and engaging learning environment.

The answer to the seventh question was whether m-learning in mathematics would allow students to study on their own. The mean score for this question was 3.52, which remains in the range between "Neutral" and "Agree." They believe that m-learning has the potential to support independent learning in mathematics. Most students believe using mobile devices and technology to support their learning can help them become more independent learners. It suggests that students see the potential benefits of using m-learning strategies to support independent learning, which may help to promote more significant self-directed learning and a sense of ownership over the learning process.

Next, it was asked if mobile learning would enable students to study and learn mathematics in settings where they couldn't previously do either. This is because mobile learning offers flexibility and convenience, allowing students to learn anytime and anywhere on mobile devices such as smartphones, tablets, and laptops to access educational content and resources. The means score was 3.52, which is still between 'Neutral' and 'Agree.' M-learning can potentially support learning and studying in various locations beyond the traditional classroom setting. Students believe that using mobile devices and technology to support their learning can help them overcome geographic and temporal barriers to learning.

Afterward, participants were asked if being familiar with a mobile device's features would make learning mathematics on it simple. The means score was 3.39, located within the 'Neutral' area. Their familiarity with mobile devices could facilitate their learning of mathematics using such devices. Most students believe using mobile devices and technology to learn mathematics can be made more accessible because of their familiarity with these devices.

The last part of the questionnaire determined participants' willingness to use m-learning as a learning tool. The students were asked if they were looking forward to engaging in m-learning to learn mathematics, and the mean score was 3.48; it was between 'Neutral' and 'Agree.' The students are open to the idea of using m-learning to learn mathematics. The results show that most are willing to use mobile devices and technology to support their mathematics learning.

4. Discussion

The survey results show that many students have smartphones; only a few have mobile phones for calls and texts, PDAs, and Tablet PCs. The majority of students have constant access to the internet. Most use the internet daily from their mobile device, and only a few of them use it weekly. This indicates that most students have access to the internet regularly and use it frequently, mainly through their mobile devices. Besides that, students frequently use their mobile devices to access the internet within and outside the university. The combination of the fact that most students have their own smartphones and constant access to the internet shows that they are already familiar with and comfortable using mobile technology.

The results of this study do not fully represent Malaysian university students' readiness for mobile learning because the respondents were undergraduate students from only one private university. It can be safely concluded that students are ready, willing, and welcome to make full use of mobile devices and technology to support their learning, and students were suggested to see the potential benefits of using m-learning strategies to keep learning and studying in various contexts, which may help to promote greater engagement and participation in mathematics education. By seeing the potential benefits of m-learning, students will be ever willing to engage with m-learning.

5. Conclusions

This study was designed to determine students' readiness to use mobile learning in higher education in learning mathematics. It can be helpful for educators and policymakers considering implementing m-learning as a part of mathematics education. Overall, students were ready and willing to use m-learning. Still, it is essential to note that most of the score was average. To further enhance students' engagement and motivation towards m-learning, addressing any potential barriers or challenges hindering their readiness may be helpful. This could include providing training or resources to improve digital literacy skills, addressing concerns about the reliability and security of mobile devices, and designing m-learning activities that are interactive, relevant, and engaging for students. Additionally, it is essential to carefully evaluate m-learning strategies' effectiveness and potential drawbacks before implementing them on a large scale. In a nutshell, this study will contribute to the body of knowledge on mobile learning readiness and promote the use of mobile technology in education.

Acknowledgment

We want to thank the participants for their willingness to be involved in this study. This research was funded by Tunku Abdul Rahman University of Management & Technology (TAR UMT).

References

[1] Raelovich, Sattarov Azamat, Yusupov Rabbim Mikhlievich, Khaitov Fayzulla Norbutaevich, Jomurodov Dostmurod Mamasolievich, Ahmedov Furkat Karimberdievich, and K. U. Suyunbaevich. "Some didactic opportunities of application of mobile technologies for improvement in the educational process." *Journal of Critical Reviews* 7, no. 11 (2020): 348-352.

[2] Almutairy, Sulaiman, Trevor Davies, and Yota Dimitriadi. "Students' perception of their m-learning readiness." *International Journal of Electronics and Communication Engineering* 9, no. 5 (2015): 1505-1508.
[3] Wang, Yi-Shun, Ming-Cheng Wu, and Hsiu-Yuan Wang. "Investigating the determinants and age and gender differences in the acceptance of mobile learning." *British journal of educational technology* 40, no. 1 (2009): 92-118. https://doi.org/10.1111/j.1467-8535.2007.00809.x
[4] Al-Adwan, Ahmad Samed, Amr Al-Madadha, and Zahra Zvirzdinaite. "Modeling students' readiness to adopt mobile learning in higher education: An empirical study." *International Review of Research in Open and Distributed Learning* 19, no. 1 (2018). https://doi.org/10.19173/irrodl.v19i1.3256
[5] Lam, Paul, Kevin Wong, Ryan Cheng, Eric Ho, and Shereen Yuen. "Changes in student mobile learning readiness–comparison of survey data collected over a nine-month period." In *Global Learn*, pp. 180-189. Association for the Advancement of Computing in Education (AACE), 2011.
[6] Althunibat, Ahmad. "Determining the factors influencing students' intention to use m-learning in Jordan higher education." *Computers in Human Behavior* 52 (2015): 65-71. https://doi.org/10.1016/j.chb.2015.05.046
[7] Ojose, Bobby. "Mathematics literacy: Are we able to put the mathematics we learn into everyday use." *Journal of mathematics education* 4, no. 1 (2011): 89-100.
[8] Gnanasagaran, Durga, Suzieleez Syrene Abdul Rahim, and Dorothy DeWitt. "Mobile learning readiness among malaysian pre-university students." *MOJES: Malaysian Online Journal of Educational Sciences* 11, no. 2 (2023): 13-24.
[9] El-Hussein, Mohamed Osman M., and Johannes C. Cronje. "Defining mobile learning in the higher education landscape." *Journal of Educational Technology & Society* 13, no. 3 (2010): 12-21.
[10] Khan Academy. https://www.khanacademy.org
[11] Abu-Al-Aish, Ahmad, Steve Love, and Ziad Hunaiti. "Mathematics students' readiness for mobile learning." *International Journal of Mobile and Blended Learning (IJMBL)* 4, no. 4 (2012): 1-20. https://doi.org/10.4018/jmbl.2012100101
[12] Pew, R. "Mobile fact sheet." *Pew Research Center* 12 (2019).
[13] Poushter, Jacob. "Smartphone ownership and internet usage continues to climb in emerging economies." *Pew research center* 22, no. 1 (2016): 1-44.
[14] Crompton, Helen, and Diane Burke. "The use of mobile learning in higher education: A systematic review." *Computers & education* 123 (2018): 53-64. https://doi.org/10.1016/j.compedu.2018.04.007
[15] Corbeil, Joseph Rene, Janice Wilson Butler, and Maria Elena Valdes-Corbeil. "Faculty, are you ready for mobile learning? e-Learners say they are geared up and ready to engage." *International Journal of Mobile Learning and Organisation* 2, no. 1 (2008): 48-61. https://doi.org/10.1504/IJMLO.2008.018717
[16] Keller, Josh. "The slow-motion mobile campus." *The chronicle of higher education* 2 (2011): B4-B6.
[17] Cheon, Jongpil, Sangno Lee, Steven M. Crooks, and Jaeki Song. "An investigation of mobile learning readiness in higher education based on the theory of planned behavior." *Computers & education* 59, no. 3 (2012): 1054-1064. https://doi.org/10.1016/j.compedu.2012.04.015
[18] Wagner, Ellen D. "Enabling mobile learning." *EDUCAUSE review* 40, no. 3 (2005): 41-42.
[19] Rukavina, Stefanie, Sascha Gruss, Holger Hoffmann, and Harald C. Traue. "Facial Expression Reactions to Feedback in a Human-Computer Interaction—Does Gender Matter?." *Psychology* 7, no. 3 (2016): 356-367. https://doi.org/10.4236/psych.2016.73038
[20] Sekaran, Uma, and Roger Bougie. *Research methods for business: A skill building approach*. john wiley & sons, 2016.