



Embracing a technologically enhanced environment: Postgraduate students' learning experiences in mobile learning platform

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Abstract

The purpose of this study is to identify the postgraduate students' Mobile learning (M-learning) experiences in Massive Open Online Courses (MOOCs) as a platform. Learning logbook is used to measure the students' real-time learning experiences in Future Learn (FLMOOC) which is one of the learning platforms in MOOCs. This study is qualitative in nature and employed thematic analysis. This study used the purposive sampling method in choosing 34 postgraduate students in one of the public universities in Malaysia. These postgraduate students were introduced to FutureLearn (MOOCs) platform. Daily and weekly based learning logbook were distributed to the students' to express their experiences. Data were analysed using the thematic analysis method. The themes derived is device used and online course elements. Most of the students' were not aware on M-learning platform and students' technology skills enhanced after gained actual learning experiences using own mobile devices for conclusive online course elements.

Keywords: future learn (MOOCs) platform, mobile learning, mobile learning experience, learning logbook

1. Introduction

Using mobile devices for learning purposes is no longer a new fashion among students'. Hence, integrating Mobile learning (M-learning) into teaching and learning is expected to have a great influence on the experience and performance of learners (Mac Callum & Jeffrey, 2013) ^[15]. In the same vein, mobile technology received popularity among learners and instructors due to its flexibility and easiness which aids to improves perceived competence and achievement (Jeno, Grytnes & Vandvik, 2017) ^[10]. The term M-learning refers to the use of mobile and handheld IT devices, such as smartphones, laptops, PDAs, tablet PC technologies, in training, learning, and teaching. These devices are reshaping students' in their daily lives in higher education. Rapid advances and evolution in the field of education technology promise to revolutionize higher education as we know it, with some even predicting that the next few years will herald the "end of the university as we know it" (Harden, 2013) ^[9]. Technology-rich activities can sustain high levels of students' engagement, which aids in transforming their daily lives compared to less technology-focused activities. Digital technologies play an essential and integral role in the instructional process to effectively prepare students' to face multiple challenges in their workplace of the 21st century (Beetham & Sharpe, 2013) ^[2]. Educators need to meet the 21st-century demands which require to boost the students' educational learning and connect mobile platform for instructional purposes. Zhang *et al.* (2010) ^[28] stressed "mobile technologies to facilitate students' communication, collaboration, and learning and to prepare them for out-of-classroom learning" (p.1520). The resources that support education are easily available with the ease of mobile devices. For example, students' have embraced e-books, Google and MOOCs' to study and explore. The cost of education can ultimately decrease in providing students' to access reading in a cheaper digital format and some

platforms like MOOCs (Coursera, EdX, and FutureLearn). These platforms are offering free courses for students' at any time regardless of venue. Furthermore, online schooling has become a legitimate form of academia. Many students' have benefited from recorded podcasts or online courses. However, there has been little discussion on the postgraduate students' learning experiences in M-learning platform. Therefore, the purpose of this study is to identify the effects of students' based on actual learning experiences in FutureLearn (FLMOOC) platform. Thus, the learning logbook used for this study which comprised of daily and weekly were distributed to the students' to express their experiences throughout the M-learning process in the Flmooc platform.

2. Literature Review

2.1. Mobile Learning Experience

Handheld mobile devices offer a variety of novel contributions including personalised learning, in-time access to information, context sensitivity, instant communication and feedback that can be used to promote mobile learning enactments (Sung, Chang & Liu, 2016) ^[23]. Mobile learning (M-learning) has been defined as "the processes of coming to know through conversations across multiple contexts among people and personal interactive technologies" (Sharples, Taylor & Vavoula, 2007 ^[21], p.224). The increased use of mobile learning technology enhanced participatory learning which permitted the students' to explore and share significant experiences in the M-learning platform (Wilson, 2013) ^[27]. Mobile devices are always prominent for students' distraction which has been debated among many researchers and scholars as for long run issues. Students' lack of commitment, interest, or engagement in online course, ethical issues (Koohestani, Baghchehi, Karimy, Hemmat, & Shamsizadeh, 2019) ^[13], laziness or distractions (Mandell, 2015 & Katz, 2014) ^[11] and the

device itself (Campbell, 2006^[4]; Berry & Westfall, 2015)^[3] is attribute for students' negative learning experiences. A study conducted by Awidi, Paynter, and Vujosevic (2019)^[1] examine the factor influencing positive learning experience on Facebook among 108 students in one of the Western Australian University. The elements that satisfy the students learning experiences were access to information and resources, support and motivation, participation and collaboration, assessment and feedback as well as reflection and knowledge construction. The findings also reported that the students' felt encouraged to learn through their Facebook engagement. A mixed-methods research project called 'The beliefs and experiences of language students in their early years of transition to university-level study' was conducted by Steel (2012)^[22] at an Australian university with 134 students on users of mobile apps for informal learning for foreign language learning. The study findings reported that students' ability to learn on-the-go as well as get benefits that permitted the development of specific language-learning areas. The study also mentioned that the study able to fit learning into their busy schedule and utilise "pocket of time" to connect with, and learn languages. Willemse, Jooste, and Bozalek (2019)^[26] explored the students' authentic mobile learning experience at a higher education institution in South Africa. Seven themes arrived from the qualitative study were identified the mobile devices afforded a learning platform, mobile learning enactment enhance engagement, learning within a group made learning easier, flexibility in time allocated to complete the tasks, challenges experienced with data/Wi-Fi, impaired communication due to poor network access and use of mobile devices in practice perceived an unprofessional.

2.2. Mobile Learning Platform

The past two decades have witnessed the rapid expansion of online instruction in M-learning platform. The students' who enroll in online courses have increased yearly. Therefore, Massive Open Online Courses (MOOCs) have transformed and reshaped online learning by offering learning experiences beyond geographical and cost restrictions (Onah, Sinclair & Boyatt, 2014)^[19]. MOOCs enhance the students' learning experiences by presenting rich and diverse educational materials and enable social connections all around the world. However, not all MOOC learners get benefit from this platform and many of them face challenges in understanding the concept and completing the tasks, thus leading to students disengagement and drop out issues. Common challenges faced by MOOC learners have been previously explored using a post-course survey and interviews (Onah, Sinclair & Boyatt, 2014^[19]; Khalil & Ebner, 2014)^[19]. According to the study conducted by Topali Paraskevi and Alejandra Martínez-Monés (2019)^[24] the main reason for students' disengagement and drop out of the course are due to lack of time management, the absence of support, feeling of isolation, lack of prior knowledge, experience, and learning skills, unchallenging course design and the failure to understand the course content. A study conducted by Zheng, Rosson, Shih, and Carroll, (2015)^[29] mentioned that learners motivated to engage in MOOC because of its fulfilling current needs, future preparation, satisfying curiosity and connecting with people all around the world. Their findings suggest that completion is just one outcome

of MOOC participation with intrinsic as a key motivation for personal improvement. The other intrinsic motivations include the learner and situational interest (overarching interest, and the transient motivation that comes from a stimulating environment or task), achievement goals and value beliefs (de Barba, Kennedy, & Ainley, 2016)^[6]. According to Zheng *et al.* (2015) added about extrinsic factors such as free and open nature of MOOCs, convenience, and the prestige of course run by high-quality institutions as a motivate the learners to be active participants in MOOC.

2.3 The Role of Instructor as Facilitator

The role of the instructor has transformed from being 'the source of knowledge' to a facilitator and role model in the process of acquiring knowledge and skills (Moodlerooms, 2012). Therefore, "instructors need to provide learners with learning experiences that foster self-directed learning, get learners actively involved in one's learning process, and explicitly teach learners how to learn, while guiding the learning process" (Francom, 2010, p.29). In addition, Rico & Ertmer (2015) examined the role of the instructor employing student-centered approaches, specifically those that are problem-centered, result in outlining effective strategies that are valuable for facilitating discussions. Therefore, the instructors' role in this study would facilitate regulations of cognitions in an interaction between the content (The Future Learn course design) and the learner as a teaching presence. The interaction between instructors' and learner are assumed to foster readiness towards self-directed learning in the M-learning (Garrison, 2015)^[8].

3. Methodology

This study is qualitative in nature and employed thematic analysis to identify the postgraduate students' M-learning experiences using daily and weekly learning logbook. This study used purposive sampling in choosing the 34 postgraduate students from Instructional Technology (IT) course in one of the public universities in Malaysia. This study used FutureLearn which is one of the learning platforms in MOOCs. An online course which is 'Blended Learning: Getting Started' from FutureLearn is used. The whole process of this online learning journey lasts up to 5 weeks.

3.1. Research Platform: FutureLearn (MOOC)

FutureLearn (MOOC) was used as the research platform of this study. The choice of FutureLearn (FLMOOC) as a platform for this research is based on the pedagogically and technologically innovative approaches implemented within this particular MOOC platform. The reason behind choosing FLMOOC platform as the research platform of this study are:

- a. FutureLearn courses were offered for a pre-set number of weeks and aimed at cohort learning, however, the content of the course, as well as its interactions remained open for a non-limited length of time after the course had finished as well. This enabled PG students' to be more flexible in their learning, as the timing was more flexible. This flexibility in time might help when looking at learning influences arising from daily life.
- b. FutureLearn courses are also designed to be accessed by multiple devices (mobiles, tablets, laptops), providing a basis for potentially investigating the

effects of these devices on the learning process. In addition, FutureLearn offers multiple media and social technologies that all have the potential to increase learning experience among PG students’.

- c. FutureLearn offers individual learning actions (e.g. watching video, reading text) as well as collaborative or social learning opportunities (e.g. conversational commenting on media, discussion with peers) which increase the PG students’ engagement in gaining learning experience and SDL readiness preferences related to individual or/and collaborative online learning.

4. Result

In order to measure the postgraduate students’ usage of mobile devices in FLMOOC platform, it is essential to investigate the students’ mobile devices used and their actual learning experiences in FLMOOC platform. The themes that influencing the postgraduate students’ M-learning experiences using mobile devices in FLMOOC platform can be categorized as device used and online course elements. Table 4.1 lists the themes and categories of postgraduate students’ device used and online learning elements as below:

Table 1: Themes for Mobile Device and Online Course Element

Themes	Categories
Device used	<ul style="list-style-type: none"> ▪ Type of mobile devices ▪ Reason for using mobile devices <ul style="list-style-type: none"> ▪ Social media tools
Online course elements	<ul style="list-style-type: none"> ▪ Newlearning experience ▪ Onlinecourse awareness ▪ Online course features ▪ Online course content

4.1 Device used

All the courses in FLMOOC is online accessible and some of the resources such as videos, transcripts and texts can be downloaded to be used for offline learning purposes. In order to engage in FLMOOC platform, postgraduate students’ required a web-enabled device to perform their learning without any barrier. Thus, the FL developers have chosen to deliver courses on a mobile enabled platform to allow the students’ ubiquitous access to the course with any mobile devices. Therefore, the types of mobile devices used to perform the learning activity in FLMOOC platform are smartphone, laptop, tablet, iPad, and netbook. The postgraduate students’ trend in using their mobile devices for learning purposes in this study is highly depended to their present circumstances which based on their time, location, learning purposes (content and interaction) and comfort zone. The postgraduate students’ determine mobile devices usage when they find a free time slot which may occur during their interval section in working place, during commute, while waiting for someone, at home or before go to bed. This respected times referred to this study determine the type of mobile devices used for the learning by the postgraduate students’. Several students’ reported that they prefer to use smartphone if have limited timeframe with non-strategic location because of portable, flexible, save time, easy and comfortable. The students’ excerpt as below: “During work free time or during commute, I used smartphone because save my time” (LB/D4/S7).

“Smartphone easy to used, serve web everywhere, portable and flexible” (LB/D5/S7).

“At this point, I prefer to use my smartphone because easy and comfortable and enable to engaged in learning at any time” (LB/D15/S25).

“I used my smartphone for learning from my bed before go sleep” (LB/D28/S32).

Despite that, the postgraduate students’ M-learning reasons and comfort level determine type of mobile devices used. The postgraduate students’ reported that if the learning purposes is only for viewing multimedia content, listening to multimedia content, synchronously following a webcast, asynchronously viewing a webcast, reading text-based content and reading course discussions, then they prefer to used smartphone because of its easy functionality which increased their comfort level. The physical characteristics of smartphone ease the postgraduate students’ to do their task on their own comfort zone. The students’ excerpt as below:

“Smartphone enable me to access the FutureLearn platform at anywhere while enable to screenshot the page i want easily while viewing and listen to video section”(LB/D15/S30). “Smartphone offered light data and fast streaming” (LB/D20/S7). “Smartphone is convenient to handle. No need to turn in or on my laptop for frequent use” (LB/D5/S23). “I am comfortable in using my Smartphone for learning whenever I have short time gap or before go to bed” (LB/D25/S28). In the same token, several postgraduate students’ reported that they prefer to used laptop and tablets for the M-learning purposes in FLMOOC platform. The postgraduate students reported that effective learning takes place when proper planning for learning has decided in specific time and location. Therefore, postgraduate students’ learning process occurred during weekend holiday where they have more time to spend for their learning in their house which considers as strategic location. Along with this, these students’ indicates that they used laptop or tablet because of their own comfort, large screen, the processor strength, and their familiarity with the device as mentioned below:

“I felt more convenient using my laptop because it is easy and big screen” (LB/D6/S19).

“Laptop is more convenient since this is my very first learning experiences in FutureLearn” (LB/D1/S20).

“I used my tablet because easy and portable for me to access the FutureLearn platform at my own pace” (LB/D9/S7).

“I used my laptop because I am not familiar with the FutureLearn platform and interface” (LB/D2/S6).

“I used my laptop because I used to it and easier” (LB/D12/S2).

Besides that, these postgraduate students’ also decided to used laptop or tablets based on their M-learning purposes and to meet their comfort zone as well. The postgraduate students’ reported that laptops being an convenient mobile devices when comes to adding notes, writing questions to the discussion forum, responding to discussions, taking a self-assessment, filling in a multiple choice test, communicating with one of the educators, marking interesting conversations or content for later reading or learning, bookmarking content for retrieval after the course has stopped, blogging on what they have seen or on their Flmoooc learning process and transforming knowledge into professional challenges. The students’ excerpt as below:

“Easy for type the notes, responding in the discussion forum and communicating with the peer in large screen” (LB/D15/S7).

“Large screen and easy for me the read and listen to the video” (LB/D3/S8).

“Easy to finish the task because of the large screen” (LB/D2/S32).

“I am feeling secure when using the devices which I am familiar with” (LB/D9/S20).

“Easy for me to type faster when have to interact with peers on time in discussion session using my laptop” (LB/D15/S29).

4.2 Online course element

The FLMOOC platform comes with various features to create the course environment. The postgraduate students' expressed this learning process as a new learning experience using mobile devices for online course features. At this point, the postgraduate students' referred to FutureLearn features in term of course content where they learned about Blended Learning. In the learning logbook, the students' referred that this course content is interesting, simple, understandable and easy to navigate. They also reported that this online course is beneficial if implemented for their teaching and learning process. The students excerpt as below:

“The course content is very interesting and simple which easy to understand while enable me to learn the actual use of blended learning which I never know all this while” (LB/D20/S15).

“This blended learning makes my brain work. Now I know what is blended learning and how it function. It is very beneficial if we manage to use it in school” (LB/D11/S10).

“I have learned many thinks about Blended learning which encourage me to think more deeper. Yet, I as a not technology literacy students' this platform being big challenges for me to handle” (LB/D28/S11).

“I have learned more about practical side of BL. I am going to think how I can implement them in my own teaching” (LB/D22/S34).

At the beginning of this M-learning process, most of the postgraduate students' were reported that they were not aware on this M-learning platform. These students' expressed that they engaging in FLMOOC platform for the first time. Few students reported that they heard about what is M-learning platform but never experience it by their own. Therefore, the postgraduate students' awareness level is literally low when come to know about the M-learning platform. Example from students excerpt is “I am not sure about this FCMOOC and M-learning” (LB/D1/S4) while another students exposed that “I heard about the FCMOOC but never engage personally” (LB/D1/S12).

Retrieved from the learning logbook, the postgraduate students' often referred the use of M-learning platform features. At some point the postgraduate students' referred to a selective use of media, indicating a critical evaluation of what they felt on their need to learn or the way to tackle the situation. Hence, the postgraduate students' reported that the videos in FLMOOC platform were mentioned that easy learning materials. Some postgraduate students' indicates that videos are simple, interesting and easy to understand and sometimes occurred repetition. Other than that, some postgraduate students' indicated that they watched the same

videos several times to increase their understanding of the course content.

“Learning by good examples in videos is sometimes better than explained by a lecturer” (LB/D20/S12).

“The video were simple and easy to be understood but there was a lot of repetition” (LB/D7/S22).

“I watched the videos several times to increase my understanding on the content at the different situations” (LB/D29/S19).

“The course content information was very interesting. I was able to create a Padlet wall with a video in it” (LB/D23/S22).

However, in term of understanding several postgraduate students' felt that the content is in-depth and difficult to understand which requested them to invest extra time to search additional information. Despite that, these students' mentioned that they needed to review several time in order to understand the content. Besides that, some postgraduate students' faced difficulties to understand the content because of the language even though there is subtitle. Other than that, few students' reported that the course content did not show the method or techniques in handling the technology tools and examples.

I spend extra time on searching for extra info for better understanding” (LB/D3/S2).

The content is all new, its' quite difficult to understand” (LB/D4/S2).

It was difficult for me to understand the content and I reviewed it again and again” (LB/D2/S3).

Sometimes it required to play the video two times in order to get what the tutor talking about” (LB/D6/S2).

The content was in-depth and was quite difficult to understand” (LB/D5/S3).

I had some difficulties in understanding the language” (LB/D6/S9).

The language was difficult to understand but there are subtitle” (LB/D2/S20).

This course did not show the method or techniques in handling the technology tools specifically” (LB/D11/S7).

Should have given more examples of lesson incorporating ICT tools as o found it quite difficult to adopt and adapt with Malaysian context” (LB/D15/S3).

5. Discussion

The themes derived for students' learning experiences on the M-learning platform is mobile devices used and online course elements. Hence, majority of the postgraduate students has employed smartphone for this M-learning process and followed by laptop and tablets. The trend of employing the type of mobile devices used highly depends on the students' present circumstances which may vary according to time, location, learning purposes (content and interaction) and comfort zone. Mobile devices well-known for its ubiquitous thus, the usability and portability of these devices and the satisfying online course elements promote the postgraduate students' constant engagement in the M-learning platform. This finding supports findings from Steel, 2012^[22] and Willemse *et al.*, 2019^[26]. However, mobile devices always prominent for students' distraction which has been debated among many researchers and scholars for long run issues. Students' lack of commitment, interest, or engagement in online course, ethical issues (Koohestani *et al.*, 2019)^[13], laziness or distractions (Mandell, 2015 &

Katz, 2014)^[11] and the device itself (Campbell, 2006^[4]; Berry & Westfall, 2015)^[3] is attribute for students' negative learning experiences. These issues are common among higher educational institutions students' and relatively difficult to identify as they engaging the learning outside of classroom settings. Therefore, this study contributes to existing knowledge of mobile devices' distraction by providing comprehension on the benefit of the M-learning by allowing the students' to experience and understand the real purpose of this learning. Subsequently, students will be more engaged in online learning instruction if they can foresee how it connects to their existing skills and on-the-go learning new knowledge. Therefore, learning experiences have a significant impact on student learning outcomes when the student experiences the practicum learning on their own. To stimulate and promote the students' motivation to learn, it is the best to the instructor not only explain the objectives of the online learning instruction but also the benefits of the M-learning platform in a way of triggering the students' interest and curiosity. Hence, this will help the students to become active learners to regulate their learning by developing goal-setting skills and constructing mental models for new knowledge. This will only take place when the students' apprehend the purpose of M-learning which in return will added values for future academic and career goals.

6. Conclusion

Embracing a technologically enhanced platform in learning articulate an authentic learning experience among students. As M-learning has become more pervasive, many education practitioners have begun to ask how to use the technological evolution platform efficiently to enhance the students' learning experiences. Therefore, policymakers, institutions, and educators should plan the curriculum and instructional considering actual learning experiences that enable students' to integrate technology to create meaningful content as well as to learn the material. It is essential to encourage the students' employ their own mobile devices for learning purposes for a successful M-learning process as well as self-directed learning.

7. References

1. Awidi IT, Paynter M, Vujosevic T. Facebook group in the learning design of a higher education course: An analysis of factors influencing positive learning experience for students. *Computers and Education*. 2019; 129:106-121. <https://doi.org/10.1016/j.compedu.2018.10.018>
2. Beetham H, Sharpe R. *Rethinking Pedagogy for a Digital Age: Designing for 21st Century Learning*. New York: Routledge, 2013.
3. Berry Michael J, Westfall A. Dial D for distraction: The making and breaking of cell phone policies in the college classroom. *College Teaching*. 2015; 63(2):62-71. <https://doi.org/http://dx.doi.org/10.1080/87567555.2015.1005040>
4. Campbell S. Perceptions of mobile phones in college classrooms: Ringing, cheating, and classroom policies. *Communication Education*. 2006; 55(3):280-294. <https://doi.org/http://dx.doi.org/10.1080/03634520600748573>
5. Canals. Smartphones Overtake Client PCs in 2012. Retrieved, 2012. from <http://www.canals.com/newsroom/smart-phones-overtake-client-pcs-2011>.
6. de Barba PG, Kennedy GE, Ainley MD. The role of students motivation and participation in predicting performance in a MOOC. *Journal of Computer Assisted Learning*. 2016; 32(3):218-231. <https://doi.org/http://doi.org/10.1111/jcal.12130>
7. Francom GM. Teach me how to learn: Principles for Fostering Students' Self-Directed Learning Skills. *International Journal of Self-Directed Learning*. 2010; 7(1):29-44.
8. Garrison DR. *Thinking Collaboratively: Learning in a Community of Inquiry*. Florence, KY: Taylor and Francis, 2015.
9. Harden N. The End of the University as We Know It. Retrieved from *The American Interest*, 2013. website: <http://www.the-american-interest.com/article.cfm?piece=1352>
10. Jenö LM, Grytnes JA, Vandvik V. The effect of a mobile-application tool on biology students' motivation and achievement in species identification: A Self-Determination Theory perspective. *Computers & Education*. 2017; 107:1-12.
11. Katz L. Today's lesson: Life in the classroom before cellphones. Retrieved, 2014. from <http://www.chronicle.com/article/Todays-Lesson-Life-in-the/148423/>
12. Khalil H, Ebner M. MOOCs completion rates and possible methods to improve retention - a literature review. *Proceedings of World Conference on Educational Media, Hypermedia Telecommunications*, 2014, 1305-1313.
13. Koohestani HR, Baghcheghi N, Karimy M, Hemmat M, Shamsizadeh M. Lived experiences of nursing students about ethical concerns regarding mobile learning in educational and clinical contexts. *Journal of Medical Ethics and History of Medicine*. 2019; 12(5):1-13. <https://doi.org/10.18502/jmehm.v12i5.858>
14. Koole M. Framework for the rational analysis of mobile education (FRAME): A model for evaluating mobile learning devices. Thesis, Centre for Distance Education, Athabasca University, 2006.
15. Mac Callum K, Jeffrey L. The Influence of Students' ICT Skills and their Adoption of Mobile Learning. *Australasian Journal of Educational Technology*. 2013; 29(3):303-314.
16. Mandell H. No phones, please, this is a communications class. Retrieved, 2015. from <http://www.chronicle.com/article/No-Phones-Please-This-Is-a/231235/>
17. Moodlerooms. About Moodle. Retrieved, 2012. from <http://www.moodlerooms.com/resources/moodle-resources/>
18. Norman D. Affordance, conventions and design. *Interactions*. 1999; 6(3):38-43.
19. Onah D, Sinclair J, Boyatt R. Dropout rates of massive open online courses: behavioural patterns MOOC dropout and completion: existing evaluations. *Proceedings of 6th International Conference on Education and New Learning Technologies*, 2014, 1-10.
20. Rico R, Ertmer PA. Examining the Role of the Instructor in Problem-centered Instruction. *TechTrends*. 2015; 59(4):96-103.

21. Sharples M, Taylor J, Vavoula G. A theory of learning for the mobile age. In H. (Eds) R. Andrews & C. (Ed.), *The Sage Handbook of Elearning Research*, 2007, 221-247). London: SAGE Publishers.
22. Steel C. Fitting learning into life: Language students' perspectives on benefits of using mobile apps. *ASCILITE 2012 - Annual Conference of the Australian Society for Computers in Tertiary Education*, 2012, 875-880.
23. Sung T, Chang K, Liu T. The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers & Education*. 2016; 94:252-275.
24. Topali Paraskevi PAOA, Alejandra Martínez-Monés SLVS, YD EE. Exploring the Problems Experienced by Learners in a MOOC Implementing Active Learning Pedagogies. Springer, 2019, 81-90. <https://doi.org/10.1007/978-3-030-19875-6>
25. Vogel B, Spikol D, Kurti A, Milrad M. Integrating Mobile, Web, and Sensory Technologies to Support Inquiry-based Science Learning. *Proceedings of the 6th IEEE International Conference on Wireless, Mobile, and Ubiquitous Technologies in Education*, Los Alamitos, CA: IEEE Computer Society, 2010, 65-72.
26. Willemse JJ, Jooste K, Bozalek V. Experiences of undergraduate nursing students on an authentic mobile learning enactment at a higher education institution in South Africa. *Nurse Education Today*. 2019; 74:69-75. <https://doi.org/10.1016/j.nedt.2018.11.021>
27. Wilson M. Mobile Learning: Endless Possibilities for Allied Health Educators. *Journal of Diagnostic Medical Sonography*. 2013; 29(5):220-224.
28. Zhang B, Looi C, Seow P, Chia G, Wong L, Chen W, *et al.* Deconstructing and reconstructing: Transforming primary science learning via a mobilized curriculum. *Computers & Education*. 2010; 55(4):1504-1523.
29. Zheng S, Rosson MB, Shih PC, Carroll JM. Understanding Student Motivation, Behaviors and Perceptions in MOOCs. *Proceedings of the 18th ACM Conference on Computer Supported Cooperative Work & Social Computing - CSCW*. 2015; 15:1882-1895. <https://doi.org/10.1145/2675133.2675217>