

Toward mobile learning at Jordanian higher education institutions

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ABSTRACT

Globally, teaching methods and tools in higher education institutions (HEIs) have changed nowadays. Many attempts have been made in Jordanian higher education institutions (JHEIs) in order to improve and continuity of the educational process, especially during coronavirus pandemic. The outbreak of this virus has become a major disruption where all Jordanian universities cancelled classes and moved toward online learning, and mobile learning (ML) has appeared as one of the possible solutions. ML is in its early stages at JHEIs, and it is academically unexplored enough. So, this study explores the ML experience at JHEIs during coronavirus disease 2019 (COVID-19) crisis. The data were collected using a web survey where 272 students in JHEIs participated. The results revealed that the smartphone is the most widely used mobile device for ML ML is easy to use, ML increases the interaction between the instructor and the students and among the students themselves, ML has a positive impact on students' performance, and also students are willing to use ML in the future. The outcomes of the study support policy makers at JHEIs to make educational decisions relating ML phenomenon.

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1. INTRODUCTION

New technology shapes the future of education at higher education institutions (HEIs) and changes the way students learn and interact with their education environment. Information communication technology (ICT) has an important impact on all aspects at HEIs worldwide [1]; it is one of the important revolutions in education that replaces traditional learning approaches with modern and interactive environments [2]. The growth in adopting this technology at these institutions offers great opportunities for improving the construction of knowledge and facilitating modern learning methods through better-quality and efficient techniques. Also, ICT tools enable managing of up-to-date learning activities and enhancing learners' skills. By the way, mobile devices are being considered as important tools for new ways of understanding educational practices [3], and mobile learning (ML) which is learning using these devices is a new learning technology [4]. This technology is being employed mostly at HEIs [5] since it gives great opportunities regarding location, timing, accessibility, and context of learning [6]. ML technologies and services offer a new platform for HEIs [7] that enhances the learning process and supports students in terms of ubiquity and flexibility [8]. Nowadays, ML grows rapidly and offers new opportunities to support the learning process [9] by eliminating time constraints and geographical barriers [10], and supporting educational institutions to apply innovative and flexible education [11].

Jordan is one of the countries in the Middle East. The technological development in Jordan has been recognized at different levels, especially in ICT fields. The reliability and quality of telecommunications infrastructure in Jordan are above global standards [12], and the employment of ICT at Jordanian higher education institutions (JHEIs) has increased over time [13]. Also, Jordan is considered as one of the most competitive mobile markets in the Middle East [14]. Noting the increasing pressure at Jordanian universities, there is a great need to take the technological factors into consideration in order to support these institutions to enhance their education quality which is an important factor in the country growth and development. So, many attempts have been made in order to redesign the learning process in Jordan to meet the future needs [15]. Consequently, Jordanian universities have implemented electronic learning (EL) systems which positively help in developing practices and facilitating the learning process [16].

In a nutshell, JHEIs have been affected significantly during the widespread of coronavirus outbreak. At these pandemic circumstances, Jordanian universities were forced to implement online learning systems to meet the requirements and the continuity of their educational systems. This global crisis and also the growth of mobile devices users, internet, and wireless communications are expected to increase the implementation of ML in Jordan; especially at JHEIs. It has also become important for JHEIs to adopt modern technological advancements as universities administrators and students have realized that the future of learning is connected with ICT, and they become more interested in flexible learning prospects at Jordanian universities. However, Jordanian universities have resorted to ML to overcome the ongoing closures during the coronavirus crisis. Also, many Jordanian educational institutions have already implemented ML in an attempt to improve the learning process and make it more flexible [16]. In all cases, there were conflicting opinions about the impact of online learning in general and ML in particular on the students' performance at Jordanian universities. So, this study explores the ML experience at JHEIs. The aim of this study is achieved by investigating types of mobile devices that Jordanian universities students use in ML, ease of use of ML, interactivity in ML, students' understanding of learning materials and their academic performance in ML, and students' willingness to use ML in the future. Consequently, the research questions are; i) what types of mobile devices do Jordanian universities students use in ML?, ii) is ML easy to use?, iii) to what extent does ML increase the interaction between the instructor and the students, and between the students themselves?, iv) what is the impact of ML on students' performance in JHEIs?, and v) are JHEIs students willing to use ML?

2. RELATED WORKS

Many researchers around the world have explored the ML environment at HEIs, investigated the impact and the potentials of employing mobile devices in the learning process at HEIs and also the benefits of integrating these devices at universities classrooms in order to reach; portable, ubiquitous, sustainable, flexible, and collaborative learning. In parallel with that, many ML researches have been carried out in Jordan, especially at JHEIs. Majority of these studies were based on the acceptance, impact, challenges, possibilities, implementation, or prospects of ML at Jordanian universities. Hassan *et al.* [17] designed an ML application at the University of Jordan, named 'UJApp.' The researchers found that the application environment has efficiently assisted university students to be engaged with their university, easily check for registered term schedules, and understand their study plans. In contrast, Al-Hamad *et al.* [18] investigated the reality of smart devices' employment in teaching and learning in Jordanian universities from the instructors' viewpoint. The researchers found that instructors were against technology use, especially inside the classrooms because of distraction, misuse, and lack of skills.

Almasri *et al.* [19] proposed a model of ML at Jordanian universities by identifying the factors that affect universities students' attitudes to use this model. Likewise, Alzu'bi and Hassan [15] investigated the factors that influenced the success of ML at Jordanian universities. The researchers found that users' satisfaction with ML was positive and significantly associated with the net benefit of the system. Also, information technology (IT), system quality, culture, and the intention to use are positively related to the users' satisfaction. Similarly, Almaiah *et al.* [13] investigated the factors which determine the high quality of ML systems based on students' perspectives at five Jordanian universities. The researchers revealed that system quality, information quality, and service quality contribute to successful implementation of ML systems at JHEIs. On the other hand, Jawarneh [16] assessed the limitations and capabilities of ML technology and its impact on learning in JHEIs. The researcher found that the implementation of ML at JHEIs has some limitations, and one of them is the unavailability of advanced IT infrastructure.

Zawaideh [20] explored the effect of ML on students' performance and their attitudes at Jordanian University. The researcher revealed that ML has a positive effect on motivating university students, increasing their academic performance, and changing their learning habits toward the better. Ababneh [21] investigated Jordanian students' attitudes towards the use of smartphones in learning English language at Yarmouk University. The researcher found out that Jordanian students showed a high usage of smartphones

in learning English. Similarly, AlShehab [22] conducted a study at Jadara University to investigate the effect of ML on improving students' skills in translation from English into Arabic. The researcher concluded that the majority of the students at JHEIs own and frequently use their mobile devices in the translation process, which enhances their skills. Also, Ligi and Raja [6] discussed the role of ML in the educational setting. They found that ML facilitates the mechanism of learning and teaching, enhances students' experiences, and supports students to achieve more in their educational process. Furthermore, the results revealed that students will be more enthusiastic to use ML since its environment provides new study opportunities for them and strengthens the flexibility of learning in any place and at any time. Likewise, Klimova [23] examined the effectiveness of smartphone applications in the improvement of university students' level in foreign language learning. The researcher revealed that these applications are effective in foreign language learning and improve university students' performance, and also can contribute to positive learning outcomes.

Al-Adwan *et al.* [24] explored the potential factors that affect Jordanian students' intention to accept and use ML at four Jordanian universities. The researchers revealed that performance expectancy, effort expectancy, trust expectancy, system functionality, self-management of learning, and social influence are the most significant determinants of ML adoption at JHEIs. Similarly, Al-Adwan *et al.* [25] explored the factors that have an impact on Jordanian students' intentions and readiness to adopt ML in HEIs. The researchers examined Jordanian universities students' preferences and requirements in terms of ML design, and they investigated their concerns about adopting ML. Their study revealed that JHEIs students' intentions to adopt ML are influenced by several factors, which include the relative advantage, social influence, complexity, the self-management of learning, and perceived enjoyment. Likewise, Al-Nawayseh *et al.* [26] explored the factors influencing Jordanian universities students' intention to adopt ML. The researchers found that students believed that ML performance expectancy, social influence, and effort expectancy will positively affect their intention to adopt ML.

One important issue that needs to be considered when developing ML environment at JHEIs is to make sure that these systems follow universities rules and regulations under any circumstances, also taking into consideration the universities and students privacy [17]. Still there are barriers encountered in applying ML at JHEIs, and there is a lack of awareness among instructors on the importance of applying new technologies in Jordanian universities [18]. Also, to integrate ML in JHEIs there are several issues that need to be taken into account, including software support, hardware, internet speed, and the cost. Currently, there is still a lack of knowledge about the impact and acceptance of ML in JHEIs. However, exploring the ML experience and its impact on students' performance at JHEIs hasn't gained enough investigation yet.

3. METHOD

A quantitative research method is employed in this study using a random sample population of students from public Jordanian universities. Public Jordanian universities students were invited to respond to a web survey at the end of the second semester of the academic year 2020/2021, where 272 participants responded to it. Ethical concerns have been taken into account, and also respondents' anonymity has been respected where a participant consent form has been attached in the introductory of the web survey. The web survey was divided into two sections. The first section is related to demography information in order to collect the respondents' personal information. Section two consists of 15 close-ended questions. Question one related to the types of mobile devices that students use in ML with four options; smartphone, tablet, laptop, and other devices. In questions from 2 to 15, a five-point Likert scale (with five choices: strongly disagree, disagree, neutral, agree, and strongly agree) used to collect data to check if ML is easy to use, to what extent does ML increase the interaction between the instructor and the students and between the students themselves, the impact of ML on students' performance in JHEIs, and finally about the respondents' willing to use ML. As well, the study employed ten indicators to investigate the impact of ML on students' performance in JHEIs. These indicators have been stated by Wong [11] in his literature review, named "Success in mobile and ubiquitous learning: indicators of effectiveness". These indicators are learning achievements, ease of use, motivation, perceived usefulness, satisfaction, learning attitude, system usage, self-efficacy, social engagement, and cognitive load. Accordingly, the web survey employed one question for each indicator, and the participants were asked if these indicators are achieved in the ML environment. Consequently, the collected data has been entered and analyzed using MS Excel software and then presented using tables and figures.

4. RESULTS AND DISCUSSION

The total respondents to the web survey were 272, which is accepted and expected rate in such surveys. The participants were 208 undergraduates and 64 postgraduates, as shown in Figure 1. Table 1

shows the participants' demographic information where the participants were grouped mainly into four academic years, and also according to their sex and academic degrees. However, majority of the participants were undergraduate (76.5%), females (53.3%), and also in the first year (40.8%). According to the analysis of section two of the survey, the results and discussion were organized into five subsections; one for each research question.

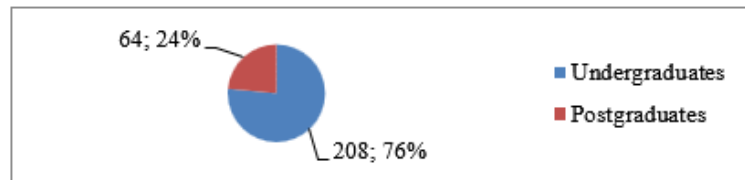


Figure 1. Numbers and percentages of the participants

Table 1. The participants' demographic information

Year	Undergraduate		Total of undergraduate	Postgraduate		Total of postgraduate	Total of respondents
	Male	Female		Male	Female		
First	37	42	79	14	18	32	111
Second	26	34	60	13	15	28	88
Third	23	31	54	3	1	4	58
Fourth	11	4	15	0	0	0	15
Total	97	111	208	30	34	64	272

4.1. Research question 1: What types of mobile devices do Jordanian universities students use in ML?

The first question at the survey aims to explore types of mobile devices that the participants used in ML. The findings revealed that 80.15% of the participants at JHEIs used their Smartphones in ML, 15.07% used their laptops, and 4.78% used their tablets as shown in Figure 2. Since smartphones have great capabilities and used widely nowadays among Jordanian universities students, the study revealed that most of the participants used their smartphones in learning more than other types of mobile devices. This result is in parallel with researches carried out by [21], [23] which indicated that the most used mobile devices in learning by HEIs' students were smartphones. Also, the result is in agreement with [12], [27] who revealed that most universities' students preferred using smartphones in ML than other devices.

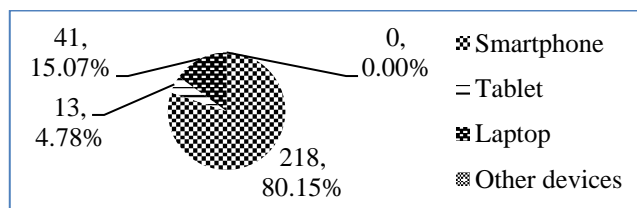


Figure 2. Numbers and percentages of the used mobile devices in ML

4.2. Research question 2: Is ML easy to use?

The second question in the survey aims to investigate if ML is easy to use. Based on the participants' opinions, the findings showed that 69.12% of them agreed or strongly agreed that ML is easy to use as shown in Figure 3. The result of the question confirmed that the participants have shown a positive attitude towards having learning materials through their mobile devices. They showed that attending lectures and having course materials on slides and notes through ML is easy. Also, ML makes learning easier in comparison with the traditional learning. This opinion is attributed to the flexibility of ML as students can use their mobile devices on learning any time and anywhere in an easy way. This finding is consistent with a study conducted by [28] that ML is a new trend in education at universities because of its ease of use. Also, this finding is supported by other researches [12], [29], [30] which emphasized that ML is easy to use.

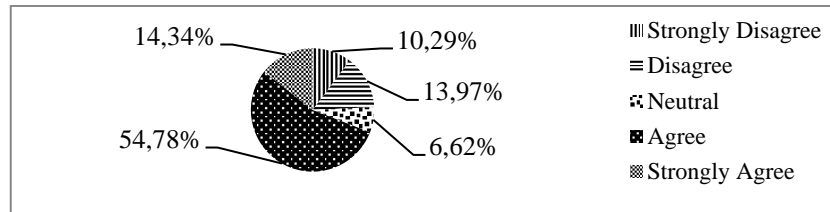


Figure 3. Numbers and percentages of ML easiness

4.3. Research question 3: To what extent does ML increase the interaction between the instructor and the students, and between the students themselves?

The third and the fourth questions in the web survey were dedicated to check if ML increases the interaction between the instructor and the students, and also between the students themselves. Based on the obtained data, the findings showed that 53.68% of the participants agreed or strongly agreed that ML environment increases the interaction between the instructor and the students as shown in Figure 4(a). Also, the findings revealed that 59.93% of the participants agreed or strongly agreed that ML environment increases the interaction between the students themselves as shown in Figure 4(b).

Slightly more than half of the participants believed that ML environment increases the interaction between the instructor and the students and between the students themselves. This percentage, which is not high, indicates that there are still interactivity limitations that face applying ML at JHEIs. This result is in parallel with the study [31], which found that smartphones are educational tools that learners and instructors can use to increase learners' connectedness and involvement. Similar findings came from [17], [32] that ML environment facilitates the interaction between the students and the teacher and among the students themselves. Also, the result agrees with the study [12] which found that ML environment improves communication between the students and the lecturer where it is a fast method of getting feedback.

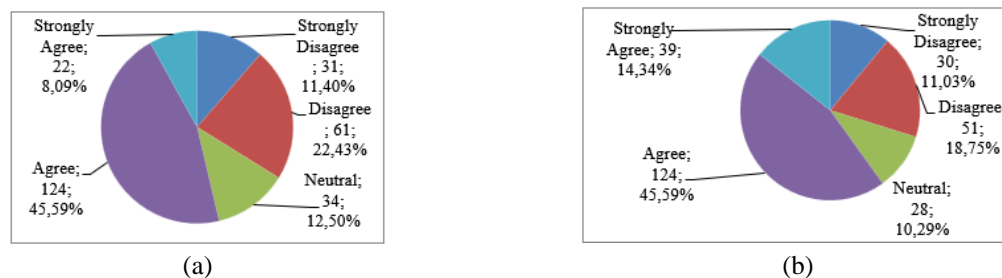


Figure 4. Numbers and percentages about of (a) the interaction between the instructor and the students and (b) the interaction between the students themselves

4.4. Research question 4: What is the impact of ML on students' performance in JHEIs?

The next ten questions (from 5 to 14) in the web survey were used to collect data in order to check the impact of ML environment on students' performance in JHEIs. The study employed the ten indicators of Wong [11] in order to answer research question number four. Accordingly, the survey employed one question for each indicator, and the participants were asked if these indicators are achieved in the ML environment. The findings overall indicated that majority of the participants (60.52%) agreed or strongly agreed that ML environment improves students' learning performance in JHEIs, and this finding is obviously shown in the indicators of learning achievement, ease of use, perceived usefulness, satisfaction, learning attitude, system usage, self-efficacy, and social engagement. In contrast, 29.63% of the participants disagreed or strongly disagreed that ML environment improves students' learning performance in JHEIs, and this contradictory finding is shown mainly in the cognitive load indicator. On the other hand, 9.85% of the responses were neutral, and this neutral finding is shown particularly in the motivation indicator. Table 2 shows the indicators of ML performance and participants opinions.

The obtained results clearly point out that the majority of the participants have a positive attitude toward ML environment and its capability in improving students' performance at JHEIs. This result is in the same line with [20] who found that ML has a positive effect on motivating students towards learning and

then improving their academic performance. Also, this result is in agreement with the findings of [6] that the use of mobile devices allows students to achieve more in their educational process since ML facilitates the mechanism of learning and enhances the learning experiences of the students. Similarly, this result is also consistent with [23] that learning via smartphones is effective and enhances the students' performance at universities. Likewise, the result is also supported by [33] who found that ML improves learners' performance at universities. By the same token, the result is in line with [22] who concluded that ML has a positive impact on students' performance. Consequently, it is reasonable to say that the ML environment offers new study opportunities for students at JHEIs which strengthens the flexibility of learning any time and anywhere, and also enhances students' academic performance.

Table 2. The ML performance indicators

The indicator	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Sum
Learning achievements	34	73	11	114	40	272
Ease of use	12	14	8	201	37	272
Motivation	18	55	58	126	15	272
Perceived usefulness	16	41	31	146	38	272
Satisfaction	15	36	54	158	9	272
Learning attitude	21	95	15	106	35	272
System usage	9	16	6	205	36	272
Self-efficacy	6	26	17	198	25	272
Social engagement	21	81	42	108	20	272
Cognitive load	73	144	26	18	11	272
Sum	225	581	268	1380	266	2720
Average	8.27%	21.36%	9.85%	50.74%	9.78%	100%

4.5. Research question 5: Are JHEIs students willing to use ML?

The last question in the web survey (question 15) explores the sustainability of ML environment by asking the participants if they are enthusiastic to use their mobile devices for learning in the future. The finding revealed that about 63.23% of the participants agreed or strongly agreed that they are willing to use ML in the future, whereas 34.56% of them disagreed or strongly disagreed that they are willing to use ML. Figure 5 illustrates that finding.

The study found that the majority of the participants are willing to engage at the ML environment. This result is in line with [33] in which universities' students are willing to use or continue to use their mobile devices on the learning process. Also, the result is in agreement with [26] who found that JHEIs students have a positive attitude to adopt ML at their universities. Despite that mobile technologies and wireless communication are growing rapidly all over the world [34], some participants didn't prefer ML or weren't sure that ML is suitable for learning at Jordanian universities and also they weren't willing to use it. It is expected that this finding reflects that there are some limitations regarding the use of smartphones in the learning process at JHEIs, such as technical issues (limited storage capacity, slow downloading, low processing power, limited access speed to online materials, and limited batteries); usability issues (small keyboards, small screen sizes, and difficulties of editing documents); the cost of unlimited wireless internet access, downtime, and also health risks. Also, this unwillingness among the Jordanian universities students reflects that there are still some obstacles in applying ML environment at JHEIs, such as lack of awareness of ML capabilities, the negative use of mobile devices during learning time, and the insufficiency of regulations and legislation governing ML in Jordan.

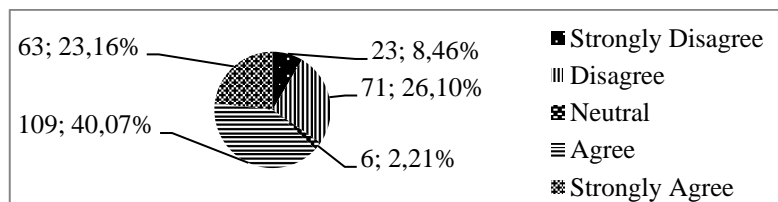


Figure 5. The students' willingness to use ML

5. CONCLUSION

Most HEIs around the world have suddenly shifted to online learning in response to COVID-19 outbreak, which has had a major impact on educational systems. Similarly, Jordanian universities have been

affected by this pandemic, and so have adopted online learning where ML has taken the lion share during this global crisis. The study explored the ML experience at JHEIs through this crisis. The study revealed that students at Jordanian universities widely used ML, and they employed generally their smartphones in this type of learning. Also, the study confirmed, without a doubt, that Jordanian universities students have the ability to utilize ML applications in the learning process since they declared that ML is easy to use. This result is attributed to the fact that almost all Jordanian universities students own smartphones and have enough experience on using and exploring learning applications. As well, the study showed that the students, to some extent, believed that ML increases the interaction between the instructor and the students and between the students themselves. Furthermore, the study presented that ML has many features and capabilities that help in improving Jordanian universities students' performance. Moreover, the study concluded that the JHEIs' students are willing to use ML environment in the future. However, the outcomes of the study were in line with earlier studies. Finally, the future work can also be extended to include the private Jordanian universities for more comprehensive investigation, and also to focus more on postgraduates.

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