Learner characteristics of m-learning preferences

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Abstract Now, mobile devices extend learning to any location and time, where students adopt different preferences to learn effectively and efficiently through mobile devices. However, podcasting learning materials to mobile learners involves considerable challenge because of ongoing changes in the behaviour of learners in different contexts. This paper explores mobile learning (m-learning) preferences in tertiary education in order to suggest the best approaches to deliver digital learning materials (podcasts) in different contexts which are physical spaces (e.g. quiet, busy, or walking), and social spaces (e.g. alone, family, or with classmates). A total of 345 students completed a survey study to identify the role of mobile learners' characteristics (gender, age, material status, nationality: Australians and Saudis, and prior m-learning experience) and their impact on podcast preferences in different physical and social spaces. Based on the survey results, in this paper, we shall present the impact characteristics on m-learning preferences for podcast length and types. We shall also summarise the affected contexts and their causes.

Keywords m-leraning · Characteristics · Preferences · Approaches · Ubiquotous

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1 Introduction

M-learning is portable, personalised, and ubiquitous. These attributes give rise to two interrelated challenges namely, technological and behavioural. As the mobile devices are small and easy to carry, mobile learners may encounter many unexpected social and environmental situations which influence their learning. Presentation of learning material, which is usually limited by small screen sizes, does affect learning preferences and potential effectiveness. Unlike PCs, mobile devices have limitations of connectivity, battery capacity, and data storage, which can have negative effects on the level of engagement, preferences, and effectiveness of learning. To create an effective learning environment, these issues have to be carefully analysed and addressed, as m-learning is affected by learner characteristics and their interactions in different physical and social spaces.

Indeed, understanding m-learning preferences is a challenging task. Firstly, m-learning is mostly utilised in informal settings as learners interact with m-learning in an informal and unsupervised environment, away from the bindings of classrooms. These kinds of learning activities cannot be monitored by teachers. These m-learning activities also occur in different contexts, such as but not limited to social spaces (e.g. being alone or surrounded by family members) and physical spaces (e.g. at home, café, or while walking). These social and physical spaces can be

associated with m-learning preferences, such as the type of media or level of engagement. Furthermore, in each context, learners' personal and social characteristics will play an important role in m-learning [1]. Research is required not only to determine m-learning preferences but also to provide explanations for these preferences.

Researchers have contributed to the design and evaluation of m-learning in terms of effectiveness and efficiency; however, there are only a few studies on mobile learners' preferences [2–8]. Moreover, these studies have not focused on one of the essential factors affecting mobile learners' preferences, namely, 'how mobility influences the usage of mobile devices in different contexts. This contextual aspect is vital for the research on m-learning in social and physical spaces [9], and indeed its effect to the general context on m-learning [1, 10, 11]. To the best of our knowledge, m-learning preferences in mobile and different contexts have not been specifically investigated. In this paper, we report a study that was designed to fill this gap by evaluating mobile learners' preferences in different contexts, such as the overlapping of physical spaces (quiet, busy, and moving) and social spaces (alone, family, friend, and with a classmate).

Although differences in learners' characteristics influence m-learning preferences, only one study examines the relationship between learner's characteristics and m-learning preferences [12]. It is vital to consider the impact of learner characteristics on m-learning preferences for two reasons. First, in the marketing literature, consumers' characteristics are considered essential to understanding their preferences and choices. Second, m-learning may amplify the effects of learners' characteristics as m-learning is mostly utilized in informal settings.

The aim of this article is to identify the role of mobile learners' characteristics and their impact on preferences of podcast types and lengths. To achieve this, we examine the impact of mobile learners' characteristics (demographics and prior experience) on m-learning preferences for podcast types and length in different contexts (Table 1). By doing so, this study could contribute towards the development of the theory and practice of m-learning. In theory, the study is filling the research gap by addressing the role of learner characteristics in forming m-learning preferences

in different contexts. Furthermore, the paper recommends further investigation for future studies in m-learning. In practical level, recommendations for appropriate m-learning podcast type and length based on learner characteristics and m-learning contexts are presented. Also, method section provides in details how m-learning practitioners can utilize different tools to measure students' preferences for m-learning.

Thus, we address the following specific research questions:

- What is the relationship between mobile learners' demographics (gender, age, marital status, and nationality) and m-learning preferences for podcast types and length in different contexts?
- What is the relationship between mobile learners' prior podcast experience (listening, reading, and watching) and m-learning preferences for podcast types and length in different contexts?
- Is there any relationship between students' characteristics (gender, age, nationality, marital status, and prior experience) and students' podcast preferences in different contexts?

1.1 Demographics and cultural effects on m-learning

Gender has always been a factor when investigating the effect of demographics on m-learning. Indeed, many studies have only investigated the gender effect on m-learning [13–18]. Other studies address the combined effect of gender and age on m-learning [12, 19], and very few studies [20] combined gender, age and culture to investigate their effect on m-learning. Based on the literature review, no study has investigated the effect of other demographic variables such as marital status and personal income on m-learning.

Most studies examine the effect of demographics on m-learning adoption and acceptance [13, 15–20], while only one study examines the effect of demographics on m-learning preferences [12]. Little work has been done to investigate the relationship between m-learning preferences and demographics. This study was intended to

Table 1 The result of environment and companion overlapping for m-learning preferences

Environment attributes	Companion attributes			
	Being alone	Being with family	Being with friend	Being with classmate
Quiet	Quiet and alone	N/A	N/A	N/A
Busy (restaurant)	Alone in busy context	In busy context with family	In busy context with friend	In busy context with classmate
Moving (walking)	Walking context alone	Walking context with family	Walking context with friend	Walking context with classmate
Moving (vehicle)	N/A	Car context with family	Car context with friend	Car context with classmate

address this research gap by investigating the effect of gender, age, culture and marital status on preferences and the level of engagement with m-learning in different contexts.

1.1.1 Gender effect on m-learning

Research suggests that both man and women are positive about m-learning [13, 15, 17, 19]; however, females are more positive than males about m-learning when learning languages [18, 20]. For example, Viberg and Grönlund [20] have found that among Chinese and Swedish students females are significantly more positive about adopting mobile devices for learning languages in higher education than males. On the other hand, Wang, Wu [19] investigation of m-learning adoption among Taiwanese students found that both genders intended to use m-learning.

With respect to gender effect on m-learning preferences, research has demonstrated that there are no gender differences in intentions to use mobile devices among higher education students in Israel [12]. As m-learning is flexible in space and time, preferences need to be adequately assessed. For example, investigating m-learning preferences in different contexts (e.g. walking or at a cafe) might reveal gender differences.

1.1.2 Effect of age on m-learning

Both younger and older students are positive about m-learning [19], while older students are more likely to adopt m-learning for assessments (e.g. quizzes) [20]. However, there is no effect of age on m-learning preferences [12]. As mentioned earlier this is probably because these studies have not investigated learners' preferences by including contexts.

1.1.3 Effect of culture on m-learning

Although cultural differences can be expected to play an important role in m-learning, very few studies have examined the impact of culture on m-learning. There are two reasons to research cultural influence. First, the influence of culture on the adoption of new technologies has been widely investigated [21–25]. Second, in some cultures people may have varying responses to new technologies in different contexts. Consequently, this study addresses culture (Australian vs Saudis) as a variable in m-learning engagement and preferences in different contexts. This is simply because major differences exist between the two cultures. First, Australia is considered as developed country, while Saudi Arabia is a developing country. Second, differences exist in Hofstede cultural dimensions between Australians and Saudis (e.g. the degree of power distance is

very high in Saudi culture while it is very low in Australian culture) [26].

1.2 Students' experiences effect on m-learning

The literature on mobile learners' experiences has several different approaches, notably instant experience vs prior experience and technological experience vs mobile experience. The timing of when learner's gain experience is the difference between prior experience and instant experience. Prior experience is simply the acquisition of experience and knowledge of a particular technology (e.g. computer literacy). Instant experience requires asking a learner about his/her experience immediately after using m-learning or any other form of educational technology. The m-learning literature addresses a range of types of learner's experiences with technology, such as their general knowledge of technology and computer literacy, as well as specific mobile literacy or forms of knowledge about m-learning.

The effect of students' mobile experience positively influences m-learning acceptance and effectiveness [18, 27, 28].

However, there was no influence on m-learning when students were asked about unrelated technological experience (e.g. advance information technology) [28]. Technology is now extremely diverse and is used in specialised ways in every discipline. Thus, asking participants about their specific technological expertise (e.g. expertise in using mobile phones), rather than their use of other technologies (e.g. computer literacy), seems to be a more productive strategy.

As mentioned above, some studies investigated the effect of instant experience on m-learning adoption and effectiveness [18, 27], while other studies investigated the effect of prior experience on m-learning [28]. To investigate the longer-term effects of experience with technology asking students about their prior experience rather than instant experience is necessary.

Based on the literature review, no studies investigating the effect of m-learning experience on m-learning preferences and engagement was found. This study addresses this gap by investigating students' prior experience of using m-learning materials (audio, text, and video) and these experiences' influence on m-learning preferences and engagement in different contexts.

2 Methodology

To address the proposed research questions, we used the survey method to obtain learners' opinions and attitudes toward m-learning preferences. Here we discuss the methodology which we have adopted to derive our results.

2.1 Samples

Our survey sample included students from the Australian and Saudi Arabian university students. We had distributed a total of seven hundred questionnaires but received only 345 responses comprising of 127 Australian 218 Saudis students, with a response rate of 49.3%.

2.2 Questionnaire design for preferences of m-learning

We prepared two versions of student questionnaire (namely, Arabic and English) for administering in Saudi Arabia and Australia. Upon receipt of the completed questionnaire, we had translated Arabic version to English and then edited and validated the data of the responses in pilot study. The questionnaire deals with evaluation of preferences of students for use of the multimedia devices during their classes. Podcast preferences in various modes including text, audio, video, and slides synchronized with audio, with podcast lengths of 1–5, 6–15, and greater than 15 min, were structured based on environment characteristics in the context of being busy, quiet, and moving. Table 1 shows their comparison with a scenario of being alone or having a companion like friend, classmate or family member. We designed and administered our survey on twelve questions, each having four subquestions (please see the Appendix). The measurement scale for questionnaire had a high level of internal consistency with Cronbach's alpha of 0.963 for Arabic questionnaire and 0.959 for English.

2.3 Characteristics Impact on M-Learning Preferences

Goodman and Kruskal's λ was run to determine possible relationship between students' characteristics (age, gender, marital status, nationality, and the prior experience of students listening, reading, or watching) and students' podcast type preferences. This helped to determine whether the of students' age, gender, marital status, nationality, and prior experience were correlated with their preferences for podcast types across the contexts (physical and social spaces). It also helped to determine if there is a relationship between demographic characteristics and length of students' podcast preferences. A point-biserial correlation was also run to determine the relationship between characteristics with dichotomous variables (gender, marital status, nationality, prior experience) and podcast length preferences. A Spearman's rank-order correlation test was used to assess the association between age and podcast length preferences was also conducted (Table 2).

Table 2 Demographics on Australian and Saudis mobile learners

	Australians N (%)	Saudis N (%)
Gender		
Male	87 (69%)	142 (65%)
Female	40 (31%)	76 (35%)
Total	127 (100%)	218 (100%)
Age		
18–24	96 (75%)	165 (75%)
25–34	23 (18%)	35 (17%)
35–55	8 (7%)	18 (8%)
Marital status		
Single	110 (86%)	177 (81%)
Married	17 (14%)	41 (19%)

2.4 Limitations of the study

We acknowledge several limitations in this paper. First, there is a small sample size for the surveys. Second, a gender imbalance is noticeable for both the data collected in the surveys. Third, there is an imbalance in the sample size collected for the surveys for nationality (the number of Australian participants compared to participation from the Saudi students). Fourth, the sampling technique for the survey is convenience sampling, which implies a non-random procedure used for selecting the sample. Consequently, with those limitations and nonprobability sampling (convenience sampling), research findings have a limited generalizability to a larger population.

3 Results

3.1 The association between demographics and podcast type preference

In this section, the connection between demographics and preferences for podcast types will be examined in a number of different contexts. Thus, a Goodman and Kruskal's λ test was run to determine whether a set of characteristics, i.e., students' age, gender, marital status, and nationality, can be predicted by their preferences for podcast types in different physical and social contexts (see Table 3).

The Goodman and Kruskal's λ was 13.2% (as shown in Table 3) in the case of being in a car with a same age friend. It was considerable reduction in the number of errors related to the knowledge of students' age as a predictor of the type of podcast preferred in the context of being in a vehicle with a friend. Table 4 shows the distribution of podcast preferences by students' age. This shows that Australian students in the age category from 25 to 44

Table 3 Association between podcast type preferences and demographics for m-learning in different contexts

Predictors:	Age		Marital status		Nationality
Contexts:	AU	SA	AU	SA	Both AU & SA
Walking alone					14%**
Vehicle with friend	13.2%**		9.2%*		
Vehicle with family				9.4%*	

Significant level: *$p < 0.05$; **$p < 0.01$

Table 4 Distribution of preferences by age, marital status, and nationality

Context	Predictor		Multiple Podcast N (%)	Vodcast N (%)	Audio N (%)	Text N (%)	None N (%)
Australians with family in vehicle	Age	18–24	22 (23%)	2 (2%)	15 (15%)	15 (15%)	42 (44%)
		25–34	14 (62%)	0%	1 (5%)	3 (11%)	5 (24%)
		35–44	4 (43%)	0%	2 (29%)	0%	2 (29%)
Australians with friend in vehicle	Marital Status	Married	10 (59%)	0%	3 (18%)	1 (16%)	3 (18%)
		Single	30 (27%)	2 (2%)	15 (14%)	16 (15%)	47 (43%)
Saudis with family in vehicle		Married	7 (17%)	8 (20%)	2 (5%)	4 (10%)	20 (49%)
		Single	74 (42%)	24 (14%)	7 (4%)	13 (7%)	59 (33%)
Comparison Walking Alone	Nationality	Australian	19 (15%)	1 (1%)	59 (47%)	3 (2%)	45 (36%)
		Saudi	77 (35%)	27 (12%)	43 (20%)	24 (11%)	47 (22%)

preferred to access multiple podcasts (43–62%) when compared to 18–24 years old students (23%). This means that many students in the youngest age category (18–24) are not willing to access podcasts (44%) when they are with friends in a vehicle.

Goodman and Kruskal's λ was 9.2% as shown in case of Table 3 refers to case of a married person. This too represented a considerable reduction in the quantum of errors related to the knowledge of the students' age as a predictor of the type of podcast preferred for Australian students in vehicle with friend context. Hence, Table 4 is provided to show the distribution of podcast preferences by students' marital status. The table show that married Australian students are more willing to access podcasts compared to single students if they are in a vehicle with friends.

Goodman and Kruskal's λ was 9.4% as shown in Table 3 in the case of person being in the car with family. It also was a significant reduction in the size of errors related to the knowledge of Saudi students' marital status as a predictor of the type of podcast preferred in a vehicle with friend context. Hence, Table 4 is provided to show the distribution of podcast preferences according to students' marital status. The table shows that single Saudi students are more willing to access multiple podcasts compared to Saudi married students in the 'vehicle with family' context.

Goodman and Kruskal's λ, in the case of person being alone, was 14% as shown in Table 3, which represents a significantly low number of errors related to the knowledge

of students' nationality (Australian and Saudi) as a predictor of the type of podcast preferred while walking alone. Hence, Table 4 is provided to show the distribution of podcast preferences by students' nationality. Finally, while walking alone, the Australians prefer audio (47%) while Saudi students prefer multiple podcasts (35%).

3.2 The effect of demographics on podcast length preferences

This section explores the association between demographics and podcast length preferences in different contexts. A point-biserial correlation was run to determine the relationship between demographics with dichotomous values (gender, marital status, and nationality) and podcast length preferences. A Spearman's rank-order correlation was also used to assess the association between age and podcast length preferences.

As shown in Table 5, there were statistically significant correlations between gender and preferred podcast length (level of engagement) in social contexts namely: Busy with friend, Busy with family, Walking with Friend, and Vehicle with Friend. Saudi male students were more engaged with podcasting than Saudi female students. Also, in Table 5, we see statistically significant correlations between marital status and preferred podcast length (level of engagement) in moving social contexts for Australian students, and in family contexts for Saudi students. Married

Table 5 A correlation between students' demographics and podcast length preferences

Demographics:	Gender		Age		Martial status		Nationality
Context:	AU	SA	AU	SA	AU	SA	Both
Quiet and alone							
Busy and Alone				0.159*			0.129*
Busy with family		0.144*	− 0.199**			0.143*	
Busy with friend		0.204**					
Busy with classmate							0.187**
Walking alone							− 137*
Walking with family						0.135*	− 115*
Walking and friend		0.187**			− 0.329**		− 156**
Walking and classmate					− 0.250**		− 0.144**
Vehicle with family							0.116*
Vehicle with friend		0.249**		0.133*			
Vehicle with classmate				0.149*		− 0.235**	0.109*

Significant level: *P < 0.05; **P < 0.01. A point-biserial correlation was run for dichotomous variables (Martial status, gender, and nationality), and a spearman's rank-order correlation was run for age

Australian students were more engaged with podcasting than single students; however single Saudi students singles were more engaged with podcasting than married students.

There is a negative correlation between Australian students' age and podcast length in the 'busy' and 'family' contexts. This indicates that the older Australian students are less receptive to accessing podcasts while they are busy with family. Also, for age, a positive correlation between age and podcast length can be seen in different contexts for Saudi students. This suggests that the older the Saudi students, the longer the length of podcast they prefer when they are alone, in a busy context, or in a vehicle with classmates or friends. Regarding nationality, Australian students are willing to receive longer podcasts in the 'busy' and 'vehicle' contexts compared to Saudi students, regardless of social status or space. Alternatively, Saudi students prefer longer podcast lengths compared to Australians when they are walking, regardless of the social space (alone, family, classmate, or friend).

3.3 The relation between podcast experience and podcast preferences

This section explores the relationship between prior experiences of podcasts and podcast preferences. A total of 126 Australian and 219 Saudi Arabian students answered the question: 'Have you ever listened/watched/read educational learning materials using your mobile device?' as shown in Table 6.

There were two questions to be answered here, first of which to explore the association between prior experience and podcast preference type, and the second to examine the impact of prior experience on podcast length preferences

Table 6 Students experience of accessing educational learning materials using mobile devices

	Listening (%)	Watching (%)	Reading (%)
Australia	43.7	84.9	94.4
Saudi Arabia	75.8	89.5	83.1

(level of engagement). A Chi-square test for independence was conducted to determine the influence of prior podcast experience by nationality (Australians and Saudis). The differences were found to be statistically significant for prior podcast experiences listened and read, both with a p value < 0.01, indicating that Australian compared to Saudis have more experience on reading learning materials using mobile devices, while Saudis have more experience listening to learning materials compared to Australians using mobile devices.

3.3.1 The association between prior experience and podcast type preference

This section explores the effect of prior experiences (read, listened, and watched) on preferences for podcast type (multiple, Vodcast, audio, text, and none).Thus, Goodman and Kruskal's λ tests were run to determine whether the prior experience of students could be better predicted by knowledge of their preferences of podcast types across the contexts (physical and social spaces).Goodman and Kruskal's λ was 11.1% for only one context, indicating a considerable lower portion of errors associated with the knowledge of Saudi students' podcast listening experience as a predictor of the type of podcast preferred in a vehicle

Table 7 Saudi students' preferences for different podcast types

Prior experience on listening podcast?	No preference N (%)	Text N (%)	Audio N (%)	Vodcast N (%)	Multiple podcast N (%)
No	31 (58%)	1 (2%)	1 (2%)	4 (8%)	16 (30%)
Yes	51 (31%)	12 (7%)	13 (8%)	21 (13%)	68 (41%)

with classmate context. Hence, Table 7 is provided to show the distribution of podcast preferences cross-tabulated with students' podcast listening experience. The table shows that the students with prior listening experience are open to experiencing more text, audio, vodcast, and multiple podcasts, compared to students with no listening experience, in the 'vehicle' context with a classmate.

3.3.2 The association between prior experience and podcast length preference

This section explores the relationship between students' prior experience of podcasts and their preferences for length of the podcast. Thus, a point-biserial correlation was run between students' prior experience and students' preferences for podcast length (none, short, moderate, and long) in different contexts.

Positive correlations were found for students' prior experience of (listening and watching) and preferred podcast length (level of engagement) in a number of contexts as shown in Table 8. This indicates that students with listening and watching experience preferred to be more engaged with podcasts than students with no listening and watching experience.

4 Discussion and conclusions

In this section, important findings are highlighted, and the effects of demographics and prior experience on m-learning preferences in different contexts are discussed.

4.1 Effect of demographics on m-learning preferences

Male population in some contexts seem to be more engaged with m-learning than females. Table 5 shows that

many contexts have a significant correlation between m-learning engagement and male students. This is to be expected, as females and males have been shown to have different learning preferences [29, 30]. This may be explained by the general tendency of males to use technology more readily than females [31–33].

Compared with single and younger students, married and older students prefer to engage more with m-learning while their families are not around. This can be seen in Table 5 and the positive correlation between married students and m-learning engagement while being alone or with a friend and classmates. On the other hand, single students more readily access m-learning while around their families (e.g. context busy with family) than married students. Similarly, older students engage more with m-learning while alone or with friends and classmates than younger students. Consequently, older and married students prefer to use more rich podcasts when they are around friends and classmates compared to young and single students, as shown in Table 4. This can be explained by the time constraints of m-learning users, as found by Pagani [34] who surveyed 1000 participants on the perceived usefulness of mobile devices, where time-saving was the second most important issue in the mobile context. Similarly, Torres and Gerhart [35] demonstrated that participants' time urgency has a significant effect on perceived usefulness to use mobile devices. In this study, a possible reason is due to the greater time constraints and family responsibilities of older/married students compared to younger/unmarried students while family around. The family usually means partners and children for older/married students, but more likely means parents and siblings for younger/single students. Thus, various responsibilities make it more difficult for older students to engage in m-learning than younger students in family contexts.

With regards to cultural differences and m-learning preferences, Saudi students engage more with m-learning

Table 8 The association between students' preferences for podcast engagement

Context	Listening		Watching		Reading	
	AUS	SA	AUS	SA	AUS	SA
Quiet and alone	0.224*	0.153*	0.182*	0.178**		
Busy and alone		0.151*				
Busy with classmate		0.137*				
Vehicle with family		0.158*				

Significant level: *P < 0.05; **P < 0.01

while walking, and Australians are more engaged when classmates are around. Table 5 shows that Australian students are more engaged with m-learning when around classmates except when walking, compared to Saudi students, who are more engaged with m-learning in all walking contexts. Likewise, Hamidi and Chavoshi [36] have found that cultural differences have a significant effect on m-learning adoption. In this study, a possible reason could be that walking in Saudi Arabia is less distracting than in Australia. Australian people often walk every day, and mostly during daytime, for various purposes (e.g. shopping for groceries, walking to public transport and to work). However, because of the very high temperatures in Saudi Arabia (even by Australian standards), people are most likely to be walking after daylight hours, and mostly for recreation. Thus, most Saudis walk for leisure, while Australians are more likely walking for a purpose, which means that Saudi students have more opportunities for m-learning while walking than Australians.

4.2 The effect of prior experience of podcasting on m-learning preferences

Prior experiences of listening to and watching podcasts have positive effects on m-learning engagement. Table 8 shows that students with listening experience prefer m-learning in several contexts: quiet and alone, busy alone, busy with a classmate, and vehicle with family. Previous experience watching podcasts has only one positive effect on engagement with m-learning, i.e., in the quiet and alone context. In general, prior experience on m-learning has a significant effect on students' intention to use m-learning [1, 36, 37]. Similar to our study, Copley [8] found that the majority of students rated audio and video as positive learning experiences. Another study [29] showed that course grades were significantly higher when students revised with Vodcast rather than traditional revision methods. The same study also showed that student grades are positively correlated with student's prior Vodcast experience. Thus, research results show that watching has only a small effect compared to listening. This is probably because of two inter-related reasons. First, vodcast requires more time and is more data intensive than audio, which is why students with watching experience prefer Vodcasting in quiet contexts (e.g. home and library), which usually have access to free WiFi or a cheap internet subscription.

Prior experience with reading and m-learning does not affect preferences in all m-learning contexts, as shown in Table 8. In fact, as in [38], respondents noted the difficulty of reading and hence using smartphones and stressed the need for having software to facilitate reading text. This is probably due to technical challenges such as small screen size. Thus, reading as prior experience did not feature significantly in the results. Watching learning materials (e.g. Vodcast) through m-learning may be more readily used in m-learning in the near future. It is expected that connectivity will be faster, and data subscriptions will be cheaper. This will minimise the negative features that currently make Vodcasting less attractive, such as the time required to download, and the high cost of data, especially in outdoor contexts (e.g. walking). On the other hand, we have found no impact of reading learning materials for m-learning, and we expect it will probably would not affect m-learning engagement in the near future, as the small screen size of smartphones is unlikely to change.

4.3 Recommendation for future studies

Many researchers have conducted studies related to many different aspects of life in Saudi Arabia. Some interesting works on various cases on different Saudi environment can be found in [39–43].

Further research is recommended to extend knowledge of m-learning preferences. Such as but not limited to: addressing the limitations of this study, expanding physical and social spaces, comparing different cultures (as this paper demonstrated that significant differences exist between cultures), utilising other tools such as personality and learning styles, and including other learner characteristics. Also, investigating both primary and secondary education is a promising potential area of research, as students in those ages are digital natives, and a rich resource to investigate future directions in m-learning.

Appendix

Background and demographics

1. Would you please write down your email:
2. What is your age?
3. Which of the following best describes your current relationship status?
4. Have you ever listened to an educational podcast using your mobile device?
5. Have you ever watched to an educational video using your mobile device?
6. Have you ever read to an educational materials using your mobile device?

Questionnaire for preferences has the same structure scenarios based on podcast type, length, and context (a combination of physical space and social space) as shown below:

64. If I were in quiet place such as home, I would like to learn through my mobile device having

	I will spend 1-5 Minutes	5-16 Minutes	More than 16 Minutes
Audio Materials	☐	☐	☐
PowerPoint with Audio Materials	☐	☐	☐
Video Materials	☐	☐	☐
Reading Materials	☐	☐	☐

I would not like to learn using mobile devices in this context (Please tick below)

☐

65. If I were alone in busy place such as cafe, I would like to learn through my mobile device having

	I will spend 1-5 Minutes	5-16 Minutes	More than 16 Minutes
Audio Materials	☐	☐	☐
PowerPoint with Audio Materials.	☐	☐	☐
Video Materials	☐	☐	☐
Reading Materials	☐	☐	☐

I would not like to learn using mobile devices in this context (Please tick below)

☐

66. If I were with family members in busy place such as cafe, I would like to learn through my mobile device having

	I will spend 1-5 Minutes	5-16 Minutes	More than 16 Minutes
Audio Materials	☐	☐	☐
PowerPoint with Audio Materials.	☐	☐	☐
Video Materials	☐	☐	☐
Reading Materials	☐	☐	☐

I would not like to learn using mobile devices in this context (Please tick below)

☐

67. If I were with a friend in busy place such as cafe, I would like to learn through my mobile device having

	I will spend 1-5 Minutes	5-16 Minutes	More than 16 Minutes
Audio Materials	☐	☐	☐
PowerPoint with Audio Materials.	☐	☐	☐
Video Materials	☐	☐	☐
Reading Materials	☐	☐	☐

I would not like to learn using mobile devices in this context (Please tick below)

☐

68. If I were with a classmate in busy place such as cafe, I would like to learn through my mobile device having

	I will spend 1-5 Minutes	5-16 Minutes	More than 16 Minutes
Audio Materials	☐	☐	☐
PowerPoint with Audio Materials.	☐	☐	☐
Video Materials	☐	☐	☐
Reading Materials	☐	☐	☐

I would not like to learn using mobile devices in this context (Please tick below)

☐

69. If I were alone in moving context such as walking, I would like to learn through my mobile device having

	I will spend 1-5 Minutes	5-16 Minutes	More than 16 Minutes
Audio Materials	☐	☐	☐
PowerPoint with Audio Materials.	☐	☐	☐
Video Materials	☐	☐	☐
Reading Materials	☐	☐	☐

I would not like to learn using mobile devices in this context (Please tick below)

☐

70. If I were with a family member in moving context such as walking, I would like to learn through my mobile device having

	I will spend 1-5 Minutes	5-16 Minutes	More than 16 Minutes
Audio Materials	☐	☐	☐
PowerPoint with Audio Materials.	☐	☐	☐
Video Materials	☐	☐	☐
Reading Materials	☐	☐	☐

71. If I were with a friend in moving context such as walking, I would like to learn through my mobile device having

	I will spend 1-5 Minutes	5-16 Minutes	More than 16 Minutes
Audio Materials	☐	☐	☐
PowerPoint with Audio Materials.	☐	☐	☐
Video Materials	☐	☐	☐
Reading Materials	☐	☐	☐

I would not like to learn using mobile devices in this context (Please tick below)

☐

72. If I were with a classmate in moving context such as walking, I would like to learn through my mobile device having

	I will spend 1-5 Minutes	5-16 Minutes	More than 16 Minutes
Audio Materials	☐	☐	☐
PowerPoint with Audio Materials.	☐	☐	☐
Video Materials	☐	☐	☐
Reading Materials	☐	☐	☐

I would not like to learn using mobile devices in this context (Please tick below)

☐

73. If I were with a family member in moving context such as a car and I am not driving, I would like to learn through my mobile device having

	I will spend 1-5 Minutes	5-16 Minutes	More than 16 Minutes
Audio Materials	☐	☐	☐
PowerPoint with Audio Materials.	☐	☐	☐
Video Materials	☐	☐	☐
Reading Materials	☐	☐	☐

I would not like to learn using mobile devices in this context (Please tick below)

☐

74. If I were with a friend in moving context such as a car and I am not driving, I would like to learn through my mobile device having

	I will spend 1-5 Minutes	5-16 Minutes	More than 16 Minutes
Audio Materials	☐	☐	☐
PowerPoint with Audio Materials.	☐	☐	☐
Video Materials	☐	☐	☐
Reading Materials	☐	☐	☐

I would not like to learn using mobile devices in this context (Please tick below)

☐

75. If I were with a classmate in moving context such as car and I am not driving, I would like to learn through my mobile device having

	I will spend 1-5 Minutes	5-16 Minutes	More than 16 Minutes
Audio Materials	☐	☐	☐
PowerPoint with Audio Materials.	☐	☐	☐
Video Materials	☐	☐	☐
Reading Materials	☐	☐	☐

I would not like to learn using mobile devices in this context (Please tick below)

☐

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