

# Adoption of M-Learning among College Students: A Literature Review

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**Abstract**—Although wireless and mobile technology is regarded to be useful for enhancing learning among students, few studies have explored the various dimensions of m-learning that may affect the application of this emerging technology in classroom situations. E-learning, and m-learning provide applications, tools and techniques that improve upon formal education. M-learning is a type of distance learning in that it uses wireless technologies supported on mobile devices. It provides a new form of education for students by providing the tools and contents that can add value to the traditional education. This paper provides a detailed analysis of m-learning techniques, its associated literature and finally provides the findings of this aforesaid analysis. It pursues to simplify the inquiry into the resulting query: “What are the various dimensions of m-learning with the help of the current tools and technologies?” The analysis will include a comparison of e-learning with m-learning, advantages and disadvantages/limitations of m-learning in comparison with traditional learning and the various different m-learning techniques currently used.

**Keywords**— E-Learning, M-Learning, Learning Model, Technology, Factors, Mobile Phone, Dimensions of M-Learning, Consumer Behavior, Student Behavior, Education.

## I. INTRODUCTION

INFORMATION is growing rapidly, according to the learning technology and communication improvements [1]. In olden times, books and teachers were the readily accessible sources of information. But nowadays, we have many other user-friendly and convenient sources of information, such as Internet PCs, Laptops and mobile devices which include personal digital assistant (PDA), mobile phone and Tablet PC [2]. The mobile devices recently have come up with They are coming with enhancements in memory storage, interactivity features and high data transfer speed. M-Learning is a kind of learning achieved through the use of small, portable computing devices, while on the move, any place, any time. Smart phones, personal digital assistants (PDAs), tablets, palmtops, handheld computer, and similar handheld devices can be used for m-learning. The integrated component of m-learning is basically a wireless two-way internet connection. Currently, m-learning is accomplished using various tools like iPod, tablets, smart phones, PDAs etc.

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## A. Mobile Devices For M-Learning In Colleges

A list of mobile devices and the features available in such devices to perform m-learning are presented here.

### 1) Use of iPod

An iPod, a portable media player was originally developed for playing music. Currently it has been used not only to download music, but for podcasts, audio books and even play videos. YouTube has created a worldwide population of viewing online videos for education and other purposes. Using an iPod, hence students can view video tutorials, books and audio lectures. Instead of studying in the book where the user's attention can be diverted, the audio and video lectures help in understanding the subject quickly. With the help of iPod now students can even share files, especially during project work or can have discussions by interfacing with iPod via a microphone. Hence iPod aid in teaching, where professors can share their lecture materials, videos which students can access any time. But, as iPod screen size is too small, it is often tough to read in it for a long time [3].

### 2) Personal Digital Assistant (PDA) as an aid

PDAs are hand held PCs designed for users to access information anytime anywhere. It has some of the key features like visual display, data storage, and internet access with the help of Wi-Fi or Bluetooth, word processing software, screen keyboard and stylus for navigation. Students can access mails, web tutorials, and play audio and video materials for study. A variety of interactive student learning tools are available, one of which, namely Coursera allows students to access content provided by experts free of cost. Compared with an iPod this has a bigger screen, with access to word processing software, access emails and websites, which are essential for current students to complete assignments and prepare for exams [4].

### 3) Resourceful Laptop or Tablet

Laptop or tablet is one of the most resourceful mobile devices that has all the features of a personal computer. It has provision for network support, for Bluetooth and Wi-Fi [5]. Tablets are mobile devices that provide instant email, web browsing, data processing, SMS, Voice over IP connections, calling facilities and many other application programs. These devices support collaboration and interactivity in research. Although the laptop provides many useful features, its relatively large size and lack of mobility on the move restricts its usage [6].

#### 4) Miscellaneous: MP3 Player, USB Drive, handset phone

The MP3 player is designed for playing music and audio files, without being much interactive. Students use this to listen to podcasts and audio recordings. MP3 player is easy to carry and compact. It has good audio quality output and has a battery lifespan that is long-lasting [7]. However, due to lack of interactivity, other hearing gadgets are preferred over it. The USB Drive is a secondary storage device that synergizes with many computers and other devices. Students transfer files between one system to another easily and therefore find it handy. Being portable, it's a medium that carries files while on the move. But, on the other hand, mass storage is an area that pen drives lag. A normal hand phone has a telephone-like facilities and more, but not the full PDA features. Though it is more affordable than a PDA, it lacks processing ability required for mobile learning.

#### 5) Trending Smart Phone

The smart phone is now the current trend for students, which provides telephone features, along with camera, access to the internet, features of PDA and MP3 player [8]. Students use smart phones to communicate with their family and friends, download materials, view videos, scan and store useful materials with the help of a camera. Even though the cost is a bit high, it has all the essential features needed for today's era and students prefer this compared to other devices.

## II. OBJECTIVES OF THE STUDY

1. To examine the different approaches in m-learning.
2. To list out the existing devices used for m-learning.
3. To briefly discuss about the various projects undertaken on m-learning.
4. To outline a few of m-learning related market trends which are significant to student's m-learning.
5. To suggest measures for improving the existing m-learning strategies.

## III. METHODOLOGY

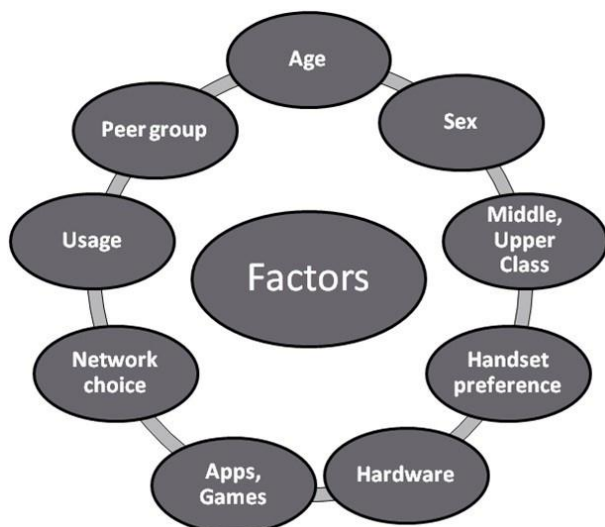


Fig. 1 Factors influencing mobile phone usage among students

Initial analysis indicated that the above factors as shown in Fig. 1., namely age, sex, usage, peer group, etc. influenced the usage of smart phone among students. Secondary data are taken for analysis in this study. Research articles and books concerning the topic of study have been taken.

## IV. LITERATURE REVIEW

There are various mobile learning applications/tools in literature. According to Stead and Colley (2008), these tools can be evaluated with three main methods [9]:

#### A. Supportive (Supplementary) Applications/tools:

The institution or the lecturer offers activities that involve individual applications/tools such as podcast, vodcasts, and mobile games.

#### B. Focused Applications/tools:

Content delivery with a focus on conventional e-learning applications in wireless mode (mobile phones).

#### C. In-depth (deep) Applications/tools:

A variety of mobile technology applications/tools help enrich the social learning processes in the context of learning, retaining customers and consumers in addition to being the creator and producer.

In this study, the various tools and techniques for mobile learning are examined within the above context.

Stead and Colley (2008), categorizes mobile learning approaches into three broad methodologies [9]:

#### 1.1 Shallow or supplementary learning:

Typically, these include SMS prompts, college generated podcasts, and mobile games. This methodology supplements other activities.

#### 1.2 Focused Learning:

This resembles a smart phone form of standard e-learning, with targeted chunks of knowledge which students can utilize anywhere – provided students know the context.

#### D. Deep Learning:

This consists of a combination of mobile technologies, as inventors or makers. This also consists of frequent users of mobile media, those who follow a model of constructivism.

According to Cochrane (2010), the instructional approach of teaching, training and learning situations range from teacher-centered (instructivism) to student-centered collaboration (social constructivism) [10]. This integrated approach provides a teaching and learning environment requiring customization with respect to the use of Wireless Mobile Devices (WMDs). Changes in pedagogical strategies, content, and contexts are required. The content has to be edited to support small screens and poor data bandwidths and the contexts have to be beyond the face-to-face classroom environment.

A pedagogical framework for networked (wired) and mobile learners can be developed by social constructivism, using and revealing constructivism, a conversational model of

learning, communities of practice, the social construction of technology, connectivism, activity theory, media richness theory. Thus, it is expected that for a m-learning pedagogical model to focus upon improving communication and relationship inside a vibrant learning atmosphere, and be student-centered.

### 1. *Supplementary learning examples*

The Handy project was initiated by a school tutor who had a specialization in sports. The mobile phone was used to support learning and search topics. The important activities of the project (MoLeaP – The mobile learning project database, 2007) were Multimodal content creation (transformative; knowledge building), micro learning, maturity/ technical literacy, archive, peer-teaching [11].

xTasks (Ketamo, 2003), is a platform for using mobile devices as a multi-user text editor [12]. The tutor gives a task to a group of students, who then can use the device for further discussions and for the fulfillment of the task. The device supports them with several functions like text sharing, writing through cooperation, and outline and structure support [13].

### 2. *Focused learning examples*

Merrill Lynch found it was uncommon to see employees complete any online training after they had initiated, often because of a busy work schedule. They considered m-learning and training courses were conducted using BlackBerry, resulting in 100% course completion rate [14].

The “From e-learning to m-learning” (Keegan, 2002) project was instigated by Sony Ericsson and concentrated on the technical difficulties and challenges that prevailed when training course materials were conveyed using a mobile phone [15]. This was one of the key path finding m-learning projects. The researchers demonstrated how they could give access to e-learning content using mobile phone [13].

### 3. *Deep learning examples*

The MOBIlearn project (Bo, 2005) prepared a context awareness system that provided the information content to visitors of the museum, depending on what they were currently observing and the amount of time they spent in each exhibit [16].

In ImagiProbe project (Vahey, Crawford 2002), several sensors and a PDA was provided, e.g. a sensor for temperature, magnetic fields, light intensity, amperage, etc [17]. Thus, the students could explore an environment on their own and get a hands-on experience of the data collection tools as well.

The Butterfly Watching Learning System (Chen et al., 2004) helps students to identify the different varieties of butterflies and learn about each. In the field the students took a picture of a butterfly with a camera. They were provided with a system that presented a selection of various types of butterflies [18]. Using the butterfly database, the students had to identify which variety of butterfly they had taken a picture of, via matching.

Homewood Suites (by Hilton) uncovered mobile training by providing video iPods in every location in order to enhance performance and promote growth in areas such as sales communications and brand messaging [19]. Each iPod program comprises a variety of two-minute modules emphasizing specific brand skills that are both essential and valuable.

From the literature survey, there are five opportunities to improve education, considering M-Learning’s unique attributes:

#### A. *Encourage “anywhere, anytime” learning*

Wireless devices and mobile learning help students to acquire, access, and use information outside the classroom.

They are capable of encouraging learning in a real-life context, and supports education after college, and home environments.

#### B. *Approach at-the-edge student*

As it is cheap in terms of cost and has more reachability in rural areas as well as in urban areas, mobile devices can help in easy access of digital content, approaching and stimulating diverse populations.

#### C. *Improve 21st-century social interactions*

Social interactions can be promoted in a better way using mobile technologies. Mobile technologies also help nurture teamwork and communication, considered vital for success in the 21st-century.

#### D. *Suitable for learning environments*

Many challenges associated with larger technologies can be overcome by learning through mobile devices.

#### E. *Provide a tailored learning experience*

Every student is unique and accordingly the instruction through mobile devices should be flexible to every student from diverse backgrounds.

Four important challenges for m-learning are:

#### A. *Harmful facets of m-learning*

Physical, Societal and Cognitive challenges need to be overcome when mobile devices form a part of a student’s learning. Some of the disadvantages are the possibility for disruption or unusual behavior, health-related and data privacy issues.

#### B. *Ethical norms and teacher, parent outlooks*

Parents and teachers are not yet convinced of the substantial potential of mobile phones in transforming students learning. Teachers still see mobile phones as distractions and feel that students should not carry mobile phones at least while attending class.

#### C. *Diverse mobile technologies and no theoretical framework available*

Due to the wide diversity in mobile tools and techniques, the teachers and learners, as well as the content developers of

mobile applications, are still not sure how to leverage it for better academic outcomes and m-learning facilitation.

#### *D. Limiting physical attributes*

Restricted text entry, small screen size, and limited battery life, combined with distracting designs adversely affects usability and prevents an optimal learning experience.

While the power and functionality of mobiles have increased in recent years, the device size as well as the price has also decreased [20].

The following market developments have the potential to significantly impact student's m-learning:

#### *A. Technological convergence*

Most of all mobile phones have common add-ons, such as color screens, cameras, and mobile web. Improvement is also seen from feature phones, through which it is possible to make voice calls, along with features such as text messaging, basic multimedia and internet browsing, making it similar to a laptop computer.

The mobile phone industry has not picked up speed in terms of developing software applications using proprietary platforms. Now, through open-source mobile operating systems, different platforms are consolidating.

#### *B. Location*

Most of the mobile devices nowadays have GPS and thus it is now possible for emerging technologies to leverage it to receive location-specific data. The educational potential of these applications, combined with social networking applications makes it significant.

#### *C. The 21st-century button*

Students of schools and colleges in the past have been inhibited to achieving full control of pocket-sized devices due to buttons and keypads. There have been a lot of developments in touch screen, thanks to advances in tactile feedback, pressure sensitivity, hover detection, infrared technology, and even dual-screen developments. Apart from the touch screen, prompting input also improves the way students interact among themselves, using their smart phones.

### V. RECOMMENDATIONS

Some of the recommendations herein made are based on observations made in the Literature Review.

#### *A. Security and trustworthiness.*

To increase the security and trustworthiness of M-learning, the universities should formulate policies. Students' privacy and confidentiality are of prime importance. The ethical factors to be considered are the protection of personal information, the need for obtaining informed permission, mobile content as well as device ownership, storage of data and protection, emphasis on user-generated content.

#### *B. Creating a positive learning climate*

Universities and educational institutions must create a viable climate for m-learning for students by instilling confidence in teachers and students of the benefits of m-learning. Universities must organize symposiums related to m-learning, ensuring their participation. Teachers and students must also be encouraged to participate in such activities in other institutions also.

#### *C. Making m-learning be seen as nationally and continentally vibrant.*

Government must also take measures to mobilize m-learning and provide opportunities for teacher and students in cross-cultural exchange programs [21].

#### *D. Capacity building*

Educational institutions must have a pool of trained m-learning resources who keep abreast of the latest technological developments, through certifications, publications, research programs.

#### *E. Organizing synergies and collaborative efforts*

Educational institutions should get the funding for research, to ensure adequate flow of information, in both public and private institutions and integrate the results of research in decision-making related to m-learning [22].

### VI. LIMITATIONS

The limitations of this study, is the m-learning adoption is still relatively new in India and there is a lack of relevant literature review in this area of study.

### VII. CONCLUSION

This study was developed due to a growing interest in mobile learning and also the importance of mobile devices in students' daily lives. Teachers are expected to integrate digital and mobile technologies into their curriculum, and universities have the responsibility of formulating policies supportive of this. Students' education has to be nurtured by the teachers, by utilizing the emerging technologies, including wireless technologies, thereby aiding in a conscious rejuvenation of education. M-Learning supplements the traditional methods of learning by using a preferred medium, convenient and desirable to students at affordable prices and already widely in use. The findings from this study add to the current understandings of currently supported pedagogical practice using digital and wireless technologies. It is believed that they will be used to facilitate meaningful teaching and learning practices among students.

### VIII. FUTURE OF M-LEARNING

The Mobile phone has become a necessary evil in the lives of modern college students. Students use them for talking, messaging, taking photos, and currently-for learning. Like taking bike keys while leaving home, students take their phones with them everywhere they go.

With the advent of Internet of Things, various mobile devices can be connected with each other seamlessly. Feature phones, along with PDAs and blackberry devices, can nowadays receive text, audio, and video information, as well as access web pages. It is imperative for the academia to make use of this opportunity to deliver educational content efficiently and innovatively. Many colleges/universities have Wi-Fi connectivity in their campus, and this facility is being increasingly used by students and teachers impart education. This further helps m-learning to flourish. The future classrooms will be increasingly digital and mobile-enabled and advance technology is more likely to be used by teachers to impart education to the students and also for assessments.

In *Wireless and mobile technologies in education, 2004. Proceedings. The 2nd IEEE international workshop on.* 11-18.

- [19] CorpU (2008), Mobile Learning: Effective training or just another technological distraction. Corporate University Xchange. Available: <http://corpu.com/weekly/article/mobile-learning/>
- [20] Mehdipour, Y., & Zerehkafi, H. (2013). Mobile learning for education: Benefits and challenges. *International Journal of Computational Engineering Research*, 3(6), 93-101.
- [21] Cavus, N., & Ibrahim, D. (2009). m-Learning: An experiment in using SMS to support learning new English language words. *British journal of educational technology*, 40(1), 78-91.
- [22] Barker, A., Krull, G., & Mallinson, B. (2005). A proposed theoretical model for m-learning adoption in developing countries. In *Proceedings of mLearn*
- REFERENCES
- [1] Noor-Ul-Amin, Syed. (2013). An effective use of ICT for education and learning by drawing on worldwide knowledge, research, and experience: ICT as a change agent for education. *Scholarly Journal of Education*. 2(4). 38-45. Available: <http://www.nyu.edu/classes/keefe/waoe/amins.pdf>
- [2] Song, Hae-Deok, Wei-Tsong Wang, and Chao-Yueh Liu. (2011). A Simulation Model that Decreases Faculty Concerns about Adopting Web-Based Instruction. *Educational Technology & Society* 14 (3). 141-151. Available: [http://www.ifets.info/journals/14\\_3/ets\\_14\\_3.pdf](http://www.ifets.info/journals/14_3/ets_14_3.pdf)
- [3] Heikki, Haaparanta, Kiili Kristian, and Multisilta Jari. "New Blow for Mobile Learning: iPods and Podcasting in Primary Schools", presented at the IEEE 29th International Conference on Information Technology Interfaces. 339-344. IEEE, 2007.
- [4] Ally, M. (2007). Guest Editorial-Mobile Learning. *The International Review of Research in Open and Distributed Learning*, 8(2).
- [5] Sharma, S. K., & Kitchens, F. L. (2004). Web services architecture for m-learning. *Electronic Journal on e-learning*, 2(1), 203-216.
- [6] Melhuish, K., & Falloon, G. (2010). Looking to the future: M-learning with the iPad.
- [7] Caudill, J. G. (2007). The growth of m-learning and the growth of mobile computing: Parallel developments. *The International Review of Research in Open and Distributed Learning*, 8(2).
- [8] Sarrab, M., Elgamel, L., & Aldabbas, H. (2012). Mobile learning (m-learning) and educational environments. *International journal of distributed and parallel systems*, 3(4), 31.
- [9] Stead G., Colley J. (2008), The power of me: Learning by making your own rich media mobile resources. *Proceedings MLearn08: The Bridge from Text to Context*, School of Computing and Information Technology, University of Wolverhampton, 363.
- [10] Cochrane Thomas (2010), Mobile Web 2.0: Bridging Learning Contexts, in Ajith Abraham, Ray Bareiss, Jerry Feldman, Nicola Capuano, Stavros Demetriadis (Ed.) *Architectures for Distributed and Complex M-Learning Systems: Applying Intelligent Technologies*, NY, IGI Global, 123-151
- [11] MoLeaP - The mobile learning project database (2007), Project Handy <http://www.moleap.net/single.php?id=5>
- [12] Ketamo, H. (2003). xTask—an adaptable learning environment. *Journal of Computer Assisted Learning*, 19(3), 360-370.
- [13] Frohberg, D., Göth, C., & Schwabe, G. (2009). Mobile learning projects—a critical analysis of the state of the art. *Journal of computer assisted learning*, 25(4), 307-331.
- [14] Swanson, K. (2008). Merrill Lynch: Bullish on mobile learning. *Chief Learning Officer*, 7(4), 54-59.
- [15] Keegan, D. (2002). The Future of Learning: From eLearning to mLearning.
- [16] Fusch, D. L., Bo, G., & Saadia, Y. (2005, November). Innovative applications for content distribution & consumption in tourism & education using PDA or mobiles. In *First International Conference on Automated Production of Cross Media Content for Multi-Channel Distribution (AXMEDIS'05)*.
- [17] Vahey, P., & Crawford, V. (2002). Palm education pioneers program: Final evaluation report. *Menlo Park, CA: SRI International*.
- [18] Chen, Y. S., Kao, T. C., Yu, G. J., & Sheu, J. P. (2004). A mobile butterfly-watching learning system for supporting independent learning.