Research on M-Learning Supported by 3G/4G

[1]V. Sujatha Bai,
MCA, M.Phil
Asst Professor MCA Department
VelTech High Tech Dr.Rangarajan Dr.Sakunthala
Engineering College

[2] S. Hendry Leo Kanickam
M.Sc, M.Phil,
[3] N. Vijayaraj
M.Sc, M.phil
Asst Professor's of IT Department
St. Joseph's College (Autonomous), Trichy – 2

ABSTRACT

With explosive immersion of mobile technology supported by 3G/4G, it's distinctive of being portable and online has injected new vitality to M-learning, people become to explore its potential under the surrounding of M-learning.

Based on the technology predominance of 3G/4G, this paper first analyses current situation of M - learning. Then it discusses the teaching relations and learning surrounding of M-learning with support of 3G/4G technology. Then it expounds on the challenges which 3G/4G brings to M-learning. Wish this paper could play an active role in actual research of M-learning.

Keywords: 3G/4G, mobile technology, M - learning, learning surrounding

1. INTRODUCTION

On July 15, 2010, CNNIC (China Internet Network Information Centre) released the latest statistics report. It shows that by the end of June 2010, China's netizens have reached 420 million. Internet penetration rose to 31.8%, and mobile phone users reached 2.77 billion. The percentage of netizens who only use mobile phones in whole netizens increases to 11.7%. A report in 2009 from federal investigation agency showed that more than half of the world's population uses mobile phones, Coverage of mobile services in Europe was close to 100% (GSMA Europe, 2008), while 400 million Europeans (80% of the total population) can access telephone network. About two-thirds of people in developing countries use mobile phones, while in 2002 the number was less than half of the population. Reduced cost of mobile phones and uneven development of fixed line infrastructure in many developing countries made mobile services more attractive to consumers. A recent digital media index reported that search with mobile phone was increased by 30% compared to last year. Owing to rapid development of 3G technologies and optimization of mobile custom content in recent years, mobile phone and smart phone users are more and more interested in mobile Internet. In the past few years, mobile devices become flexible enough to deal with more functions of Internet. Expand continuously to meet needs of many notebooks and desktop computers. A survey from Anderson & Rainie (2008) estimated that by 2020, most people would use mobile devices as their primary method access to Internet. In summary, mobile technology and mobile devices have broad access to people's daily lives, used by people of all ages and socio-economic groups.

2. NEW GENERATION OF 3G/4G INTECHNOLOGY AND STATUS OF MOBILE LEARNING

A. Advantages of 3G/4G technology

Technological development of 3G/4G and wireless network technology and their explosive penetration into various fields of the world create infinite opportunities. Mobile services in social, cultural, economic and educational areas are constantly undergoing tremendous changes. 3G technology is the third generation mobile communication technology. Its representative feature is to provide high-speed data services and its rate is generally more than a few hundred kbps. With continuous development of 3G technologies, MMS (multimedia messaging service) and mobile video bring people with rich learning and life experience. As we expect 3G technology will bring excellent services, latest technologies of the fourth generation mobile communication system are in the study quietly. 4G is 3G and WLAN in one, and can transmit video images in high quality. So far, although there are not precise definitions about 4G, one thing we can be sure that there will be a more perfect wireless world with 4G communication rather than with 3G.Compared with traditional communication technologies, the most obvious advantage of 4G communication technology is its communication quality and data communication speed. As follows:

(1) Faster communication speed

Data transfer rate of the third-generation mobile communication system can be up to 2Mbps.Experts predict, the fourth generation mobile communication system can reach 10Mbps to 20Mbps or even up to 100Mbps per second to transmit wireless information, this rate will be equivalent to about 10,000 times the current transmission speed of a mobile phone.

(2) **Wider network spectrum**

In order to enable transmission speed of 4G communication reach to 100Mbps telecommunication operators must carry out substantial reformation and research based on 3G communication network. According to AT&T executives' report, each 4G Communication channel is estimated to occupy 100MHz spectrum, equivalent to 20 times W-CDMA 3GNetwork.

(3) More flexible communication

Strictly speaking, features of 4G cell phone cannot be simply classified as "phone" category, after all, transmitting voice data is only one function of 4G mobile phones, so future 4G mobile phones can be regarded as small computers, and their appearance and style will be even more astonishing

breakthrough. Thus, with gradual development of 3G technology to 4G, mobile devices look more like platforms, not just phones, for they creates a lot of opportunities for ordinary users. With explosive penetration of mobile technology, combined with its technical characteristics of portability and available being online, makes it attract the

Attention of educators, people started to explore its potential in the learning environment. Technical experts are very optimistic about the prospect of 4G. Assuming that we can integrate technologies of different standards to provide seamless and transparent services and applications, we will get a highly universal tool which has a huge potential influencing education quality.

B. Status of mobile learning

In traditional sense, E-learning (online learning)

Refers to learning in any place at any time with computer. Mobile learning can be seen as an extension of online learning, or a new mode of learning. Mobile learning has many different meanings and definitions. These definitions are focused on its mobility, and wireless nature at anywhere. Mobile learning is defined as "complex of online learning and mobile computer", and Wains & Mahmood (2008, p.31) defined it as "a E-learning type mixing wireless technologies and mobile technology". From the above discussion, we can see that the definition of mobile learning, simply, is "using mobile devices in learning." If more complex, it can be defined as "mobile learning is a new types of learning mode that use wireless mobile technology and wireless communication equipments (such as mobile phones), personal digital assistants(PDA, Pocket PC) access to education information, educational resources and educational services ". Mobile learning for all students' access to resources can be "at anywhere and anytime access to learning materials" (Rainger, 2005), and because mobile devices have advantages of portability and flexibility, they can provide remote students with suitable learning mode. The projects undertaken in Ericsson Dublin mentioned, which researched on how to develop from E-learning to mobile learning, smart phones and mobile phones used in mobile learning have a lot of problems which still haven't be effectively solved. These problems always affected the Development and popularization of mobile learning. Therefore, when we see the advantages of smart phones and mobile phones that support mobile learning, we have to see its shortages. As follows:

(1) Mobile device screen is too small, capacity is limited and unstable, and functions of platform are imperfect:

Although the screen of mobile phones now have greater development than before, but so far for people, are still too small, which makes they cannot carry out their learning comfortably. Besides, people sometimes have to read in noisy crowd, moving car, and subway, etc. Previously mobile learning focused on providing a brief courses summary, exam review notes, or study guide. Most of these courses are composed of images and text material, additional short answer questions and simple contents to contact with teachers, making their mobile phones just to play a small part of their functions-that is, mobile guiding and supporting learning, and mobile management. Mobile service does not support wireless printing. If you want to print, you must use third-party program, but not all devices support. Mobile devices have limited and unstable capacities. Their storage size and time length will be affected by network speed greatly. The capacities of mobile devices are also not stable. Once

equipments are out of control, they will lose all contents in temporary storage of memory card. Not all mobile platforms support advanced features of HTML and Flash, it is best not to use them, especially when learning contents are for low-end users, or there will be a lot of learning contents not being properly displayed on users' devices.

(2) Teaching resources based on mobile terminal platforms are not enough rich. These learning materials focused on phone-based E-book, MP3, video clips and so on, learning contents are relatively simple, and they are concentrated in English and a few other subjects. Research has shown that, if there have more easily accessible teaching resources, they will encourage students to seek ways actively to improve their learning skills, find advice and guidance to improve their experience, and give them practical help. Fortunately, our country has some forward-looking research institutions, now they are studying platform software on mobile learning and curriculum resources development.

(3) Bandwidth is not wide enough. It is a major barrier that mobile learning using mobile devices has to be faced. Due to relatively slow transmission speed, many mobile devices are limited for the low speed wireless connection. Multimedia requires faster connection speed; otherwise it is unlikely to send multimedia contents to mobile devices Teaching institutions can only present main learning materials and information in form of text, as well as some simple web browsing functions, so mobile learning will be greatly hampered and limited.

(4) Communication cost is high, especially in China.

Mobile communication cost is high and confused, which will greatly restrict initiatives and enthusiasms of poor students to learn with mobile devices.

(5) Development of mobile learning courses and certification haven't formed systemic standards. How to effectively develop mobile courses to improve their diversity, and how to collect rich multimedia learning materials to meet the needs of learners and make them be willing to study, all of these are questions that educational researchers need to carefully study.

(6) Teachers have technical obstacles widely. In research projects on mobile learning, educator found

only a few students feel they have technical obstacles to operate equipments, while teachers faced common difficulties in the development and design of learning materials. The reasons may be lack of technical knowledge, for example, they do not know how to use public online spaces, not familiar with operating software. They also can be hardware problems, for example, the sound quality of microphone or software is not compatible with Apple computers, etc. All these will enable teachers to spend more time than they expected.

(7) Be lack of integrated learning spaces. The establishment of learning spaces can provide reference for many students who engaged in work, especially for those students who cannot directly participate in face-to-face teaching. The spaces should allow access to different types of file, blog and information resources, and should also have a corresponding description so that students can easily access, however, they are now generally not established.

3. RESEARCH ON MOBILE LEARNING WITH 3G/4G TECHNICAL SUPPORT

A. Analysis of teaching relationship in mobile learning with 3G/4G technical support

The term "Mobile Learning" is linked with technology, learning, mobile devices and many othe concepts. However, focus should be on mobility of people- students or teachers, rather than mobility of devices. Note that the main body in mobile learning activities is "moving people," mobile devices only play supportive roles. Using mobile technology allows teachers and students communicate with each other fully outside traditional classroom. In online environment, use of

mobile devices increases interaction between teachers and students and cooperation levels among students. Advanced mobile devices with 3G/4G connection speed play an important role in providing more efficient communication channels and improving user experiences. To make full use of advantages in 3G/4G technical connection, mobile devices must have appropriate capacities and abilities to control information flow. Table 1 relationship among students, teachers and teaching contents with potential support of 3G/4G technology.

B. Analysis of learning environment in mobile learning

Mobile learning means learning environment is constantly changing, so make careful analysis for learning environment of mobile learning is very necessary. Educator Phil Marston(2010) classified four mobile learning environments that may occur, as shown in Figure 1:

In independent learning environment, learners' environment is nothing to do with learning. For example, in the train journey or at home, via mobile devices access virtual learning environment. In formal environment, learning environment has relevant functions, such as in a classroom, teachers lecture with audience response system. in field environment, places where learning happened should be relevant to learning. For example, people using GPS system in the museum learn about the history knowledge and ancient sites.In communication environment, learners must share sustainable, stable relationships, including existing or past situations, friend relationships and learning

C. Mobile learning framework under 3G/4G technical support

The standard elements of mobile learning are learner, learning objectives and tools of achieving objectives. In addition, elements can be extended to control factors, learning environment and teacher-student exchange. Figure 2 shows mobile learning framework under 3G/4G technical support, including the following elements Mobile learning framework of the above is as follows: Real-time communications capabilities of mobile devices under 3G/4G support have been greatly improved, message size is unlimited. Whether in voice message, text message, mobile video calls, or Internet connection, communication capabilities of mobile devices are important support in learning process. 3G/4G technology improves communication quality in teaching process, improving the user experience. 3G/4G will improve communication performance (Coverage and connectivity) and make the equipment more powerful. However, when develop in applications for teaching use, screen size of mobile device is still an important issue to consider. 3G/4G offers a different learning environment for mobile learning. When teachers and students are on the road, on his way home, or back to school, they are all in different information environment. As mobile

devices are with 3G/4G connection, its portability and characteristics of being online can provide immediate opportunities for teacher-student interaction. 3G/4G technology can also create and manage interaction of teachers and students in different environment for mobile learning, greatly stimulate enthusiasms of students and improve teaching effect. In addition, learning environment personalized is also another direction that educators should consider in non-formal learning. There has undertaken a number of research projects all over the world to explore the advantages of mobile learning using 3G/4G technologies in information environment. The project will provides valuable experience for developing applications of mobile learning related to different learning environment. Mastering technical skills of mobile devices 3G/4Gtechnology support is necessary.

4. CHALLENGES THAT 3G/4G TECHNOLOGY BRINGS TO MOBILE LEARNING

Rapid penetration of mobile technology with 3G/ 4G support and explosive development of wireless network technology has brought opportunities and challenges to mobile learning. On the one hand, it tries to bring advantages of mobile technology to learning process, improving learning efficiency. On the other hand, the rapid pace of technological development has also brought new problems. Specifically, carrying out mobile learning when using mobile technology and its applications, teachers and administrators should be provided appropriate training to help them overcome psychological barrier. When creating theoretical framework for teaching elements of mobile learning, we should be people- oriented, concerning mobility and interaction of teachers and students, instead of focusing on the portability and technology functions of current equipments When developing suitable teaching contents for mobile devices, such as screen size, internal capacity, processing speed and data transfer rate, all factors should be considered. Also, ensure there has appropriate technical support, and avoid students to distract for equipment failure. Designing applications should be simple and practical. Consider carefully cost of mobile devices with 3G/4G support and local wireless connection. Problems of safety, ethics and other issues should also be considered in process of using mobile devices. At present, improper use of mobile devices in educational environment is the most concern that teachers, administrators and parents worry, which requires the whole community, school and family give special attention. Of course, it not only needs more research and development, but also requires cooperation and discipline of everyone.

5. CONCLUSION

Connectivity and popularity is important features of mobile learning. We need to recognize that application of the first generation of wireless technology (1G and 2G) in mobile learning is limited. The emergence of 3G and 4G technology not only provides platforms for transmission and interaction of teaching contents, but also increases the possibilities of full interaction. Wireless service providers and device manufacturers are also actively developing powerful mobile devices and applications to give users better experience. It can be expected that technologies develop towards 4G, increasing connectivity and popularity will make interaction process more flexible and use of mobile devices more attractive. New

development of mobile interface and man- machine interaction will bring teaching with a steady stream of activity.

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