A Model of Mobile Learning Application
for Tertiary Education in Rural Area in China:
A Preliminary Study

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Abstract. This preliminary study is conduct a survey to understand the expectations and elements of mobile learning education in rural area of China. After analysis the results from survey, a mobile learning model has been constructed. This model has considered the factors on mobile learning devices, the speed of internet service, the courses contents, the non-paper-based teaching materials, teacher or teacher's teaching method, use of the mobile applications, and social networking. Therefore, the motivation of students might be brought up though this model to archive much higher academic results.

Keywords: Mobile learning · Higher education · Modelling design
Education in rural area

1 Introduction

Mobile learning is a trend of adopting the technology in education. Educational Games [1, 2], the Educational system through iPhone and iPad [3, 4], and e-learning [5] are the emerging tools for information communication technology (ICT) in education. The technology advance in mobile services that are in internet speed and capacity have introduced the use of high volume data materials for the teaching purposes. In addition, the advantage of the mobile phone technology has also brought the concepts and needs, which are learning at home or work [6]. For these reasons, mobile learning may satisfy the demands of learning out of school. Therefore, the academic outcome would be as high as compared with the traditional classroom teaching method.

In the rural area of China, it has limited resources, for example, the financial and educational background of the teaching staff to input to its educational system [2, 7]. The disadvantage is that college is very unusual to obtain and use the technologically advanced ICT system [8]. As a result, the implementation of mobile learning

in the colleges or universities might need a different approach compared with the urban area of China or even other well-developed countries. There are many mobile learning modellings that show in the recent researches [8]. The mobile learning devices [7], the speed of internet service [7], the courses content [6], the non-paper based teaching materials [9], teacher or teacher's teaching method [10], use of the mobile applications ('Apps') [11], and social networking [12] need to be awarded. Therefore, a survey is needed to investigate in detail how the students expected.

The requirements and essential elements of the model should be identified in order to investigate further in the research study. This study has undergone a survey that conducted in a tertiary college in the rural area of China students. The survey could understand the advantage of mobile technology in the tertiary education in rural China, as the financial capacity is the relative disadvantage to the capital city in China [6, 8]. Furthermore, the survey could also be able to e-learning [1] and mobile learning [13] are able to narrow down this gap, which the quality of teaching is not as well as the college in the major cities in China. It is because the well-educated teaching staff would prefer the key colleges and universities around China, as they will have diverted teaching recourse [3]. Therefore, the results of the survey may build up a solid foundation to the model of mobile learning.

Freely studying outside the classroom just like classroom teaching is the trend of reformation of the educational system. The motivation of study might be increased concurrently, as study become limitless in the classroom [14]. Mobile learning has improved the ability and capability to replace e-learning and classroom learning as a studying framework in this technology advanced century. It might bring the educational advantage, for example, teaching resources, from the capital city to rural area [3, 15].

2 Methodology

This study has established a survey at the tertiary college in China (DaZhou Vocational and Technical College, DaZhou, China). The aim of the survey is understanding the perceptions of students, which is about what subject is applicable to implement the mobile teaching, in the rural area in China. The questions of the questionnaire and the structure of the questionnaire have designed and organized following by the guideline [16, 17]. The 5-point scale design has employed for the deigns of the question [17]. Furthermore, the requirement of the mobile learning is identified from the literature review in this paper. Total students (N = 700, Female = 379, Male = 321) are a random selected from 13 different departments in the DaZhou Vocational and Technical College, DaZhou, China. The statistical analysis has performed the outcome to investigate any significant relationship between the results and the requirement of the mobile learning. All statistical analyses were done using SPSS 16.0 (Chicago, IL). All statistical tests were two-sided. A P-value 0.05 was considered statistically significant. Finally, a model that followed the results was constructed in this paper.

3   Results

The survey result shows that high percentage of students are interested in mobile learning. The requirements or elements have not limited the findings only from the literature review, which have included in the questionnaire, but the financial problem and view from parents and peers also become a concern.

Figure 1 shows the study area distribution of the students, who ages in between 17 to 20 years old. More than half of the students (N = 380) are studying Science, Health and Medical Science in this study. In addition, about thirty percent of students (N = 251) are studying Art and Humanity, Education and business.
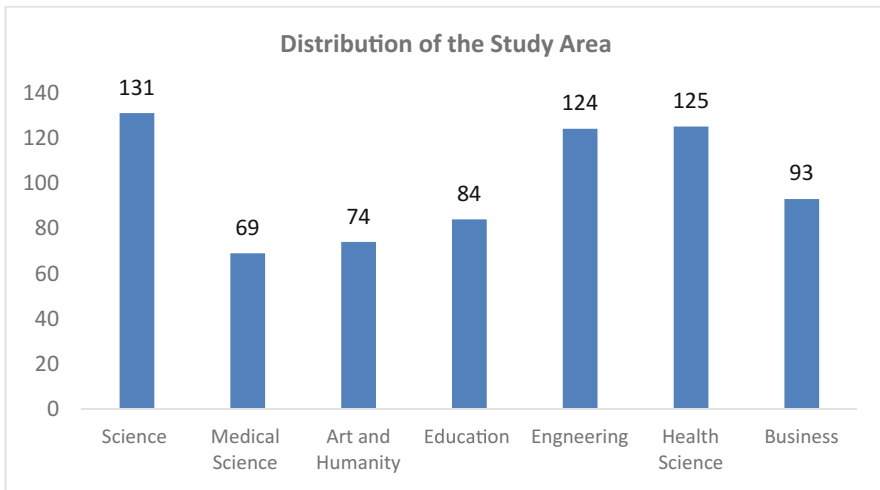

Distribution of the Study Area

Fig. 1.   Distribution of the study area

Figure 2 shows the students that selects the three areas of concern in mobile learning. Firstly, high percentage of students, which has mean = 4.2 and SD = 0.45, believe that teaching materials and contents are the main issues. Secondly, the mean = 4.2 and SD = 0.6 of students aware of the communication between the teacher and classmates. The other concerns, which are speed of internet, the devices, and the Apps, has the mean in between 2.3 to 3.6. It shows that students have its own understanding of studying mobility.

Figure 3 shows the reasons for using mobile learning or studying outside the school. Students consider that it provides a freedom of study with Mean = 4.2 and SD = 0.3. In addition, the result shows students (Mean = 3.75, SD = 0.6) presume that it could improve the study outcome. However, few students believe that mobile learning is a trend of future education, which has Mean = 2.9 and SD = 0.8.
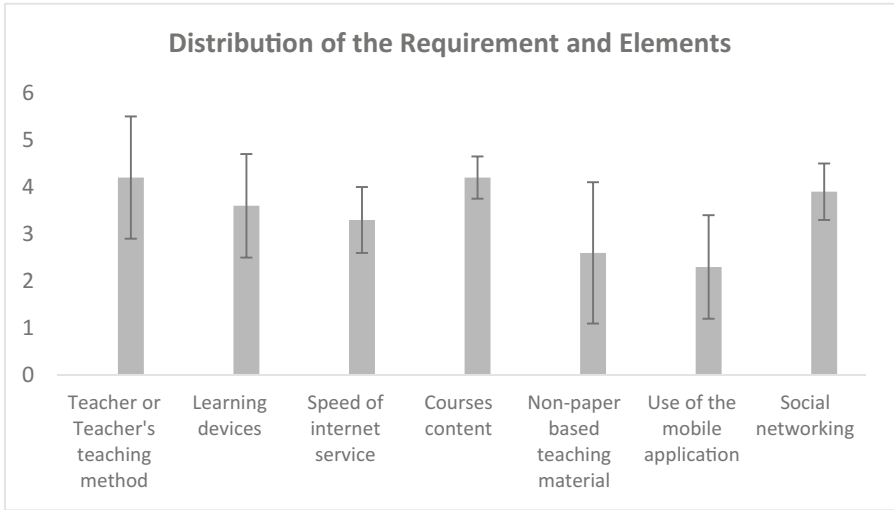
Distribution of the Requirement and Elements

Fig. 2. Distribution of the requirement and elements

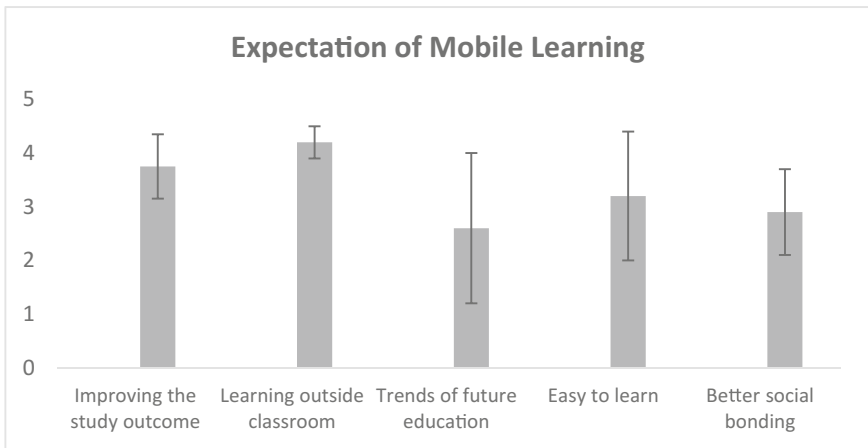**Expectation of Mobile Learning**

Fig. 3. Expectation of mobile learning

The results from an open question that is about the concern of using mobile learning shows in Fig. 4. More than half of students indicated that the opinions from their parents or peers into account are the main concern. Also, the financial issues of mobile learning are an important area that student would aware.

The statistical analysis was performed to investigate any significant difference in between the study area and requirement from the students. Table 1 shows the statistical results and have significantly different on teaching materials and contents with
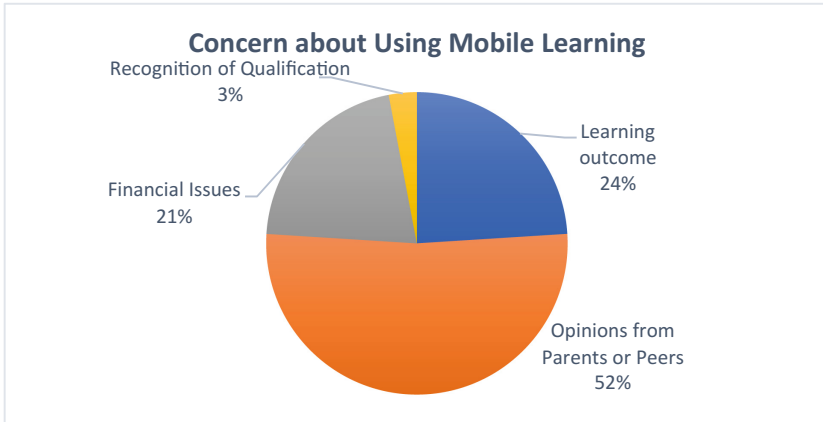
Fig. 4. Concern about using mobile learning

the medical students, which *P*-value is 0.02. In addition, the other statistical different is the Art and Humanity students and communication around the teacher and class-mates with *P*-value 0.045. Therefore, the results show that students studying in the different area would have a meaningful impact on the requirements and elements in the mobile learning.

Table 1. The statistical result of each study area and the requirements or elements of mobile learning

	Science	Medical Science	Art and Humanity	Education	Engineering	Health Science	Business
Teacher or teaching method	0.03*	0.02*	0.17	0.04*	0.07*	0.05*	0.23
Learning devices	0.09	0.067	0.02*	0.06	0.075	0.092	0.12
Speed of internet service	0.13	0.056	0.06	0.07	0.08	0.043*	0.05*
Courses content	0.08	0.02*	0.24	0.14	0.11	0.07	0.06
Non-paper-based teaching material	0.22	0.13	0.19	0.08	0.058	0.098	0.12
Use of the mobile Apps	0.23	0.09	0.18	0.12	0.06	0.087	0.07
Social networking	0.03*	0.04*	0.045*	0.02*	0.076	0.011	0.06

* *P*-value < 0.05

3.1 Model of Mobile Learning for Tertiary Education in Rural Area

The construction of the model has taken the statistical results and the results of the survey into account. Figure 5 shows the model of mobile learning for tertiary educa-tion in a rural area in China. The results are consistent with the expected demand on each study area in the college. For example, the Science, Medical Science, Engi-neering, and Health science major study show a high demand of the course content and

internet speeding, as these majors might include high-quality photos or videos into the teaching material. Therefore, the design process has involved these combinations.

For the mobile technology, a high-speed mobile network is required, as it might have high data transformation in between the users and the Apps. The current 4G or 4G + mobile network is able to encounter this problem now. Furthermore, the processing power of the mobile devices is also well enough to process a higher volume data flow at the same time without any bottom neck. Therefore, the mobile learning is applicable and feasible in term of mobile technology.

The model is encouraging students to study and improve their motivation. The interaction in between Apps and students is very important. It is because students have become more independent than before. They might ability to autonomous studies, such as references searching and notes taking skill. In the end, teachers may reduce the loading and the monitoring effect on student performance. Therefore, teachers could devote their time and energy to developing the teaching contents.

This model has integrated the assignment and examination elements. It is because students might like to have quizzes or mid-semester examination in a computerized way. Moreover, the online practical experiments could also be organized as an assignment tool for students, whom are studying science and engineering. It is true that online practical experiments are not applicable and feasible for some majors. However, it is necessary to put online practical experiments, as students might like to review the process of experiments about each experiment, which have done in the college. Therefore, assignment and examination maybe an element in the mobile learning Apps rather than paper-based rules and regulations to study.

Finally, the feedback from students is crucial to teachers' development. Teachers could review the discussion neither from the mobile learning or social networking Apps. Although students would like to have their own privacy to operate its group of discussion, this action is still encouraged students may get involved in their study and monitor each other.
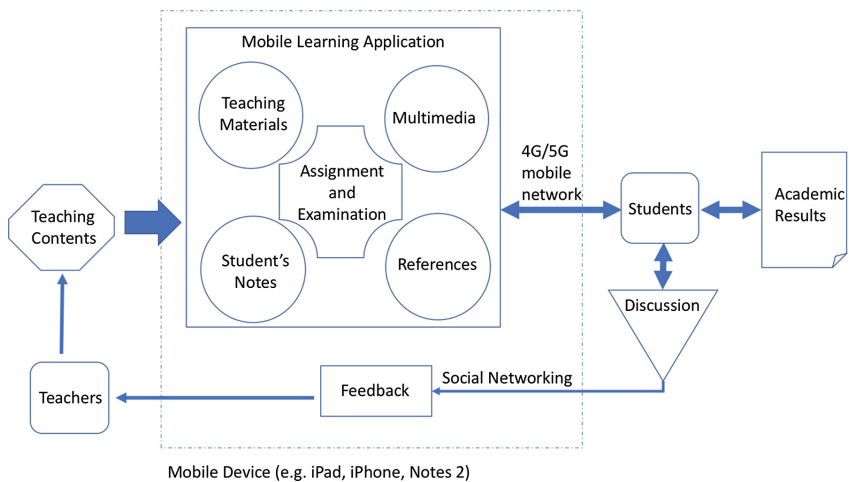

Fig. 5. The model of mobile learning for tertiary education in rural area in China

4   Discussion

The result shows that majority of students would prefer mobile learning as a study tool to help them outside the classroom. The perceptions are students would become active and freely in learning. Furthermore, the other understanding is that mobile learning could provide the benefits of improving the teaching resource and contents of the study.

The results on expectation on mobile learning show the motivation of study would be improved. It is because students are able to study freely outside the college. For example, students might not catch up the lectures very well. Since the computer technology has advanced and applied to the education system, mobile learning would create perform for students studying in a small screen. In this case, they can review the lectures and concurrently ask the questions while they are travelling back home. Furthermore, students have depended on the mobile devices. Further, they are willing to share the solution and help each other to resolve the problems in the study through the social media network. These Apps or software is easy to use and gives instantly responds. As a result, a study has integrated into the student's daily life, as their peers are kept pushing, coordinating, and monitoring each other. Finally, the study motivation and the study outcome would also be increased.

The model shows an improvement of teaching resources is not proportional because of the background or location of the college. Many of teachers may have already overlooked the creativeness of students. The results show that students are welcome to post and share their own study notes or simple drawings about the lecture. Furthermore, they may devote study times to reviewing the related lecture materials form other overseas colleges or universities. These approaches are encouraged in the learning process, as they keep learning something meaningful and filtering the study information. In addition, students could also share the result on the implementation in their own practical experiments and cases at home or in their workplace by making some movies. It is no doubt that e-learning system has already provided a perform to students in the college. However, mobile learning has removed the barriers in the e-learning, such as carrying a computer with a network connection. The advanced functions of mobile devices offer students an out of the box creativeness in the Apps. Therefore, students may be going to create its own learning process and resources that without the physical and financial limitation of college.

The limitation of this model has limited advanced educational tools. It is because the development of these tools requires many recourses, like manpower and financial. It is not practical for a tertiary college especially in a rural area in China. For this reason, a practical model should be refined in this study. Furthermore, the model does not have any measures about privacy protection. The right of using student's posted photos or videos might not be protected and limited for the college. Also, the copyright of teaching materials of overseas college and universities also have not been examined in this study. Further research studies are necessary to investigate issues on privacy and copyright protection and the effectiveness and the study outcome of students after experiencing mobile learning.

5   Conclusion

The technological advanced in the mobile industry has introduced the advantage and tools to the field of education. The survey results show that students believe that mobile learning could bring the freedom of study. Therefore, the model of mobile learning in China would be effective and applicable to tertiary college in rural China. However, further research should be initiated to investigate the effectiveness and application of mobile learning in China.

References

1. Filsecker, M., Hickey, D.T.: A multilevel analysis of the effects of external rewards on elementary students' motivation, engagement and learning in an educational game. Comput. Educ. **75**, 136–148 (2014)
2. Moreno-Ger, P., Burgos, D., Martínez-Ortiz, I., Sierra, J.L., Fernández-Manjón, B.: Educational game design for online education. Comput. Hum. Behav. **24**, 2530–2540 (2008)
3. Al-Emran, M., Elsherif, H.M., Shaalan, K.: Investigating attitudes towards the use of mobile learning in higher education. Comput. Hum. Behav. **56**, 93–102 (2016)
4. Dennen, P., Hao, S.: Intentionally mobile pedagogy: the M-COPE framework for mobile learning in higher education. Technol. Pedagog. Educ. **23**, 397–419 (2014)
5. Teri, S., et al.: Student use and pedagogical impact of a mobile learning application. Biochem. Mol. Biol. Educ. **42**, 121–135 (2014)
6. Sung, H.-Y., Hwang, G.-J., Liu, S.-Y., Chiu, I.H.: A prompt-based annotation approach to conducting mobile learning activities for architecture design courses. Comput. Educ. **76**, 80–90 (2014)
7. Hargis, J., Cavanaugh, C., Kamali, T., Soto, M.: A federal higher education iPad mobile learning initiative: triangulation of data to determine early effectiveness. Innov. High. Educ. **39**, 45–57 (2014)
8. Churchill, D., Fox, B., King, M.: Mobile Learning Design: Theories and Application. Springer, Singapore (2016). https://doi.org/10.1007/978-981-10-0027-0. Ed. by Churchill, D., Lu, J., Chiu, T.K.F., Fox, B.
9. Francese, R., Gravino, C., Risi, M., Scanniello, G., Tortora, G.: Using project-based-learning in a mobile application development course—an experience report. J. Vis. Lang. Comput. **31**, 196–205 (2015)
10. Mac Callum, K., Day, S., Skelton, D., Lengyl, I., Verhaart, M.: A multiple case study approach exploring innovation, pedagogical transformation and inclusion for mobile learning. In: Brown, Tom H., van der Merwe, H.J. (eds.) mLearn 2015. CCIS, vol. 560, pp. 315–329. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-25684-9_23
11. Shuib, L., Shamshirband, S., Ismail, M.H.: A review of mobile pervasive learning: applications and issues. Comput. Hum. Behav. **46**, 239–244 (2015)
12. Lai, C.-L., Hwang, G.-J., Liang, J.-C., Tsai, C.-C.: Differences between mobile learning environmental preferences of high school teachers and students in Taiwan: a structural equation model analysis. Educ. Tech. Res. Dev. **64**, 533–554 (2016)

13. Bannan, B., Cook, J., Pachler, N.: Reconceptualizing design research in the age of mobile learning. Interact. Learn. Environ. **24**, 938–953 (2016)
14. Briz-Ponce, L., Juanes-Méndez, J.A., García-Peñalvo, F.J., Pereira, A.: Effects of mobile learning in medical education: a counterfactual evaluation. J. Med. Syst. **40**, 136 (2016)
15. Fulantelli, G., Taibi, D., Arrigo, M.: A framework to support educational decision making in mobile learning. Comput. Hum. Behav. **47**, 50–59 (2015)
16. Fowler Jr., F.J.: Improving Survey Questions: Design and Evaluation, p. viii, 191. Sage Publications, Inc, Thousand Oaks (1995)
17. Krumpal, I.: Determinants of social desirability bias in sensitive surveys: a literature review. Qual. Quant. **47**, 2025–2047 (2013)
18. Kim, Y., Smith, D.: Pedagogical and technological augmentation of mobile learning for young children interactive learning environments. Interact. Learn. Environ. **25**, 4–16 (2017)
19. Melero, J., Hernández-Leo, D., Manatunga, K.: Group-based mobile learning: do group size and sharing mobile devices matter? Comput. Hum. Behav. **44**, 377–385 (2015)
20. Tabuenca, B., Kalz, M., Drachsler, H., Specht, M.: Time will tell: the role of mobile learning analytics in self-regulated learning. Comput. Educ. **89**, 53–74 (2015)