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# Empirical study on the important function of mobile interactive model for MOOC

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**Abstract**

This paper was studied on the important function of mobile interactive model for the Massive Open Online Course (MOOC) under Chinese context. We did empirical study to find out which function should be considered when designing a mobile MOOC platform. The author conducted a questionnaire in Distance Education School of Zhejiang University from the perspective of the main online learning users. We used the method of factor analysis by SPSS16.0 to analyze the research results. Through simplifying the interactive function of each module and analyzing the research results, the important function of mobile interactive model for MOOC composed of 5 modules and 7 factors were put forward. Our works have certain reference to the study of platform development and development for MOOC.

Keywords: Mobile learning, Interactive mode, Factor analysis, MOOC.

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## 1. Introduction

A Massive Open Online Course (MOOC) is an online course aimed at unlimited participation and open access via the web [1]. MOOC has developed rapidly recent years. The New York Times dubbed 2012 "The Year of the MOOC".

Most studies about MOOC now are educational articles or case studies. Phil Hill (2012) introduced what is MOOC and how it works [2] .Daniel T. Seaton (2013) did a case study about learners and what they did with a particular course on edX-platform [3]. Antonio Fini (2009) did a case study of MOOC to investigate lifelong learners' attitudes towards learning network technologies [4].

As well as the developing of MOOC, mobile learning is greatly developed with the spread of smartphone and pad.

Most studies focus on evaluating the effectiveness of mobile learning, and designing mobile learning systems. In China, how to build up a mobile learning system is a main research direction.

For the first direction, most studies showed mobile learning has positive effectiveness of both teachers and students. Hamid R.Abachi, Ghulam Muhammad (2013) found that in university, most students and teachers were strongly in favor of mobile learning [5]. However, there was also some studies showed negative. Doolittle and Mariano (2008) examined the effects of individual difference in working memory capacity (WMC) on learning from an historical inquiry multimedia tutorial in stationary versus mobile learning environment using a portable digital media player [6]. The results came out that students in a stationary instructional environment performed better, while interaction effects indicated that low-WMC students performed most poorly in a mobile instructional environment.

For the second direction, researchers designed their personal mobile learning platform. Wenqin Chen and Ying Wang (2010) put forward an m-learning model based on 3G technology to analyze the design idea and system structure of the system [7]. They also considered the key technology and environment that the system design and implementation involve. Zheng Peng (2010) put forward a design scheme of m-learning platform based on J2ME and J2EE Technology, which can avoid the huge difference between devices by using J2ME as client and provide efficient and stable service by using J2EE as the server [8].

We can see that MOOC will be a new kind of e-learning platform and m-learning will be the main way to study on line. Nowadays, most study about MOOC are based on desktop and studies about m-learning are not combined with MOOC. Thus we did empirical study on the important functions of mobile interactive model for MOOC to find out which function should be considered when designing a mobile MOOC platform.

## 2. Mobile interactive model for MOOC

For the sake that the research is scientific, this paper is based on the interactive model exploited by Anderson (2004) [9]. Through the analysis of each module in the model, the MOOC's mobile interactive model used in this study was developed to study on the interactive function between each module, as shown in Figure 1.

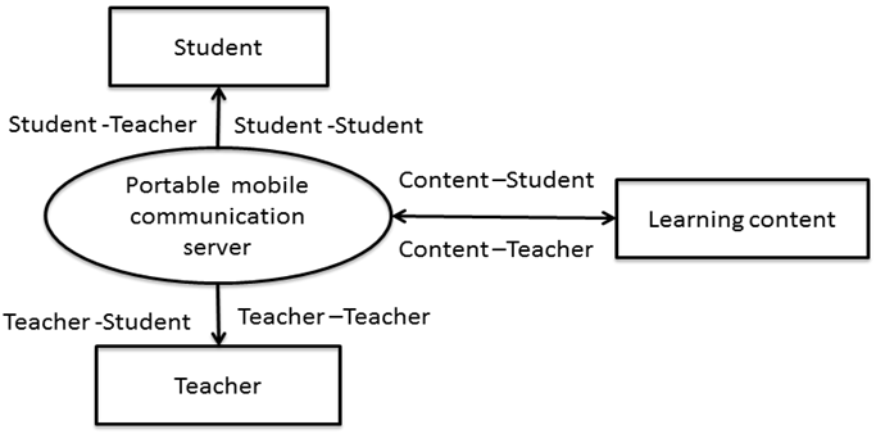


Figure 1. Mobile interactive model for MOOC

The model supports mobile phone for MOOC, PDA or handheld computer and other mobile communication equipment. It consists of three parts, namely, students, mobile learning guidance and professional support. And there are 5 kinds of interactions among the components (I1-I5): Interaction between students and teachers (I1) refers to synchronous or asynchronous communication between both sides based on network, which include e-mail, message, test pager, live video broadcast, live audio broadcast, class news, score, delivery box, feedback, teacher evaluation, curriculum, situational teaching, course notes, course outline, meeting discussion and simulation laboratory, and they are numbered from A1 to A16. Interaction between students and content (I2) refers that students use all kinds of learning resources provided by mobile interactive platform, including 16 functions which are coded from B1 to B16. They are class news, test, documents issued, video broadcast, audio broadcast, homework review, preferences, saving, help tools, resources links, course notes, homework release, e-book curriculum, students' learning progress and help from writing lab. Interaction of teachers and content (I3) refers that teachers not only develop, update and control learning contents and activities, but also create and maintain the structural learning resources. There are 12 functions including test, delivery box, setting homework, online community, situational teaching, course notes, resources link, e-book, curriculum, preferences, saving and students' learning progress from C1 to C12. Interaction between students and students (I4) refers to various communications between learners occurred in the process of using mobile interactive platform which include 8 functions from D1 to D8, which are e-mail, chatting talking, discussion, brainstorming version, image version, voting, annotation and community edition. Interaction between teachers and teachers (I5) refers that teachers who use mobile interactive platform exchange information and educational resources with each other. There are 6 functions from E1 to E6 which include teacher evaluation, teacher discussion, brainstorming version, e-mail and community edition.

## 4. Empirical study

### *3.1 Questionnaire survey*

This study chose the students in Distance Education School of Zhejiang University for questionnaire survey. A total of 150 questionnaires were issued, and 144 were valid, effective rate was 96%. This questionnaire adopted statistical standard Likert 5 subscales, the numbers 1, 2, 3, 4, 5, respectively corresponding to "strongly disagree" and "disagree", "not necessarily", "agree" and "strongly agree".

### *3.2 Variance contribution rate analysis*

The purpose of factor analysis is to extract some factors from the above 58 elements, these factors can illustrate the functions of mobile interactive model for MOOC to the maximum extent. The data was processed by SPSS16.0 software, the values of off-diagonal element in correlation matrix are mostly over 0.35. The result also shows that KMO index is over 0.8, and according to the metrics presented by Kaiser, the original variables are suitable for factor analysis and the effect is good. What's more, statistic significance probability in Bartlett sphere test is 0.000, which is less than l %. It means the sample data is enough, and the correlation coefficient matrix is not the unit matrix. So, the applicability of the factor analysis has met the requirements.

The author uses the Principal components analysis method to extract factor. Rotating analysis was carried out on each module except for the module of teacher-content student-student and teacher-teacher (these three modules can't be rotated when only one factor is extracted), then the variance contribution rate was concluded as shown in Table 1:

Table 1. the variance contribution rate of each module

| Module | Factors | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|---|
| | | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| Student -Teacher | 1 | 9.115 | 56.966 | 56.966 | 6.062 | 37.887 | 37.887 |
| | 2 | 1.159 | 7.244 | 64.210 | 4.212 | 26.323 | **64.210** |
| Student -Content | 1 | 8.989 | 56.181 | 56.181 | 5.414 | 33.839 | 33.839 |
| | 2 | 1.128 | 7.049 | 63.230 | 4.703 | 29.391 | **63.230** |
| Teacher -Content | 1 | 7.280 | 60.666 | **60.666** | | | |
| Student -Student | 1 | 5.125 | 64.062 | **64.062** | | | |
| Teacher -Teacher | 1 | 4.404 | 73.394 | **73.394** | | | |

### *3.3 Factor loading matrix analysis*

Above shows that cumulative variance contribution rates of the factors in each module were higher than 50% of the qualified requirements in ref. [10] (Nunnally and Bernstein, 1994). Therefore, the factor variables extracted by each module contain enough information that each function of the original data expressed.

Table 2. The factor loading matrix of each module

| Student -Teacher Principal Component | | | Student -Content Principal Component | | | Teacher -Content Principal Component | | Student -Student Principal Component | | Teacher -Teacher Principal Component | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | | 1 | 2 | | 1 | | 1 | | 1 |
| A1 | .417 | .584 | B1 | .596 | .574 | C1 | .724 | D1 | .811 | E1 | .868 |
| A2 | .486 | .588 | B2 | .551 | .668 | C2 | .859 | D2 | .769 | E2 | .872 |
| A3 | .556 | .602 | B3 | .416 | .746 | C3 | .780 | D3 | .826 | E3 | .814 |
| A4 | .241 | .855 | B4 | .626 | .330 | C4 | .819 | D4 | .825 | E4 | .871 |
| A5 | .146 | .864 | B5 | .706 | .326 | C5 | .814 | D5 | .851 | E5 | .862 |
| A6 | .445 | .630 | B6 | .707 | .465 | C6 | .847 | D6 | .806 | E6 | .852 |
| A7 | .628 | .450 | B7 | .444 | .491 | C7 | .801 | D7 | .754 | | |
| A8 | .730 | .401 | B8 | .777 | .225 | C8 | .742 | D8 | .755 | | |
| A9 | .699 | .358 | B9 | .822 | .223 | C9 | .649 | | | | |
| A10 | .716 | .368 | B10 | .727 | .355 | C10 | .690 | | | | |
| A11 | .801 | .161 | B11 | .761 | .291 | C11 | .834 | | | | |
| A12 | .680 | .461 | B12 | .479 | .633 | C12 | .757 | | | | |
| A13 | .743 | .387 | B13 | .298 | .663 | | | | | | |
| A14 | .790 | .144 | B14 | .061 | .757 | | | | | | |
| A15 | .656 | .405 | B15 | .337 | .710 | | | | | | |
| A16 | .653 | .296 | B16 | .418 | .684 | | | | | | |

After the factor loading matrix analysis as shown in Table 2, we selected 7 important factors affecting the quality of mobile interactive platform as shown in Table 3.

Table 3. Factor analysis result of the interactive learning modules

| Module | Factor1 | Factor2 |
|---|---|---|
| Student-Teacher | Information flow (A4,A5,A15,A16) | Mobile contact(A1-A3,A8-A10,A13) |
| Student-Content | Settings, references and inquiry(B4-B6,B7-B9, B13-B16) | Course content and course work (B1-B3,B10-B12) |
| Teacher-Content | Information exchange between teachers and content(C1 -C12) | |
| Student-Student | Information exchange between students (D1-D8) | |
| Teacher-Teacher | Information exchange between teachers (E1-E6) | |

The 8 interactive functions between students and students can be summarized as "information exchange between students", which mean the students and students can contact anytime and anywhere on the MOOC's mobile interactive platform, denoted as F1. The functions of students and contents, teachers and teachers are simile to the function of students and students, denoted as F2, F3. The interactive functions between teacher and student can be integrated to two factors: " "information flow" reflect the free exchange of information between students and their teachers, denoted as F4. "mobile contact" reflect the teachers can contact with students for activity whenever and wherever possible according to their own will by mobile devices, denoted as F5. The interactive functions between students and content can

be summarized as two factors: "Settings, resources and inquiry", denoted as F6, meaning that students can use mobile devices for all MOOC's information and consultation. "Course content and course work " reflect the content function of mobile interactive platform, denoted as F7.

## 4. Conclusions

The conclusions obtained in this paper have contributions both in theory and practice. From the theoretical perspective, this paper conducts an empirical study from a new perspective of mobile interaction for MOOC, which is more scientific, comprehensive and complete than the existing research and provides theoretical foundation for the future related research. From the practical point of view, it has the following value: On the one hand, according to the analysis results, asking experts to score 7 factors from five aspects (namely the five modules) helps to evaluate of mobile interactive platform for MOOC from the view of quantitative and provide a scientific decision basis for the follow-up to improve the function of the platform. On the other hand, platform developers can refer to the evaluation criteria to meet personalized needs about MOOC of main users more targeted and better, so as to improve the learning effect and the utilization rate of MOOC.

However, the author put forward the elements and functions in the context of Chinese mobile interactive platform for MOOC should have, instead of presenting a specific evaluation scale. Future research may use the 7 factors as indicators of the secondary to design a questionnaire. On the basis, an exploratory factor analysis should be carried out. Finally, an evaluation index system of mobile interactive platform for MOOC will be concluded.

## 5. Acknowledgement

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