

A Development of E-Learning Readiness Assessment System for Undergraduates of Xingyi Normal University for Nationalities of China.

การพัฒนาระบบประเมินความพร้อมการจัดการเรียนรู้ E-Learning สำหรับนักศึกษาในระดับปริญญาตรี มหาวิทยาลัยแห่งชาติ Xingyi

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Abstract

The purposes of this study were 1) to develop an E-learning readiness assessment system, 2) to study the component of E-learning readiness using the exploratory factor analysis (EFA), 3) to assess E-learning readiness of undergraduate students in Xingyi normal University for nationalities, and 4) to compare the difference of E-learning readiness of the School of Biology and Chemistry and the School of Information and Technology. This research was the Research and Development design (R&D). The sample was the first-year, the second-year, and the third-year students in the School of Biology and Chemistry and School of Information and Technology. A total of 642 samples were selected by stratified random sampling technique. An E-learning readiness assessment system was developed based on PHP technology and MySQL database which aim to obtain efficient and accurate collection of investigation data. The instrument used to collect data was a web-based questionnaire survey system. The results of the questionnaire survey were analyzed using statistical methods such as descriptive statistics, T-test, analysis of variance, exploratory factor analysis and principal component analysis. The results shown that there were five dimensions of E-learning readiness questionnaire survey system consisted of learning conditions and support, learning basic skills, computer application skills, learning attitude and self-management skills respectively. The findings indicated that undergraduate students had better learning conditions and support. They had moderate level of learning basic skills and computer application skills.

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However they were lower of learning attitude and self-management skills. The results of comparison between the two schools found that students in the School of Information and Technology demonstrated certain professional advantages in E-learning readiness.

Key Words: E-learning Readiness, E-learning Readiness Assessment System, Undergraduate Students

บทคัดย่อ

การศึกษาวิจัยนี้มีวัตถุประสงค์ดังนี้ 1) เพื่อพัฒนาระบบประเมินความพร้อมในการเรียนรู้รูปแบบ E-learning 2) เพื่อศึกษาองค์ประกอบของระบบประเมินความพร้อมในการเรียนรู้รูปแบบ E-learning 3) เพื่อประเมินความพร้อมในการเรียนรู้รูปแบบ E-learning ของนักศึกษาระดับปริญญาตรี ในมหาวิทยาลัย Xingyi normal University for nationalities ประเทศจีน และ 4) เพื่อเปรียบเทียบความพร้อมในการเรียนรู้รูปแบบ E-learning ของนักศึกษาระดับปริญญาตรีระหว่างคณะเทคโนโลยีสารสนเทศและคณะศึกษาศาสตร์ มหาวิทยาลัย Xingyi normal University for nationalities ประเทศจีน และ 4) เพื่อเปรียบเทียบความพร้อมในการเรียนรู้รูปแบบ E-learning ของนักศึกษาระดับปริญญาตรีระหว่างคณะเทคโนโลยีสารสนเทศและคณะศึกษาศาสตร์ มหาวิทยาลัย Xingyi normal University for nationalities ประเทศจีน และ 4) เพื่อเปรียบเทียบความพร้อมในการเรียนรู้รูปแบบ E-learning ของนักศึกษาระดับปริญญาตรีระหว่างคณะเทคโนโลยีสารสนเทศและคณะศึกษาศาสตร์ มหาวิทยาลัย Xingyi normal University for nationalities ประเทศจีน

รูปแบบการวิจัยครั้งนี้เป็นรูปแบบวิจัยและพัฒนา กลุ่มตัวอย่างที่ใช้ในการศึกษาคือ นักศึกษาชั้นปีที่ 2 และชั้นปีที่ 3 ที่กำลังศึกษาอยู่ในคณะเทคโนโลยีสารสนเทศและคณะศึกษาศาสตร์ มหาวิทยาลัย Xingyi normal University for nationalities ประเทศจีน จำนวน 642 คนซึ่งได้มาโดยการสุ่มแบบแบ่งกลุ่ม ระบบประเมินความพร้อมในการเรียนรู้รูปแบบ E-learning ถูกพัฒนาขึ้นโดยใช้เทคโนโลยี PHP และ MySQL เป็นฐานข้อมูลในการพัฒนาทั้งนี้มีวัตถุประสงค์เพื่อการเก็บรวบรวมข้อมูลที่แม่นยำ เครื่องมือที่ใช้ในการเก็บรวบรวมข้อมูลได้แก่ แบบสอบถามผ่านระบบเว็บไซต์ สถิติที่ใช้ในการวิเคราะห์ข้อมูลที่ได้จากแบบสอบถาม ประกอบด้วยสถิติเชิงพรรณนา สถิติค่า t-test การวิเคราะห์ความแปรปรวน และการวิเคราะห์องค์ประกอบ ผลการพัฒนาระบบประเมินความพร้อมในการเรียนรู้รูปแบบ E-learning พบว่าองค์ประกอบของระบบมีดังนี้ สถานะในการเรียนรู้และการสนับสนุน ทักษะพื้นฐานในการเรียนรู้ ทักษะการประยุกต์ใช้คอมพิวเตอร์ ทักษะคิดด้านการเรียนและทักษะการบริหารจัดการตนเอง ผลการศึกษาความพร้อมในการเรียนรู้รูปแบบ E-learning ของนักศึกษาระดับปริญญาตรี ในมหาวิทยาลัย Xingyi normal University for nationalities ประเทศจีนพบว่า นักศึกษามีสถานะในการเรียนรู้และการสนับสนุนที่ดีขึ้น มีทักษะพื้นฐาน ในการเรียนรู้ ในระดับปานกลาง อย่างไรก็ตามพบว่านักศึกษามีทัศนคติด้านการเรียนและทักษะการบริหารจัดการตนเองในระดับต่ำ ผลการเปรียบเทียบความพร้อมในการเรียนรู้รูปแบบ E-learning ของนักศึกษาระดับปริญญาตรีพบว่า นักศึกษาระดับปริญญาตรีในคณะเทคโนโลยีสารสนเทศได้ประโยชน์จากเรียนรู้รูปแบบ E-learning มากกว่านักศึกษาในคณะศึกษาศาสตร์และคณะ

คำสำคัญ : ความพร้อมในการเรียนรู้รูปแบบ E-learning, ระบบประเมินความพร้อมในการเรียนรู้รูปแบบ E-learning, นักศึกษาระดับปริญญาตรี

Introduction

Higher education plays a major role in the economic development of a society. It provides advanced skills, which enable high productivity and improved quality of life (Ramos, 2000), which is why the developed world prioritizes higher education for advanced skills that command a premium in today's workplace (UNESCO, 2011). At the present, profound changes have taken place in the teaching mode of universities, and gradually evolved from the traditional teaching mode to a combination of traditional mode and modern technology. The E-learning mode has received extensive attention and development.

The concept of E-learning has been discussed in recent years by many institutions and researchers under the topics of "online learning", "distance learning", "distance education" or "virtual learning" (Smith, 2011). E-learning is currently a common form of self and organized education. E-learning is becoming an increasingly widespread approach in higher education institutions around the world (Reddy, 2017). E-learning plays a major role in improving undergraduate students' self-organized learning ability for contemporary undergraduate students. However its effectiveness ultimately depends on the degree of acceptance and use within the target population (Teo, 2016).

Nowadays, E-learning has been identified to be the future of learning worldwide since the very powerful platform of the internet has accelerated the speed of communication. Adoption of E-learning has become the latest trend across universities all over the world. Today, E-learning is a common delivery media for education and training within many organizations. Since the upsurge of internet use in

the mid-1990s, the characteristics of distance education, particularly in economically developed countries, have changed substantially. E-learning mode has gradually transitioned from a network-based mode to a mobile terminal's smart phone terminal mobile learning mode. E-learning is the use of network technology to design, deliver, select, manage and expand learning (Cross, 1999).

E-learning is internet-based learning, including content delivery in various formats, management of learning processes, learning communities, developed content experts (Ramos, 2000). E-learning delivers content through all electronic media including the Internet, LAN, satellite radio, video, audio, interactive TV and CD-ROM (Surjono, 2011); E-learning uses the Internet and the internet technology to create and deliver content to aid lifelong learning (Means, 2013). Moreover, E-learning uses the power of the web to make learning happen when and where (Barron, 2000). In short, E-learning is a learning method related to networking digitalization and electronicization. Its advantage lies in providing a low-cost, fast, efficient, and flexible learning path. It is characterized by revolutionary, unprecedented, continuous education and lifelong learning; its learning content is personalized, learners can choose learning content according to their needs, knowledge background, personal preferences, learning style learners are the masters of learning, they are responsible for their own learning; its form is dynamic, advancing with the times, and constantly developing. Its direct purpose is to achieve maximum benefit in the shortest possible time with minimal training or learning. Currently, Chinese undergraduate students' smart mobile terminals have become popular,

round of the test. In the course of the questionnaire test, researchers recorded the details and the suggestions of the subjects for the modification of the design form. After the questionnaire was revised, researchers invited experts in the field of education, teachers and learners to test and modify the items that were difficult to understand or were ambiguities to form the final questionnaire. The subjects were asked to self-assess the conformity of each item and evaluate their grades. After testing, Cronbach $\alpha = 0.911$, indicated that the internal consistency of the questionnaire is highly reliable. At the same time, 60 learners were

invited to test the stability and reliability of the questionnaire system, indicated that the online questionnaire system is stable. The questionnaire published in the campus network, and the respondents notified to register and complete the questionnaire.

Phase 3. Data analysis

The results of the questionnaire survey were analyzed using statistical methods such as descriptive statistics, analysis of variance, exploratory factor analysis and principal component analysis. The SPSS software was used to conduct a comparative analysis of two schools (T-test) and other factors analysis.

Results

1) The result of development an E-learning readiness assessment system

According to the E-learning readiness assessment system it included 7 function modules as follows:

- 1) User registration module
- 2) User questionnaire module
- 3) Administrator module
- 4) School administrator
- 5) Query module
- 6) Result analysis module
- 7) CVS file module.

2) The results of studying the components of E-learning readiness by using Exploratory Factor Analysis (EFA) method.

There were three aspects of exploratory factors which analyzed and the results shown as follows;

2.1) Reliability analysis of the questionnaire

Cronbach α coefficient was used to analyze the reliability of the questionnaire. In general, if the reliability coefficient of the questionnaire α value is above 0.9, the reliability of the questionnaire is better, and the reliability is above 0.8, which is relatively good. The results of 613 valid questionnaires were collected. The results were standardized according to the scoring rules, and then the reliability analysis was carried out by using SPSS software. The results were shown in the Table

Table 1 Reliability analysis of the questionnaire

Category	Cronbach's Alpha	Item No.
Whole questionnaire	0.928	32
Learning attitude	0.779	6
Learning basic skills	0.819	8
Computer application skills	0.772	4
Self-management skills	0.859	9
Learning conditions and support	0.796	5

2.2) Validity analysis of the questionnaire

The questionnaire with reliability may not have validity, so it is necessary to analyze the validity of the questionnaire, in table 2 KMO and Bartlett test were used to analyze the validity. The results were shown in the Table 2.

Table 2 KMO and Bartlett test

KMO and Bartlett test	
Kaiser-meyer-olkin measurement of sampling adequacy	0.932
Chi square approximation	7870.857
Bartlett ball test df	496
Sig.	0.000

The data in the above table indicated that KMO value of the questionnaire statistical results is 0.932, and the Bartlett ball test with a significant level of 0.05 which is passed. The questionnaire had a high structural validity.

2.3) Cluster analysis of the questionnaire and factor analysis

The statistical results of the 32 questions in the questionnaire were analyzed and clustered by using SPSS software. The 32 questions are clustered into 5 branches, 1- 1, 1 -2, 1,4-4 ,3-4 ,2-4 ,1-4 ;5-3 ,4-3 ,3-3 ,2-3 ,1-3 ; 8-2 ,7-2 ,6-2 ,5-2 ,4-2 ,3-2 ,2-2 ,1-2 ;6-1 ,5-1 ,4-1 ,3-4-5 ,3-5 ,2-5 ,1-5 ;9-4 ,8 4 ,7-4 ,6-4 ,5-4. The variables corresponding to each question are gathered into one branch; therefore, the questionnaire statistical results are consistent with the preset 5 dimensions (common factor).

3. The results of assessment E-learning readiness of undergraduate students

In this study, a total of 642 questionnaires were distributed and 613 valid questionnaires were returned. The questionnaire recovery rate was 95.48%. According to the original design scheme, E-learning readiness of undergraduate students of Xingyi Normal University for Nationalities was assessed using mean and standard deviation. The results were shown in Table 3

Table 3 Mean and standard deviation of sub-items in each dimension of E-learning readiness
Table 3 Mean and standard deviation of sub-items in each dimension of E-learning readiness (Continued)

Readiness dimension	Investigation item content	Means	Standard deviation
Learning attitude	1-1 Responsibility awareness of E-learning	3.636	0.8135
	1-2 Clear learning motivation	3.586	0.7650
	1-3 Recognize the learning autonomy required for E-learning	3.705	0.7810
	1-4 Know the characteristics of E-learning	3.241	0.8089
	1-5 think that time and energy should be invested	3.802	0.7694
	1-6 Be prepared for any learning difficulties	3.868	0.7548
Learning basic skills	2-1 Basic reading and writing skills	4.044	0.7249
	2-2 Clearly express your personal opinion	3.793	0.7248
	2-3 Know the learning method that suits you	3.705	0.7627
	2-4 Find ways to solve learning problems	3.879	0.7128
	2-5 Ability to complete homework and preparation	3.947	0.6865
	2-6 Professional Basics Tutoring	3.642	0.7049
	2-7 Know the path to improve learning efficiency	3.527	0.7338
	2-8 Ability to study independently and intently	3.790	0.7019
Computer application skills	3-1 Online Information Browsing	4.017	0.7484
	3-2 Network Data Retrieval	3.897	0.7633
	3-3 Sending and receiving mail and file transfer	3.906	0.8026
	3-4 Online Communication and Discussion	3.727	0.8164

Readiness dimension	Investigation item content	Means	Standard deviation
Self-management skills	4-1 Develop a suitable study plan	3.671	0.7718
	4-2 Complete E-learning task as planned	3.663	0.7354
	4-3 Self-monitoring E-learning progress	3.655	0.6870
	4-4 Adjust the plan according to the specific situation	3.763	0.7211
	4-5 Dealing with the problem of work and home	3.696	0.7611
	4-6 Excluding interference and persistence in E-learning	3.520	0.7211
	4-7 Arranging a fixed study time	3.484	0.7615
	4-8 consciously urge yourself to learn	3.712	0.7251
	4-9 Investigation and reflection on learning effects	3.666	0.7453
Learning conditions and support	5-1 Get support from family	4.342	0.7616
	5-2 Get support from the school	4.063	0.7799
	5-3 Basic computer and network environment	3.851	0.8469
	5-4 Tuition is guaranteed	3.870	0.8646
	5-5 Basic learning environment	3.972	0.7998

According to the scores and standard deviation of the data items, the standard deviation is low and the data validity is high because of the elimination of invalid questionnaires. The overall situations of students' E-learning are relatively consistent, and the individual differences are small shown that students' understanding of E-learning is generally consistent.

Table 4 Means value of E-learning readiness in each dimension

	Learning attitude	Learning basic Skills	Computer application skills	Self-management skills	Learning conditions and support
Means	3.648	3.798	3.887	3.648	4.020

The overall analysis of the sample showed that students' learning attitude and self-management skills score were shown in low level, learning conditions and support score were shown in the highest level, learning ability and computer application ability were shown in the middle level.

4. The results of comparison the difference of E-learning readiness between the School of Biology and Chemistry and the School of Information and Technology

The results of the differences in E-learning readiness of undergraduate students with different professional backgrounds (School of Biology and Chemistry and School of Information

and Technology) were analyzed using the T-test statistics method. It mainly analyzed the differences between 32 skills in the School of Biology and Chemistry and the School of Information and Technology. Through this research, the researchers expected to find that the advantages and disadvantages of Information and Technology majors and Biology and Chemistry majors in different dimensions of E-learning readiness and different competency projects. The application of the research results provided a basis guide for the subsequent targeted training of students to carry out E-learning the comparison of mean values of E-learning readiness for different professional backgrounds were shown in Table 5

Table 5 Comparison of mean values of E-learning Readiness for different professional backgrounds

	Learning attitude	Learning basic skills	Computer application skills	Self-management skills	Learning conditions and support
Means (School of Biology and Chemistry)	3.626	3.781	3.900	3.644	3.998
Means (School of Information and Technology)	3.677	3.740	3.980	3.660	4.075
P value	0.078	0.174	0.015*	0.465	0.018*

Note: *Indicated the significant level was $p < 0.05$.

From Table 5, the results indicated that different professional backgrounds affected on E-learning readiness of undergraduate students as follows. As shown the table, in computer application ability and learning conditions and support dimensions, students in School of Information and Technology were significantly better than students in the School of Biology and Chemistry.

Discussion

According to the results of the study, it could be discussed as follows;

1. In the questionnaire system, users can log in, answer questions, send out volumes, and submit questionnaires at the front desk. The administrator can perform related operations on user information and questionnaire information. The system can analyze the survey results according to the information recorded in the background database. The system can realize online questionnaire E-learning readiness assessment.

2. Analysis of E-learning readiness of undergraduate students

2.1 The questionnaire results were demonstrated, and the questionnaire had high validity and reliability. KMO and Bartlett test indicated that the questionnaire had higher validity and reliability. The cluster analysis results obtained that the five principal components were consistent with the preset five dimensions, and exploratory factor analysis can be conducted. The principal component analysis showed that the preset 5 dimensions reflected E-learning readiness of undergraduate students.

2.2 According to the scores and standard deviation of the data items, the standard deviation was low, and the data validity was high by the elimination of invalid questionnaires. The overall situation of students' E-learning was relatively consistent, and the individual differences were small, which showed that students' understanding of E-learning was generally consistent.

In terms of learning attitude, the results indicated that undergraduate students had insufficient understanding of the characteristics of E-learning. From the perspective of scores, the scores of undergraduate students

who scored less than 2.0 on E-learning characteristics accounted for 15.17% of the total surveys; which in agree with the need for time and energy input is not high, and E-learning learners tend to overestimate the flexibility of time and underestimate the conditions and efforts required for E-learning (Ivan and Harrell, 2012).

The research by Li and Sakiroglu (Li & Liu, 2017, Sakiroglu & Dikilitas, 2012) shown that the better academic performance, the past success will increase the level of learner motivation. Therefore, students in the western region of China had a poorer academic performance and a lower sense of achievement in the learning process. Learning motivation was poor. This may be the cause of poor students' learning attitude and self-management skills.

According to the study, the average online time of most undergraduate students in China is less than 4 hours (55.5%), of which 42.9% of college students spend 2-4 hours online; the proportion of people who spend 4-6 hours online every day is 27.1%, 17.4% undergraduate students spend more than 6 hours online each day (Wang, 2018). Comprehensive comparison the data for the four years of 2014-2017 found that the average daily value of undergraduate students' online time increased year by year, and the proportion of people who spent more than 4 hours online every day increased from 35.6% in 2014 to 44.5% in 2017. However, the survey found that college students' online destinations are ranked according to the selection ratio from high to low, followed by "entertainment and recreation" (71.9%), "learning" (61.5%), "communication" (59.1%), and "getting news information" (57.8). %, "Business Transactions" (5.2%) and "Others" (2.4%). Studies shown that students in key universities and universities, the

proportion of E-learning time in online time is concentrated between 10% and 30%, accounting for a relatively low proportion (Wang, 2018). Therefore, this can be explained that the scores of undergraduate students were lower in E-learning attitudes. These results were in line with the results of the present study. Besides, the study of (Guo, 2012) showed that due to the influence of traditional basic education mode, the lack of self-management skill of Chinese college students is a common phenomenon, which is also the reason why the score of self-management skill of undergraduates was low in this study.

The results of this study are basically consistent with the results of the learning attitude and self-management ability of Chinese common universities and key universities. The learning attitude and self-management skills of common University students are low (Qin, 2008). Self-management skills due to its critical influence on students' E-learning outcomes (Abar & Loken, 2010), which are widely used in the evaluation of learning readiness. Compared with Huang's (2012) study of Chung Yuan Christian University (Taiwan), this study has a lower value in self-management skills dimension.

2.3 Personal factors influence on E-learning readiness. The analysis results of the present study were similar to the research by (Peng et al, 2019) which showed that female undergraduates' academic performance is significantly higher than male students, and female students' learning attitude, learning time and learning motivation are significantly better than male students, which is consistent with the results of high E-learning readiness of female students. There are differences in E-learning readiness for age at different ages, higher E-learning readiness for low age and

older age, and low E-learning readiness for middle age students. This may be related to the student's psychological maturity, but also to the student's knowledge and ambition of learning (Ji, 2011). The older students had a clearer learning purpose and career plan, the younger students were more likely to accept the guidance of teachers and have better motivation to learn.

In terms of Nation, the results may be that the Han students and minority students in this University have basically the same birthplaces, and they have similar learning experiences and social living environments. There was no significant difference in ethnicity and hometown (from urban and rural students). It may be that the Han students and minority students in this University have basically the same birthplaces, and they have similar learning experiences and social living environments. The difference between E-learning readiness of students from urban and rural is very small. The results may be because the students of this University are mainly from small and medium size cities. With the rapid development of China's economy in recent years, the differences of social factors between rural and urban, such as the level of economic development, educational levels and learning ambition are narrowing. Therefore, E-learning readiness does not show significant differences.

Students from other provinces are better E-learning Readiness than students from Guizhou province (learning attitude, $P < 0.05$). This is in accordance with the research by (Li and Liu, 2017) identified that students from the western region had lower learning motivation. The research results may be due to the relatively weak basic education in Guizhou and lower in student learning habits and motiva-

tions, which also explained the reasons for the low learning attitude scores of students from Guizhou Province.

3. E-learning is a form of self-organized learning based on computer skills and networks. Undergraduate students of School of Information and Technology had the study experience in various computer specialty laboratories. They had a lot of opportunities to use computers for professional learning in traditional teaching. Therefore, they had better computer knowledge and operation skills, as well as Internet application capabilities. The results was consistent with the students' professional characteristics, and the results reflected their professional advantages.

Conclusion

According to the results of this study, the conclusions are as follow:

1) Undergraduate students have good conditions and support for E-learning.

2) Undergraduate students have strong computer application ability for E-learning.

3) Undergraduate students in ethnic minority areas are generally deficient in learning attitude, learning skills and self-management skills.

4) Most importantly, the evidence of this study provided key guiding significance for improving undergraduate students' E-learning readiness and E-learning course construction.

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