



A development of E-Learning Readiness assessment system for Undergraduate
Students of Xingyi Normal University for Nationalities

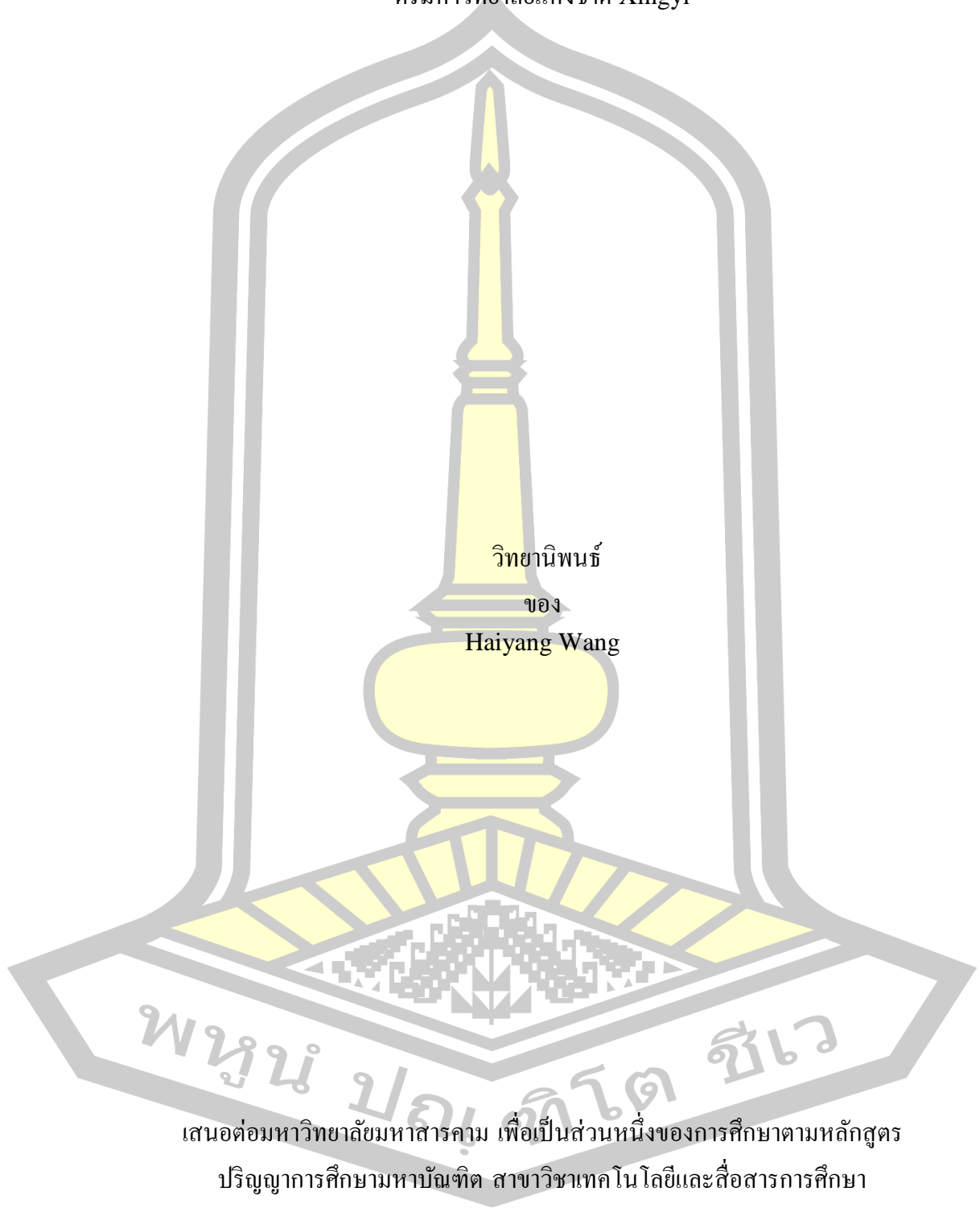
Haiyang Wang

A Thesis Submitted in Partial Fulfillment of Requirements for
degree of Master of Education in Educational Technology and Communications

August 2020

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การพัฒนาระบบประเมินความพร้อมการจัดการเรียนรู้ E-Learning สำหรับนักศึกษาระดับปริญญา
ตรีมหาวิทยาลัยแห่งชาติ Xingyi

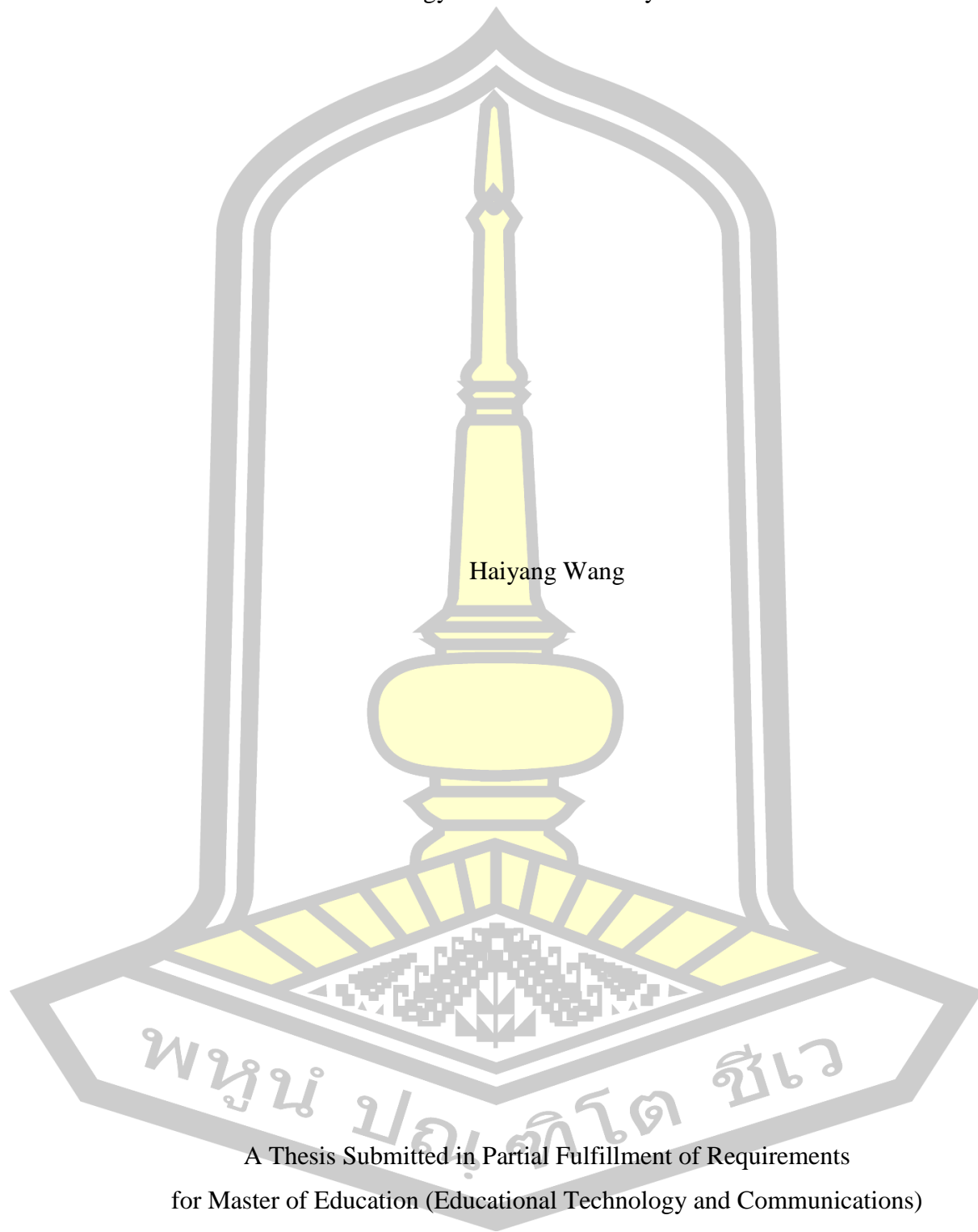


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A development of E-Learning Readiness assessment system for Undergraduate
Students of Xingyi Normal University for Nationalities



Haiyang Wang

A Thesis Submitted in Partial Fulfillment of Requirements
for Master of Education (Educational Technology and Communications)

August 2020

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ABSTRACT

In this study, PHP (full name Hypertext Preprocessor) technology and B/S (Browser/Server) architecture patten were used to develop E-learning readiness assessment system for undergraduate students. The system was used to conduct a questionnaire survey on 642 undergraduate students of the School of Biology and Chemistry and the School of Information Technology of Xingyi National Normal University for Nationalities. The research results and research conclusions are as follows:

The study recovered 613 valid questionnaires, and the questionnaire recovery rate was 95.48%. The statistical analysis of the questionnaire results showed that the quality of the questionnaire was satisfactory. The overall analysis of the sample shows that students' learning attitude and self-management skills score were low, learning conditions and support score were the highest, and learning Ability and computer application ability were in the middle level.

Studies show that Personal factors such as gender, age Nation, Age, Nation, Hometown (Guizhou or Other provinces), Student Origin (Urban or Rural), parental education level have a certain impact on undergraduate students' E-learning readiness.

Compared with the e-learning readiness of the school of information and technology and the school of biology and chemistry, the school of information and technology has a higher degree readiness.

Based on the results of this study, the study obtained the following conclusions:

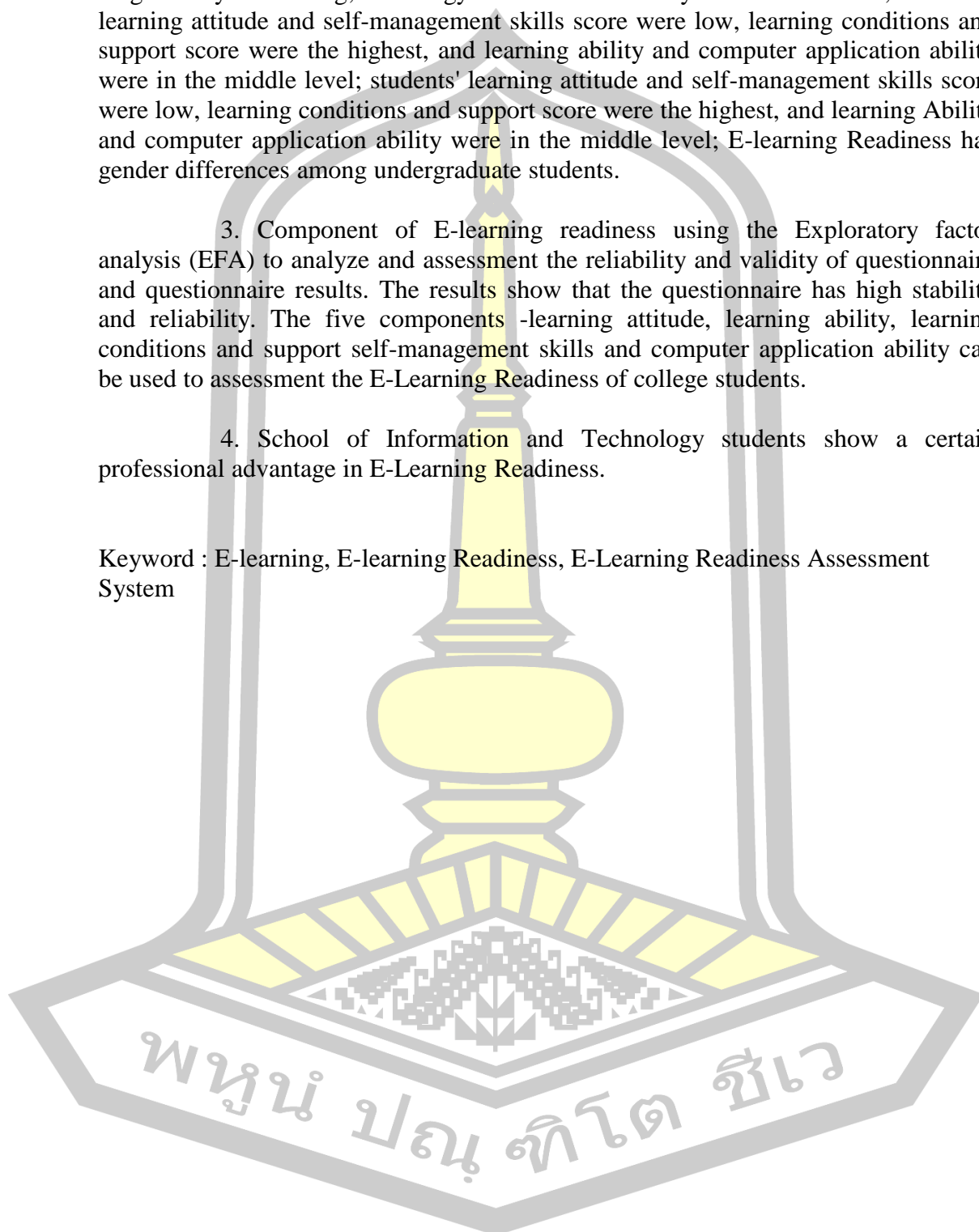
1. Obtain a reliable E-Learning Readiness assessment system.
2. Students have the ability to use the network and e-learning resources for learning and a certain degree of E-learning awareness; Currently, the university

provides a platform for undergraduate students to conduct e-learning, and the content is gradually increasing; In Xingyi Normal University for Nationalities, students' learning attitude and self-management skills score were low, learning conditions and support score were the highest, and learning ability and computer application ability were in the middle level; students' learning attitude and self-management skills score were low, learning conditions and support score were the highest, and learning Ability and computer application ability were in the middle level; E-learning Readiness has gender differences among undergraduate students.

3. Component of E-learning readiness using the Exploratory factor analysis (EFA) to analyze and assessment the reliability and validity of questionnaire and questionnaire results. The results show that the questionnaire has high stability and reliability. The five components -learning attitude, learning ability, learning conditions and support self-management skills and computer application ability can be used to assessment the E-Learning Readiness of college students.

4. School of Information and Technology students show a certain professional advantage in E-Learning Readiness.

Keyword : E-learning, E-learning Readiness, E-Learning Readiness Assessment System



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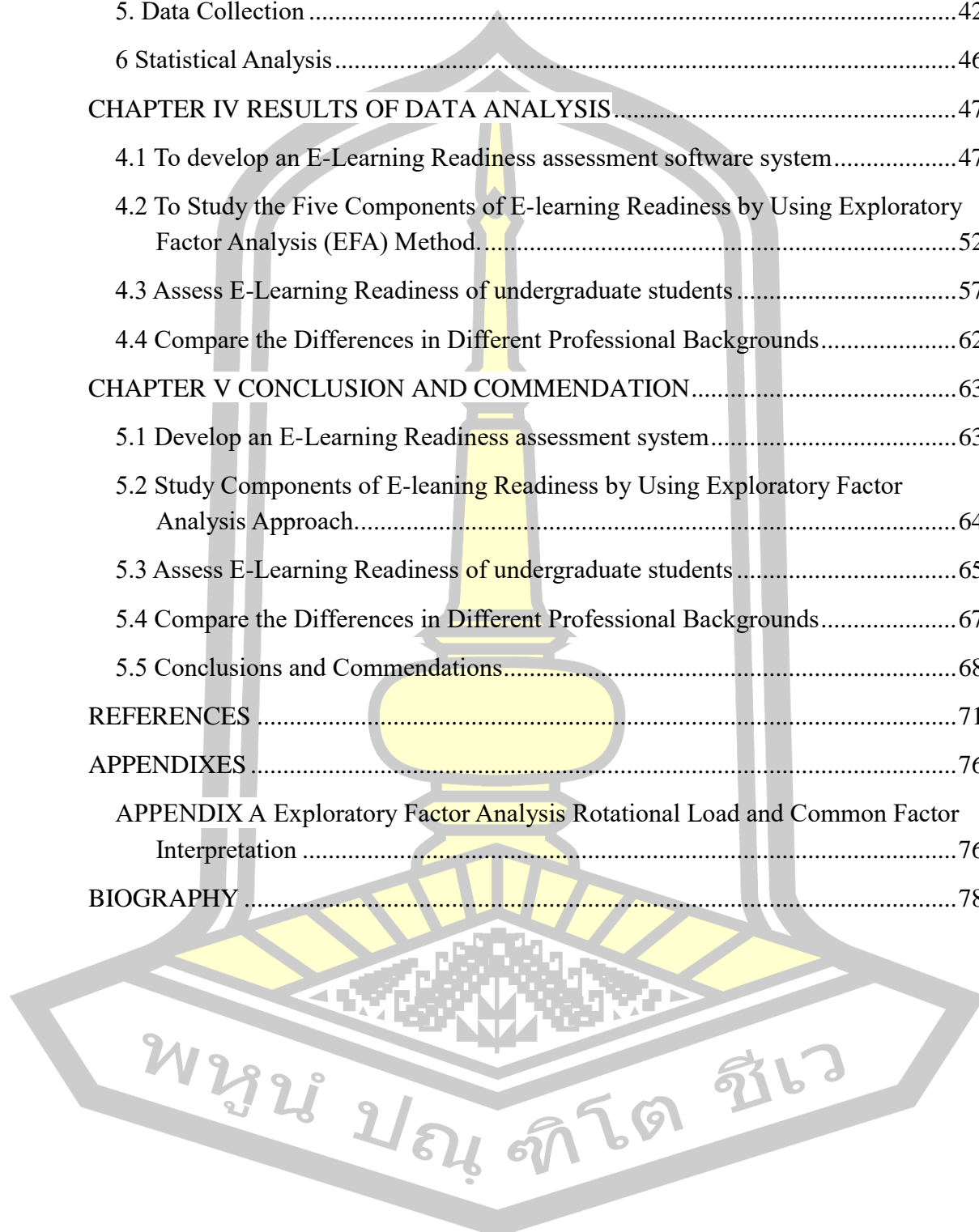
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Haiyang Wang

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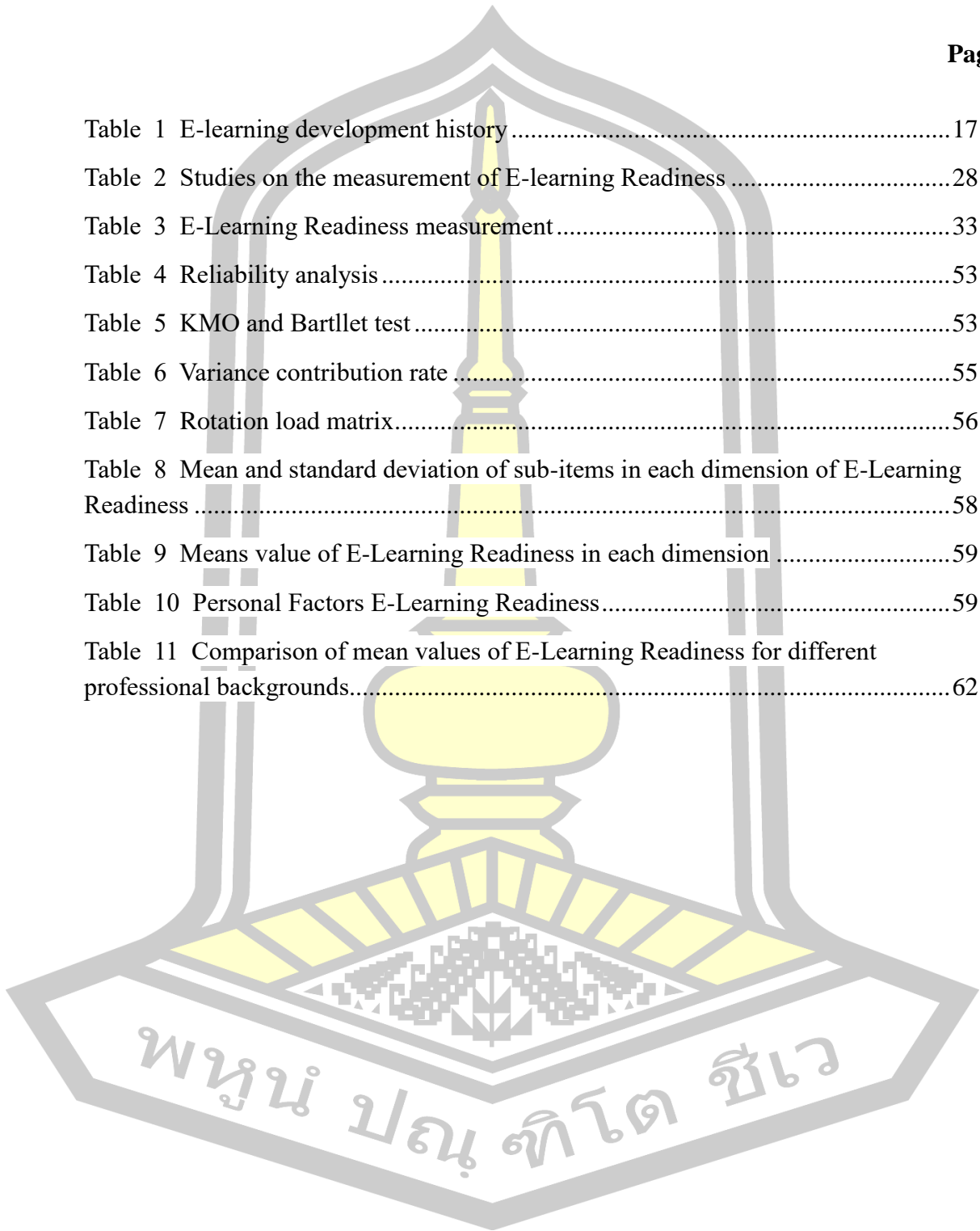
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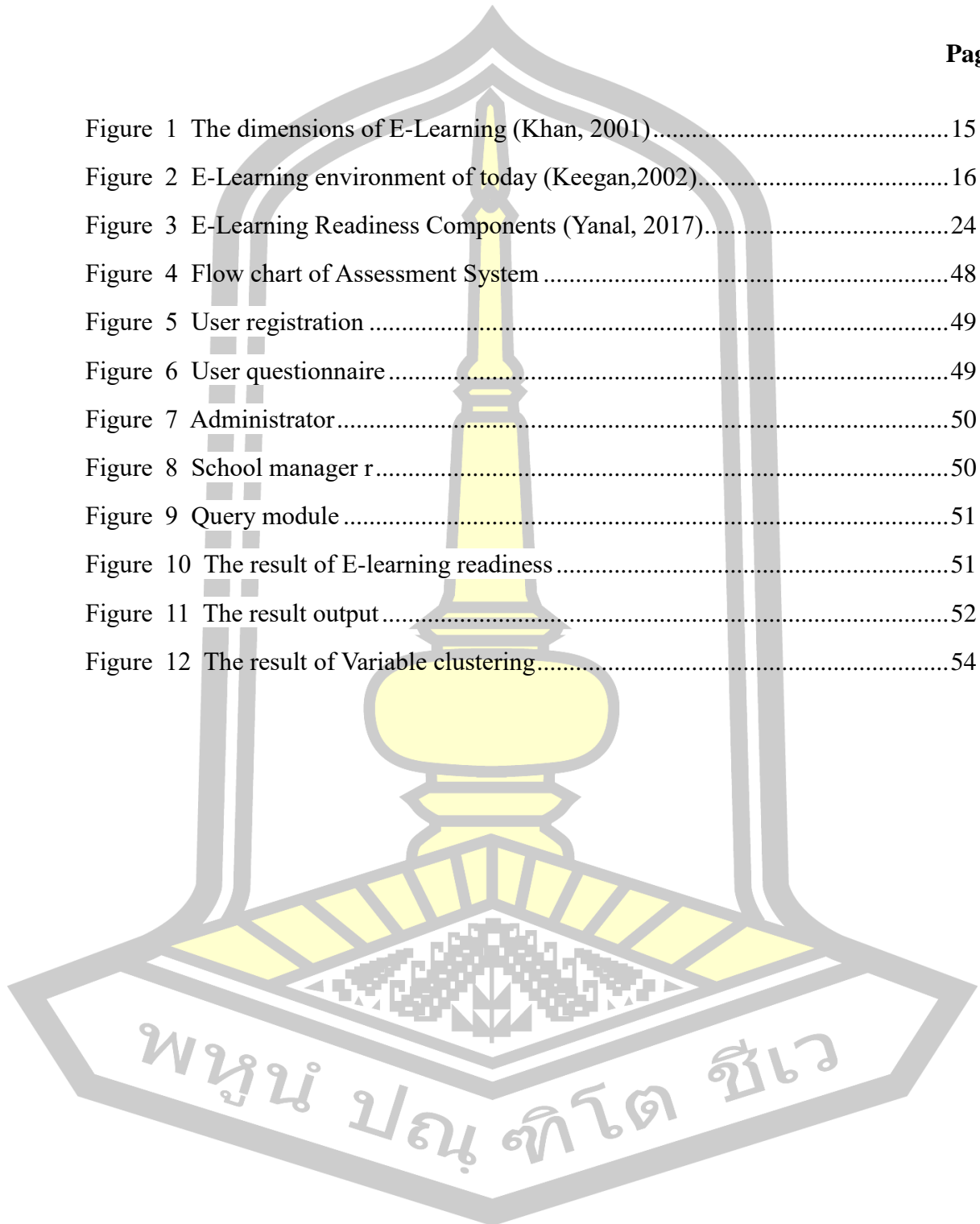
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CHAPTER I

INTRODUCTION

1.1 Background

E-Learning is the use of network technology to design, deliver, select, manage and expand learning (Masie E 2012); E-Learning is internet-based learning, including content delivery in various formats, management of learning processes, learning communities, developed content experts (Cisco Systems)(Hernández-Ramos 2000); E-Learning delivers content through all electronic media including the Internet, LAN, satellite radio, video, audio, interactive TV and CD-ROM (Herman D. S 2011); E-Learning uses the Internet and the Internet Technology to create and deliver content to aid lifelong learning (Peterson N. S. and Facemyer K. C 1996); E-Learning uses the power of the web to make learning happen when and where (Barron T 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. Here we temporarily understand it as "networked learning." This is the product of the information age, electronic technology, and network technology development, and it is also an urgent need for people to adapt to this era.

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. Earlier modes of distance education (e.g., correspondence courses, radio-based courses, video-taped lectures) are being updated or replaced with Internet-based learning opportunities or other computer-

based modes of delivery (Borba M. C 2012). The movement toward online learning (or “E-Learning”) has not been limited to institutions of higher education.

Continuous learning is the most important aspect for dynamic organizations. E-Learning provides the necessary environment and appropriate tools for task oriented, up to date and continuous learning. E-Learning also makes organizations capable to train their geographically scattered workforce giving them current knowledge and skills, with greater efficiency but at less cost. To introduce E-Learning, organizations should be prepared with proper environmental and technological aspects.

Organizations have to be ready to adopt E-Learning and benefit from its advantages. Such e-readiness can be defined as “how ready the organization is on several aspects to implement E-Learning”. E-Learning-readiness should be determined before organizations introduce E-Learning. Readiness includes learners’ ability to adapt to technological challenges, collaborative training and synchronous as well as a synchronous self-paced training. It also depends on their motivation and their discipline to learn in a self-driven mode and to respond to online instructions. E-readiness makes up the e-maturity of the organization which also is represented in the readiness of learners. It includes the availability of infrastructure, clear training objectives, trainer support and guidance and knowledgeable leadership. Therefore, E-Learning not only requires readiness from the learner but also from the trainer and the organization to successfully engage E-Learning (Bowles M 2004).

Readiness for an organization intending to adopt E-Learning can be defined as the “mental or physical preparedness for that organization for some E-Learning experience or action”. It is important to understand that readiness isn't a one-time action, rather it is a continuous process. As more and more organizations decide to join and expand E-Learning interventions, it becomes critical to assess their readiness to utilize technology for a successful implementation and to match learning strategies with local needs. Government, industry, education, and society are identified as the key components in the first level of E-Learning Readiness. In the second level, readiness is evaluated based on the connectivity, the capability – a country’s ability to deliver and consume E-Learning, literacy rates, and trends in training and education – content and culture (Rosenberg 2000). Rosenberg focused on the concept of sustainability and proposed the components of business readiness, changing nature of learning and E-Learning, value of instruction and information, role of change management, reinvention of training organizations to support E-Learning efforts, E-Learning industry, and personal commitment (Chapnick S 2000). Chapnick

proposed the components of psychology, sociology, environment, human resource, finance, technology, equipment, and content readiness (National Electronics and Computer Technology Center 2003) Overall E-Learning Readiness is defined by many key components.

"E-readiness" is mainly used to measure the quality of a country's Information and Communication Technology (ICT) infrastructure, the use of ICT by consumers, the business efficiency created by the use of ICT, the development of government and the state application of ICT.

Since the importance of E-Learning in Internet applications is increasing, and it is of great importance in the improvement of national competitiveness and the shortening of the digital divide, the world famous market research institute in 2006, the Economist Intelligence Unit (Economist Intelligence Unit (EIU) and IBM Institute for Business Value (IBV) for the first time specifically included E-Learning in the study area, and released the global E-Learning Readiness ranking report for the first time. E-Learning Readiness has gradually developed in China with economic development, but it has been relatively backward in the world rankings due to its late start.

At present, Chinese universities carry out a large number of E-Learning curriculum development and promotion work. Each university is actively introducing a series of E-Learning courses such as MOOCs to educate students on ideas, etiquette, traditional culture and some skills expansion. It is to improve college students' overall knowledge, ideology, and cognition of traditional culture. However, there is less research on E-Learning Readiness for undergraduate students (Li Juan 2014, Yao Jie 2015, Yang Ming 2018), especially the research on E-Learning Readiness of undergraduate students in Western universities of China has not been reported, and the lack of research on E-learning readiness of undergraduate students. It is not conducive to the development of digital learning courses and content selection and the development of a series of related management work. Therefore, understanding the status of E-Learning Readiness of colleges and universities in Western regions of China, especially Universities in ethnic regions, will develop E-Learning resources in western ethnic regions more effectively. And use to provide important reference basis. It also provides data reference for how to improve undergraduate students' E-Learning Readiness.

In general, E-Learning Readiness reflects the ability of a country to generate, reorganize, and apply digital information to enhance the value of economic activity.

For undergraduate students, E-Learning Readiness is one of the important factors affecting E-Learning efficiency of undergraduate students.

Xingyi Normal University for Nationalities is located at Xingyi city, the capital of Qianxinan Miao and Buyi Autonomous Prefecture in Guizhou Province, Southwest of China. Since its founding in the year of 1813 in the name of “Bishan Academy”, the university has witnessed nearly 200 years.

The university consists of 12 schools: Literature and Media, Foreign Languages, Arts, Mathematics, Physics, Chemistry and Biology, Information Technology, Physics and Engineering Technology, Politics and History, Economics and Trade, Public Administration, and Education Science and so on and 2 public teaching sections. At present, the university offers 15 four-year programs and 36 three-year programs, and it has over 8000 full-time students. In recent years, it began to accept international students.

There is a teaching staff of 663, of which over 200 have doctor and master’s educational background, and over 258 are professors or associate professors. The university occupies an area of 894 Mu with a floor space of 286,100 square meters.

The teaching instruments and apparatus of the university have a total value of ¥ 25,528,300. The library houses over 620,000 books, 451 kind of periodicals both in Chinese and foreign languages, and 440,000 kind of electronic books as well. Besides, it has some modern teaching and scientific research institutes. It has a first-class library, some modern classroom buildings, lab buildings, art building, multi-media buildings.

The university pays more attention to science and technology research. In recent years, 82 textbooks and academic works as well as over 4000 academic papers have been published, of which over 100 academic papers have been published in the core periodicals. Over the past five years, the university has undertaken over 93 scientific research projects in succession at or above the provincial level. The journal of Xingyi Normal University for Nationalities has been chosen as one of the national academic publications in China. Since its foundation, the journal has become an arena for teachers to conduct academic exchange.

The Mission State of the University is to adhere to the principle of harmonious development of the scale, structure, quality and benefit.

Oriented to establishing a normal, academic, comprehensive, regional and ethnic University and centered upon the talents demand for the local economic development, the university forms its own talent education modes on the basis of

the discipline groups. With teachers' education of the undergraduate students as the main body and non-teachers' education and adults' education as the two wings, the university has formed a multi-pattern school-running of "one body, two wings", and will firmly carry out the strategies of strengthening school by talents, of developing school by quality, of thriving school by features, and of building school by harmony. The university is pursuing a coordinated development with suitable size, rational structure, good quality and remarkable achievements.

The students of the University are oriented to the whole country and radiate to the west. The minority students account for 30%. The main ethnic groups include the Buyi, Miao, Hui, Yi, Tujia, Dong, Gelao, Shui and Bai ethnic groups. Mainly from the southwestern region of China.

The School of Biology and Chemistry was formerly the Department of Chemistry and Biology of the Southwestern National Teachers College. In 1978, the Department of Chemistry was established in the Southwestern National Teachers College. In September 1983, the Department of Chemistry and Biochemistry was established on the basis of the Department of Chemistry. In 2009, approved by the Ministry of Education, the Southwest Guizhou National Teachers College was upgraded to an undergraduate college and renamed Xingyi National Normal College. The Department of Chemical Biology was renamed the Department of Chemical Biology of Xingyi National Normal University. In the same year, undergraduates were recruited. In September 2013, the Xingyi National Teachers College was reformed by the Ministry of Education. The Department of Chemistry and Biology of Xingyi National Normal University was renamed the School of Biology and Chemistry of Xingyi National Normal University, referred to as the School of Biochemistry of Xingyi National Normal University.

The School of Biochemistry is one of the strongest secondary schools in Xingyi Normal University for Nationalities. It has 46 faculty members, 29 full-time teachers, 11 other teachers, 9 doctors, 26 masters, 6 professors, and 20 associate professors. Currently there are 4 undergraduate majors in chemistry, applied chemistry and biological sciences, more than 800 undergraduate students; 16 basic teaching laboratories, 7 research laboratories and 2 provincial key laboratories, with an average annual project funding is more than 1.2 million yuan.

The school has always adhered to the school-running philosophy of "Strengthen the use of teachers, highlighting the characteristics and serving the localities". Under the guidance of the school-running thinking, the school has formed a "study to promote education, integrate production and education, and cultivate the

two-in-one dual-energy type. The school-running characteristics of 'talent'. After years of construction and development, it has become a comprehensive educational entity integrating teaching, scientific research, production and development. It has rich teaching resources, strong teaching staff, strong research and management level, and has become a chemical and biological institution in Southwest Guizhou and even Guizhou Province. An important base for talent training and scientific research.

The School of Information Technology has 19 full-time teachers, 7 other teachers and 8 management staff. Among the faculty, there are 1 professor, 11 associate professors and 14 lecturers. There are 2 doctors and 19 masters. They are devoted to network development, database development and data mining, network information security, information system design, multimedia technology, algorithm analysis, modern education technology, information technology curriculum and teaching theory, knowledge representation and knowledge reasoning of artificial intelligence. At present, the college has four professional laboratories and 440 basic computer laboratories, including computer composition principle and single chip computer laboratory, computer network laboratory, digital media laboratory, database and mathematical modeling laboratory. The experimental teaching and scientific research work conditions are good. It has two undergraduate majors of computer application technology, information and computing science and three specialized majors of computer science and technology education, computer application and electronic commerce. It is dedicated to cultivating computer application-oriented talents with innovative ideas, good scientific literacy and humanistic quality. More than 500 undergraduate students are currently enrolled in the school.

Xingyi Normal University for nationalities has carried out a series of E-learning course construction and teaching work, but for analysis and research of students' E-learning readiness has been not done, and the degree of conformity of the course to the students and the readiness of the students for E-learning course are unknown.

Carrying out research on E-Learning Readiness of undergraduate students in the western region University of China can not only master the basic situation of E-Learning Readiness, but also provide important data support for the development and formulation of E-Learning policy, development path, development direction and curriculum construction. At the same time, it also made some contributions to gradually get rid of China's shortcomings in the development and research of E-Learning Readiness.

1.2 The purpose and importance of the research

1. To develop an E-Learning Readiness assessment system.
2. For study component of E-learning readiness using the Exploratory factor analysis (EFA) to analyze and assessment the reliability and validity of questionnaire and questionnaire results.
3. Assess E-Learning Readiness of undergraduate students in Xingyi Normal University for Nationalities by sampling survey.
4. Compare the difference of E-Learning Readiness of the School of Biology and Chemistry and the School of Information and Technology and analyze reasons the difference formation.

1.3 Research Significance

The latest techniques in education have been developed in many areas. The educational field has its share in these changes which aims at developing the educational process and enhancing its methodologies and the teaching methods by shifting gradually from the traditional educational system to modern educational system, supported by technology. Recently launched Massively Open Online Courses, referred to as " MOOCs. The upsurge is a major change in the learning model of college students. Many Chinese universities have begun to take active actions, including Peking University and Tsinghua University, first announced their participation in edX Line course project in May 2013. Fudan University, Shanghai Jiao Tong University and Peking University applied for the Coursera platform in the same year. E-Learning has achieved rapid development in China. At present, most colleges and universities have launched a talent training program that combines E-Learning courses with traditional teaching mode. It had been noticed in 2005 that about 32.2 million students received at least one E-Learning course in Taiwan (Lin and Laffey, 2008). Overall, E-Learning is the future of learning that focuses on both the individual requirements of learners and the content delivered (Colvin and Mayer, 2008). In the face of large-scale E-Learning courses, in the same time the question that it is whether undergraduate students are fully prepared. (Candy P. C 1991) has emphasized that educators cannot rely on their good academic performance in the past and believe that they will perform well in a new field.

Research shows that E-Learning Readiness of E-Learning learners is one of the important factors affecting E-Learning. E-Learning Readiness is the ability of a country to generate, reorganize, and apply digital information to enhance the value of economic activity. The research results be used to further optimize the E-Learning

course selection, curriculum arrangement and guide college students' E-Learning. With an investigation of the student's E-Learning Readiness, the university will provide students with valuable strategies in time management, learning assistance and learning resource, continuously improve students' learning ability and E-Learning Readiness, and prompt students to adapt to changes in the online education environment.

1.4 Research Scope

1. The population

The population of students at Xingyi Nomorl University for Nationalities , Guizhou province , People's Republic of China. The population consisted of:

1.1 The total of 871 students of School of Biology and Chemistry who enrolled on 1st semester 2019.

1.2 The total of 485 students of School of Information and Technology who enrolled on 1st semester 2019.

2. Sample

2.1 The number of 414 students of School of Biology and Chemistry

2.2 The number of 228 students of School of Information and Technology

The researcher determined the sample size from (Krejcie 1970) and stratified random sampling technique was employed to obtain sample. According to the table for Determining sample size for a Given Population (Krejcie a Morgan, 1970), the sample size is at least 269 when the given population is 900; the sample size is 214 when the given population is 500, and the sample sizes of the School of Biology and Chemistry and the School of Information Technology are 414 and 228 respectively, Meet the sample sampling requirements.

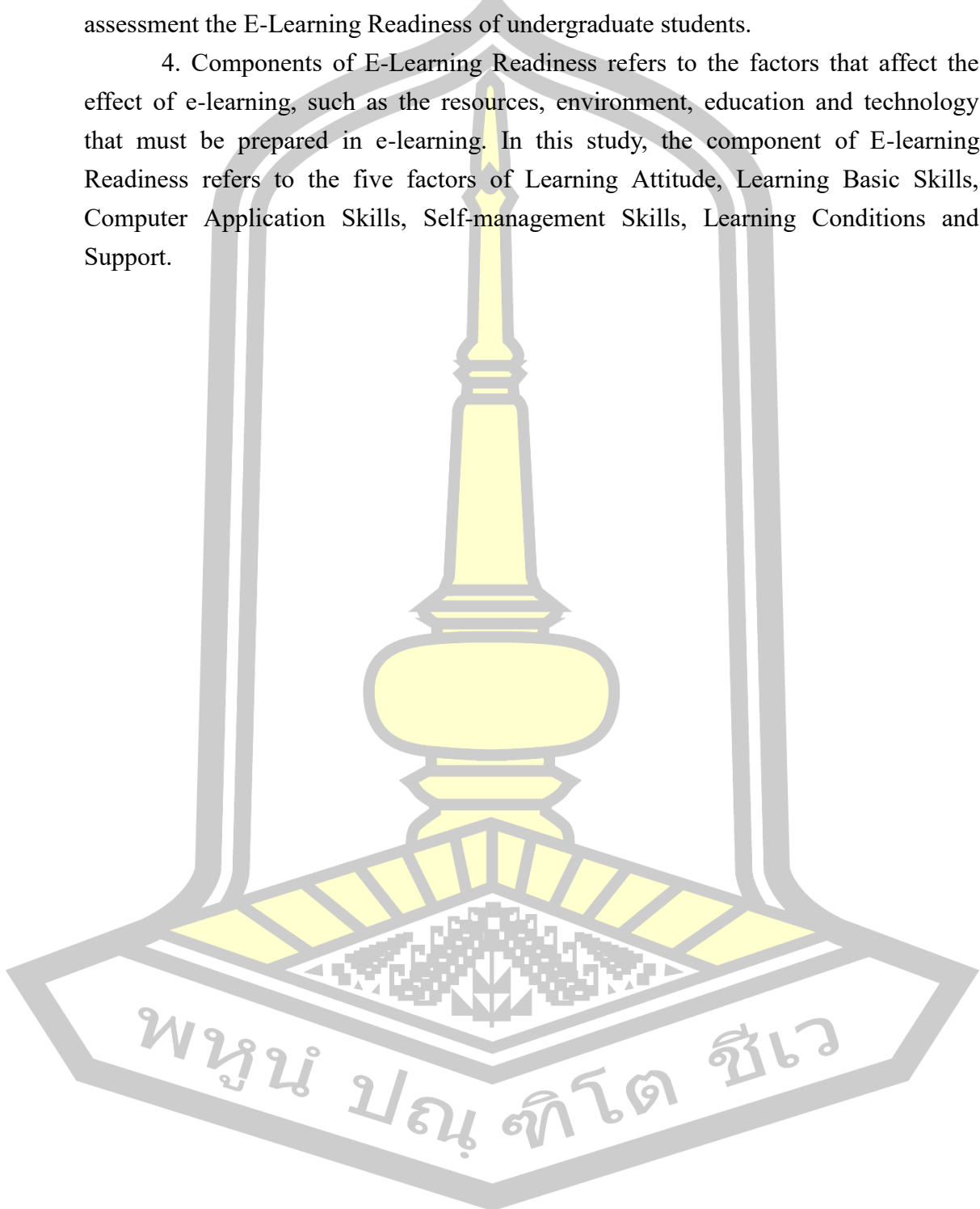
1.5 Definition of Term

1. E-Learning: E-Learning refers to a new learning model in which an Internet platform is established in the field of education and students learn through the Internet. Also known as networked learning or E-Learning. The integration of information technology and curriculum with E-Learning as the core is different from traditional learning methods.

2. E-Learning Readiness: E-Learning Readiness can be defined as the level of readiness of certain institution or organization towards various aspects of the technology of E-Learning, before the whole E-Learning environment being applied for various purposes.

3. E-Learning Readiness Assessment System: Based on PHP information technology, the E-Learning Readiness assessment system was developed to assess the E-Learning Readiness of undergraduate students.

4. Components of E-Learning Readiness refers to the factors that affect the effect of e-learning, such as the resources, environment, education and technology that must be prepared in e-learning. In this study, the component of E-learning Readiness refers to the five factors of Learning Attitude, Learning Basic Skills, Computer Application Skills, Self-management Skills, Learning Conditions and Support.



CHAPTER II

LITERATURE REVIEW

Informatization is the general trend of economic and social development in the world today. The learning of the information age is closely related to the development of information technology with multimedia and network technology as the core (Hanrin C 2014). Information technology is based on digitalization. After information technology is applied to the education and teaching process, the learning environment, learning resources and learning methods are all developing in a digital way, forming an E-Learning environment, E-Learning resources and E-Learning methods.

2.1 E-Learning and E-Learning features

E-Learning refers to the process in which learners use E-Learning resources to learn in a digital way in a digital learning environment. It consists of three basic elements: a digital learning environment, digital learning resources, and digital learning methods (Rosenberg 2003). E-Learning has the following important features:

The content of learning and the acquisition of resources for E-Learning are arbitrary. As long as the network system has the desired bandwidth, students and teachers can get the required course content and learning resources on the network and resource library. Students can receive high-quality course-related information through a variety of devices without the limitations of time and space and delivery presentations, enabling the transmission, reception, sharing, organization and storage of arbitrary information (Khamparia 2018).

E-Learning makes the content of the course effective.

Through a digital learning environment (Suzanne P. Stokes 2001), teachers and students can make full use of current domestic and international real-world information as teaching resources and integrate them into the curriculum for learners to discuss and use. This use of reality-based information will help students learn to discover knowledge and deepen their understanding of the real world.

E-Learning makes the study of course content more multi-layered (Chatzara 2006).

E-Learning resources are highly diverse and shared. Digital resources are used as the content of the course. For the same subject content, teachers and students can explore different levels of difficulty according to their needs, abilities and interests.

E-Learning makes the course learning content maneuverable.

The E-Learning process not only digitizes the course content, but also integrates the shared digital resources into the course teaching process. These E-Learning contents can be evaluated, modified and reproduced. It allows students and teachers to use a variety of advanced numbers. Information processing methods use it and recreate it.

E-Learning makes the course learning content reproducible (Entzinger 2011).

The digitalized course learning content can stimulate students to actively participate in the learning process. Students no longer passively accept information, but adopt novel and skilled digital processing methods to integrate and re-create knowledge and learn as learners. Results. The reproducibility of E-Learning not only stimulates students' creativity, but also provides greater possibilities for students' creativity.

It is not only focused on online contexts, and includes the full range of computer-based learning platforms and delivery methods, genres, formats and media such as multimedia, educational programming, simulations, games and the use of new media on fixed and mobile platforms across all discipline areas.

2.2 A History of E-Learning

In the history of E-learning, it is important to note that there is no single evolutionary tree and no single agreed definition of E-Learning: since the 1960s, E-learning has evolved in different ways in Business, Education, the Training sector, and the Military(Fletcher 1986) fields. E-learning has different meanings in different fields. In the school sector, 'E-Learning' refers to the use of both software-based and online learning, whereas in Business, Higher-Education, the Military and Training sectors, it refers solely to a range of on-line practices. (Campbell 2004). The history of E-learning across all fields is best summed up as: 'Opportunities multiply as they are seized.' (Sun Tzu, 410BC)

The development of e-learning has experienced the origin of Stanford University and the University of Illinois, and then gradually developed from simple to complex (See table 2-1). E-learning originated from the insightful work of Stanford University's Patrick Suppes and the University of Illinois' Don Bitzer, and Suppes and Bitzer explicitly placed the use of technology in a broader education agenda(Suppes 1964, Suppes 1966, Suppes 1986), which marked the birth of e-learning. In the 1960s, the use of computers in education was limited by the popularity of computers and the high cost of technology. But in 1966 Suppes (Suppes, 1966) predicted that 'in the

future it would be possible for all students to have access to the service of a personal tutor in the same way that ancient royals were once served by individual tutors, but that this time the tutors would be in the form of a computer.' Don Bitzer at the University of Illinois created PLATO, a timeshared computer system, to address concerns about student literacy. PLATO could be used to develop and deliver computer-based education, including literacy programs in 1960s. PLATO was eventually commercialised, it became the direct ancestor of today's E-learning systems such as Blackboard and WebCT. It's interesting that what are widely touted as the key features of such systems are exactly those that Woolley identifies in PLATO! Like Suppes, Bitzer appears to have created the technology mainly as a tool, but also oversaw its operationalization in other dimensions.

Dan Watt took the first computer terminal into a Boston school in 1969 (Fernández-Manjón 2007, Nicholson 2007) Human could hardly have envisaged the subsequent changes, from localization to distributed. Some educational theories have been continuously introduced into E-learning, for example, constructivism and social constructivism have been introduced, resulting in many E-learning models and E-learning Theories.

Good pedagogical practice has a theory of learning at its core. However, no single best-practice E-Learning standard has emerged. This may be unlikely given the range of learning and teaching styles, the potential ways technology can be implemented and the ways in which educational technology itself is changing (Meredith S & Newton B 2003). Various pedagogical approaches or learning theories may be considered in designing and interacting with E-Learning programs.

Social-constructivist – this pedagogy (Woo 2007) is particularly well afforded by the use of discussion forums, blogs, wiki and online collaborative activities. It is a collaborative approach that opens educational content creation to a wider group including the students themselves. The One Laptop Per Child Foundation attempted to use a constructivist approach in its project

Laurillard's conversational mode is also particularly relevant to eLearning, and Gilly Salmon's Five-Stage Model is a pedagogical approach to the use of discussion boards (E-moderating, 2000).

Cognitive perspective focuses on the cognitive processes involved in learning as well as how the brain works (Sawin 1957).

Emotional perspective focuses on the emotional aspects of learning, like motivation, engagement, fun, etc. (Bååth 1982).

Behavioural perspective focuses on the skills and behavioral outcomes of the learning process. Role-playing and application to on-the-job settings (Areskog N-H 1995).

Contextual perspective focuses on the environmental and social aspects which can stimulate learning. Interaction with other people, collaborative discovery and the importance of peer support as well as pressure (Black 1995).

Mode neutral Convergence or promotion of 'transmodal' learning where online and classroom learners can coexist within one learning environment thus encouraging interconnectivity and the harnessing of collective intelligence (Smith B 2008).

For many theorists, it's the interaction between student and teacher and student and student in the online environment that enhances learning (Mayes and de Freitas, 2004). Pask's theory that learning occurs through conversations about a subject which in turn helps to make knowledge explicit has an obvious application to learning within a VLE (Allen 2007).

Salmon developed a five-stage model of E-Learning and e-moderating that for some time has had a major influence where online courses and online discussion forums have been used (Salmon G 2005). In her five-stage model, individual access and the ability of students to use the technology are the first steps to involvement and achievement. The second step involves students creating an identity online and finding others with whom to interact; online socialization is a critical element of the E-Learning process in this model. In step 3 students are giving and sharing information relevant to the course to each other. Collaborative interaction amongst students is central to step 4. The fifth step in Salmon's model involves students looking for benefits from the system and using resources from outside of it to deepen their learning. Throughout all of this, the tutor/teacher/lecturer fulfils the role of moderator or e-moderator, acting as a facilitator of student learning.

Some criticism is now beginning to emerge. Her model does not easily transfer to other contexts (she developed it with experience from an Open University distance learning course). It ignores the variety of learning approaches that are possible within computer mediated communication (CMC) and the range of learning theories that are available (Moule, 2007).

Self-regulation: Self-regulated learning refers to several concepts that play major roles in learning, and which have significant relevance in E-Learning. Zimmerman (1998) explains that in order to develop self-regulation, learning courses should offer opportunities for students to practice strategies and skills by themselves.

Self-regulation is also strongly related to a student's social sources such as parents and teachers. Moreover, Steinberg (1996) found that high-achieving students usually have high-expectation parents who monitor their children closely (Hellman W. C. M 2004).

With the academic environment, self-regulated learners usually set their academic goals and monitor and react themselves in process in order to achieve their goals. Schunk argues, "students must regulate not only their actions but also their underlying achievement-related cognitions, beliefs, intentions and effects"(p. 359). Moreover, academic self-regulation also helps students develop confidence in their ability to perform well in E-Learning courses (Hellman W. C. M 2004).

With the development of technology, in order to solve pedagogical and technological issues, the e-learning and Innovation thread of the programme explores ways in which institutions can enhance learning through the design of learning spaces and use of innovative technologies. E-learning environment and facilities have taken place great changes. In particular, mobile and wireless technologies such as laptops, tablet pc's smart phones, voting devices, multimedia personal digital assistants and stronger wireless networks.

E-Learning literature identifies an ecology of concepts, from a bibliometric study were identified the most used concepts associated with the use of computers in learning contexts, e.g. computer assisted instruction (CAI), computer assisted learning (CAL), computer-based education (CBE), E-Learning, learning management systems (LMS), self-directed learning (SDL), and massive open online courses (MOOC). All these concepts have two aspects in common: learning and computers; except the SDL concept, which derives from psychology, and does not necessarily apply to computer usage. These concepts are yet to be studied in scientific research, and stand in contrast to MOOCs. Nowadays, E-Learning can also mean massive distribution of content and global classes for all the Internet users. E-Learning studies can be focused on three principal dimensions: users, technology, and services. According to Aparicio, Bacao & Oliveira (Manuela Aparicio 2016) "The E-Learning systems' theoretical framework contains the three main components of information systems. These components are people, technologies, and services. People interact with E-Learning systems. E-Learning technologies enable the direct or indirect interaction of the different groups of users. Technologies provide support to integrate content, enable communication, and provide collaboration tools. E-Learning services integrate all the activities corresponding to pedagogical models and to instructional strategies. The complex interaction combination is the direct or indirect action with E-Learning systems. At the same time, systems provide services according to the specified strategies for

activities. In other words, service specifications are E-Learning activities aligned with the E-Learning pedagogical models and the instructional strategies".

A number of factors together create a meaningful network learning environment, many of which are systematically related and independent of each other, forming a basic architecture based on E-Learning (Khan, 2001). This architecture has eight dimensions: institutional, pedagogical, technical, interface design, investigation, management, resource support, and ethics (Figure 1). Each dimension has several sub-dimensions, consisting of questions that focus on a particular aspect of the E-Learning environment.

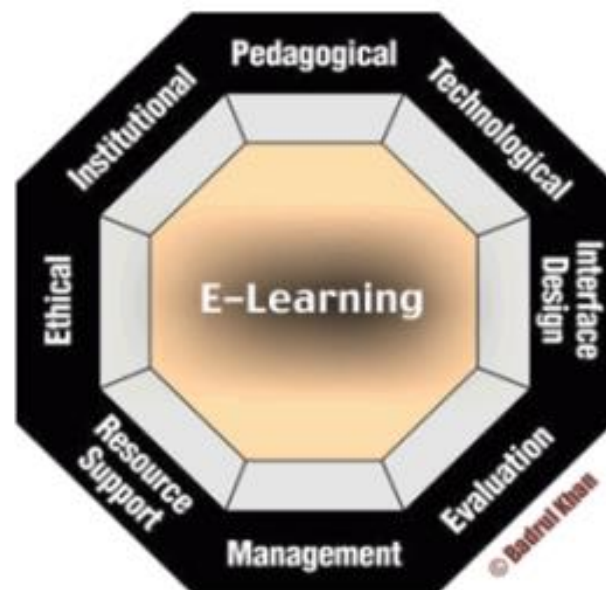


Figure 1 The dimensions of E-Learning (Khan, 2001)

E-Learning is one of the most used technologies in this modern time. E-Learning is basically a learning platform that applies the utilization of electronic media and information and communication technologies (ICT). E-Learning can be implied as other alternative terms such as online education, computer-based training, technology-enhanced learning and others. The implementation of E-Learning has been carried out in multiple education departments and learning institutional levels. The usage has also broadened within some corporate and professional companies, in informing their staffs and customers on any related development occurs within their business world. The importance of E-Learning has led to the need in assessing the mental and physical preparation of the users before using the E-Learning environment (Colace 2008).

E-Learning means the award of nationally and internationally recognized university degrees, college diplomas and training certificates to students who spend all or much of their study program sitting in front of a computer. The main task of transitioning from distance education to E-Learning is to build the same systems for wireless computing and telephony as E-Learning has provided for wired computing and telephony.

The E-Learning environment of today might be presented diagrammatically thus (Keegan 2002) (Figure 2) :

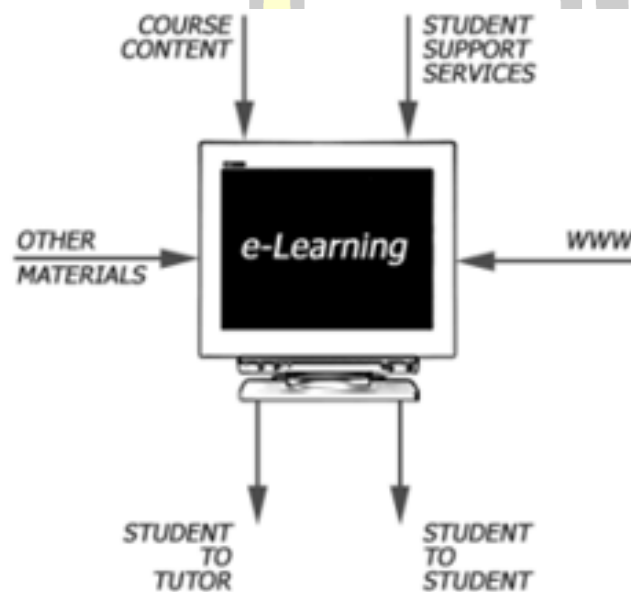


Figure 2 E-Learning environment of today (Keegan,2002)

Since its inception, technological advances in computers and networks facilitated advances in E-learning as educators seized on new features in an attempt to adapt them to their needs, to accommodate new educational theories, or looked for the promise of enhanced functionality. The theory, technology and implementation of E-learning are developing and improving continuously, and the theory and practice are more abundant and perfect. E-learning technology is gradually from simple to complex, E-learning styles are more flexible and diverse, human-computer interaction is more friendly, and learning terminals are also developed from early Fixed terminal (desktop) to mobile terminal(laptops, palmtops(iPads)and smart mobile phone), so as to make E-learning the concept of learners-centered is further strengthened, and the flexibility and autonomy of learning are outstanding. It not only plays a role in school

education, but also plays an increasingly prominent role in socialized learning, lifelong learning and the construction of a learning society.

E-learning's theory, technology, and implementation methods have been continuously developed and improved. The theory and practice have been enriched and improved. The e-learning technology has gradually changed from simple to complex. The e-learning form has become more flexible and diverse. The terminal has also been developed from an initial computer terminal to a laptop computer, iPad, and smart mobile terminal, which further strengthened the learner-centered concept of E-learning, and the learning flexibility and learning autonomy are outstanding, not only is it play a role at the level of school education, while playing an increasingly prominent role in socialized learning, lifelong learning, and the construction of a learning society.

Table 1 E-learning development history

Years	Researcher	Topic	Factors
1960s	Suppes,1964; Bitzer et al, 1962;	Origin of e-learning	the use of computers in education
1960s-1990s	Suppes, 1966;1986; Fletcher 1982; Kowch, & Schwier 1997; McGreal, 1997; Stokes 1999;	E-learning from simple to complex	Continuous integration of learning theory and technological progress, expansion of application fields (Internet technology)
1990s-Now	Keegan, 2002; Rosenberg,2002; Mayes and de Freitas, 2004; Georgiev et al, 2004; Chatzara 2006; Fernández-Manjón et al, 2007;	E-learning improvement	E-learning technology is constantly enriched and the theory is more complex. The learning terminal is developing from fixed terminal to mobile terminal, and the concept of learner centered and lifelong learning are gradually developing.

2.3 E-Learning course design principle

E-learning aims to build knowledge and skills in order to enhance the quality of learning. E-Learning theory describes the cognitive science principles of effective multimedia learning using electronic educational technology.

Mayer, Sweller and Moreno established a set of multimedia instructional design principles (Clark R. C 2007, Moreno 2007, Mayer R 2014) that promote effective learning. Many of these principles have been "field tested" in everyday learning settings and found to be effective there as well (Harskamp E.G. 2007, Chang C. C. & Yang F. Y 2010, Issa 2013) The majority of this body of research has been performed using university students given relatively short lessons on technical concepts with which they held low prior knowledge. However, David has tested the method with students in nine social science disciplines including sociology, politics and business studies. His longitudinal research program over 3 years established a clear improvement in levels of student engagement and in the development of active learning principles among students exposed to a combination of images and text, over students exposed only to text.

The multimedia instructional design principles identified by Mayer (Mayer R 2014) and their colleagues are largely focused on minimizing extraneous cognitive load and managing intrinsic and germane loads at levels that are appropriate for the learner. Examples of these principles in practice include.

1.Multimedia principle: Deeper learning is observed when words and relevant graphics are both presented than when words are presented alone (also called the multimedia effect) (Clark Ruth C 2011). Simply put, the three most common elements in multimedia presentations are relevant graphics, audio narration, and explanatory text. Combining any two of these three elements works better than using just one or all three.

2.Modality principle: native speakers of the narration language, or when only printed words appear on the screen. Generally speaking, audio narration leads to better learning than the same words presented as text on the screen. This is especially true for walking someone through graphics on the screen, and when the material to be learned is complex or the terminology being used is already understood by the student (otherwise see "pre-training"). One exception to this is when the learner will be using the information as a reference and will need to look back to it again and again (www.edgurus.com. EdGurus.com,2015).

3.Coherence principle: Avoid using unnecessary content (irrelevant video, graphics, music, stories, narration, etc.) in order to minimize cognitive load

imposed on memory during learning by irrelevant and possibly distracting content. Basically, the less learners know about the lesson content, the easier it is for them to get distracted by anything shown that is not directly relevant to the lesson. For learners with greater prior knowledge, however, some motivational imagery may increase their interest and learning effectiveness just a bit (ParkB 2011, Magner U. I. E 2014).

4. Contiguity principle (Fred D. Sheffield 1951): Keep related pieces of information together. Deeper learning occurs when relevant text (for example, a label) is placed close to graphics or when spoken words and graphics are presented at the same time, or when feedback is presented next to the answer given by the learner.

5. Segmenting principle (Mayer 2009): Deeper learning occurs when content is broken into small chunks. Break down long lessons into several shorter lessons. Break down long text passages into multiple shorter ones.

6. Signalling principle: The use of visual, auditory, or temporal cues to draw attention to critical elements of the lesson. Common techniques include arrows, circles, highlighting or bolding text, and pausing or vocal emphasis in narration (Crooks 2012). Ending lesson segments after the critical information has been given may also serve as a signaling cue (Ibrahim 2012).

7. Learner control principle: Deeper learning occurs when learners can control the rate at which they move forward through segmented content (Hasler B. S 2010). Learners tend to do best when the narration stops after a short, meaningful segment of content is given and the learner has to click a "continue" button in order to start the next segment. Some research suggests not overwhelming the learner with too many control options, however. Giving just pause and play buttons may work better than giving pause, play, fast forward, reverse buttons (Savoji A. P. 2011). Also, high prior-knowledge learners may learn better when the lesson moves forward automatically, but they have a pause button that allows them to stop when they choose to do so (Spanjers I. A. E 2011, Hatsidimitris G. 2013, Khacharem A 2013).

8. Personalization principle (Adile 2011): Deeper learning in multimedia lessons occur when learners experience a stronger social presence, as when a conversational script or learning agents are used. The effect is best seen when the tone of voice is casual, informal, and in a 1st person ("I" or "we") or 2nd person ("you") voice (Kartal 2010). For example, of the following two sentences, the second version conveys more of a casual, informal, conversational tone:

8.1 The learner should have the sense that someone is talking directly to them when they hear the narration.

8.2 Your learner should feel like someone is talking directly to them when they hear your narration.

Also, research suggests that using a polite tone of voice ("You may want to try multiplying both sides of the equation by 10.") leads to deeper learning for low prior knowledge learners than does a less polite, more directive tone of voice ("Multiply both sides of the equation by 10."), but may impair deeper learning in high prior knowledge learners. Finally, adding pedagogical agents (computer characters) can help if used to reinforce important content. For example, have the character narrate the lesson, point out critical features in on-screen graphics, or visually demonstrate concepts to the learner (Mayer R. E & Dapra C.S 2012).

9.Pre-training principle: Deeper learning occurs when lessons present key concepts or vocabulary prior to presenting the processes or procedures related to those concepts. According to Mayer, Mathias, and Wetzel,"Before presenting a multimedia explanation, make sure learners visually recognize each major component, can name each component and can describe the major state changes of each component. In short, make sure learners build component models before presenting a cause-and-effect explanation of how a system works." However, others have noted that including pre-training content appears to be more important for low prior knowledge learners than for high prior knowledge learners (Clarke T 2005).

10.Redundancy principle: Deeper learning occurs when lesson graphics are explained by audio narration alone rather than audio narration and on-screen text. This effect is stronger when the lesson is fast-paced and the words are familiar to the learners. Exceptions to this principle include: screens with no visuals, learners who are not native speakers of the course language, and placement of only a few key words on the screen (i.e., labelling critical elements of the graphic image (Scheiter K 2014).

11.Expertise effect: Instructional methods, such as those described above, that are helpful to domain novices or low prior knowledge learners may have no effect or may even depress learning in high prior knowledge learners (Magner U. I. E 2014).

Such principles may not apply outside of laboratory conditions. For example, Muller found that adding approximately 50% additional extraneous but interesting material did not result in any significant difference in learner performance. There is ongoing debate concerning the mechanisms underlying these beneficial principles, and on what boundary conditions may apply. Here it has been a lot of research on E-learning in particular the adoption of E-learning technology such as research related to the adoption of e-learning models (Mayes, 2004).

2.4 Advantages, disadvantages and significance of E-Learning

With the advent of the knowledge economy, our learning model has been hit by unprecedented impact. Various new learning models have emerged like a flood. Among all the learning models, the most impactful is the network that emerges with the development of network technology. Learning, also known as E-Learning, is a new way to build online education through E-Learning platforms. This E-Learning method is a new learning environment composed of multimedia network learning resources, E-Learning community and network technology platform. It has an unparalleled advantage over other learning modes (Koren 2008, Zuzana Melicheríková 2012).

1. Separation from the limitations of time and space in traditional education.

One of the benefits of online learning is that it is not limited by time, place, space, and can achieve the same interaction as in reality. It is easier to achieve one-on-one communication between learning and teaching (Chizmar 1996).

2. Fast and timely

E-Learning requires no downloads, no waiting, and you can quickly get what you want to learn. Fast, as long as you can access the Internet, you can start learning in time without wasting time. No need to worry about backup and synchronization of learning materials, all on the server. The update of the learning content will also be very fast, as long as there is new learning content, you can start learning right away (Piskurich 2006).

3. Repeatability

E-learning can be repeated learning (Schooley 2009), so students can listen to or re-learn some of the content according to their own learning needs, so as to better grasp the content learned and fully consolidate the learning effect. For the more difficult content, through repeated E-Learning, repeated thinking, to help thoroughly understand and master. Repeated learning can better review and consolidate what you have learned. Avoid the problem of “getting to forget” that is easy to appear in class.

4. Reflecting personalized learning

E-Learning can achieve personalized learning. Students can schedule their learning according to their own time. They can choose learning content according to their needs, knowledge background, personal preferences and learning style, effectively enhancing the pertinence of learning and effectively Stimulate learning motivation and improve learning efficiency, which can be increased by more than 30%.

5. Rich interactivity and collaboration

E-Learning makes it easy for students to communicate and collaborate with each other, and to communicate their ideas with others in a timely manner. When discussing the issue, everyone will brainstorm and have more and better solutions and solutions. Mutual help and collaboration between learners will broaden your horizons and broaden your knowledge structure.

6. Low cost

The cost of E-Learning is very low, and it is only about 30%-50% of the on-site learning, but the learning effect is almost the same. Online learning saves a lot of money for travel, accommodation, teachers, classrooms, materials, etc., which means you can learn more at the same cost.

Just like the two-sidedness of things, E-Learning has some limitations. The limitations are mainly reflected in:

1. Lack of humanized communication. The Internet artificially widens the distance between people and creates obstacles for direct emotional communication. Lack of emotional communication and emotional communication between employees, lecturers and employees, the effect of learning may be greatly reduced.

2. The practical function is weak. To truly acquire and master knowledge and technology, it is not enough to explain through E-Learning. You must personally participate in the practice and use it in the real environment. Learners' freedom is too high to manage.

3. Limitations in the transmission of teaching content. Traditional training is a learning environment that is fully controllable by the instructor – it needs to be rearranged and changed at any time. There are many factors that influence the state of teaching such as the instructor's efforts and personal abilities, skills, adapting to the teaching environment and the courseware provided. However, in the case of E-Learning, this change is impossible due to isolation from the network of the trainee, resulting in a critical barrier to content.

4. Limitations in learning content. In terms of learning content, there is a lack of high-quality, multimedia interactive E-Learning courseware and platform, different interfaces, repeated registration, no standard software, and many different formats for online courses. This is not only difficult to manage, but also costly. As a result, it is difficult to establish a good communication system within the company, and information transmission is extremely unsmooth (Wang Li 2004, Randell D 2011).

E-Learning is a new type of learning that is closely related to the traditional subject teaching and has certain relative independence. Its research and implementation will develop students' initiative, creativity and cultivate students' innovative spirit and practical ability. Has the following important significance (Peng 2012, Postigo 2013).

1. E-Learning changed the concept of time and space in learning.
2. E-Learning requires learners to have a lifelong learning attitude and ability.
3. E-Learning requires learners to have good information literacy skills.
4. It is often characterized by active learner-centred pedagogies. (McGreal 1997)

2.5 The concept, components and classification of E-Learning Readiness

In order to adopt a successful e-learning system, the Higher education institution (HEI) should assess its readiness before initiating an E-learning project. A primary reason for the failure to adopt an e-learning system in higher education is the lack of assessment of readiness for e-learning (Hanafizadeh & Ravasan, 2011; Odunaike, Olugbara, & Ojo, 2013).

The E-Learning Readiness refers to the degree of attitude, ability, and personality traits that learners' E-Learning. E-Learning Readiness can be defined as the level of readiness of certain institution or organization towards various aspects of the technology of E-Learning, before the whole E-Learning environment being applied for various purposes. The E-Learning Readiness specifies a country's ability to produce, use and expand E-Learning at work, at school, in the government and in the society at large in order to improve the country's economic activity. As same time E-learning Readiness is recognizing as one the most critical aspect for achieving successfully implementation of E-learning programs in higher education.

The typical E-learning readiness assessment will measure the users' ability in adapting to technological challenges, collaborative learning and training as well as the synchronous and asynchronous self-paced learning and training (Hashim 2014).

All universities that plan to deal with E-Learning must percept the terms of readiness of E-Learning connectivity issues related to infrastructure readiness, frequencies of teacher training, experiences of using the Internet for education, external environment readiness and demand of facility were examined. Figure 7.

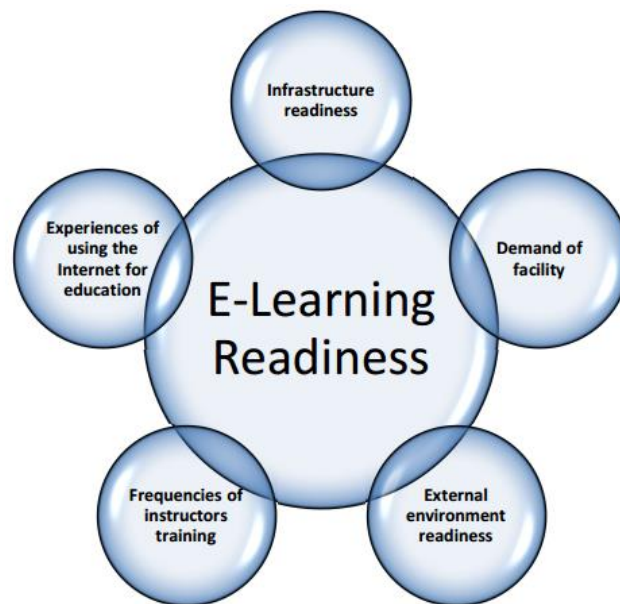


Figure 3 E-Learning Readiness Components (Yanal, 2017)

E-Learning readiness is a dynamic development process that includes both vertical and horizontal dimensions. Longitudinal for E-learning readiness refers to the preparation for study at all ages from birth to maturity. At different ages, there are significant differences in the level of physical maturity and psychological development of students. These differences are prerequisites for effective learning. Education should provide learning preparation suitable for students. Without certain preparation conditions, it is difficult for students to learn new things. Horizontal learning preparation refers to the interaction and interaction of various internal factors that occur at each age to form an operational structure. The rich environmental impact is conducive to the development of physiological organs and their functions, and psychological development can be achieved through learning.

2.6 Main tasks of E-Learning Readiness (Borotis & Poulymenakou, 2004)

1. Physical development

This is the most basic preparation for all learning readiness. All other preparations in learning depend on the preparation of certain nerve, glandular, muscular and skeletal structures and functions. Physical development is a must for learning. If an individual is not prepared for physical development, it will be difficult to learn. For example, children with impaired hearing organs and vocal organs are difficult to learn as normal children. In addition, it is difficult for young children to understand some abstract and logical theories, because their level of thinking development is still at the stage of image thinking. That is to say, in the relevant

learning, the level of maturity of the child when learning the project should be considered, and regardless of this, the ideal learning effect cannot be obtained.

2. Intellectual development

This is the most important preparation for all study preparation. Psychologists use a certain age of intelligence as an important indicator of whether children can learn. In order to find out which level of intelligence the child has at the level of maturity to start reading, the psychologist conducted the following experiment: The children aged 5-8 years old were taken as subjects, and the children were given half-year education, and then they were measured here. The percentage of reading standards reached within half a year. As a result, almost none of the children under the age of 5 can read smoothly. Only a small number of children aged 5 years and 6 months can read smoothly, while more than half of the children aged 6 years and older cannot. After reading smoothly, about 70% of children at the age of 6 years and 6 months have made satisfactory progress. Based on these materials, it can be considered that the age of 6 years and 6 months of wisdom is expected to be the minimum level of reading in the first grade of primary school.

3. Emotional development

Modern educational science theory shows that emotion is an important factor affecting students' learning. If a child is unwilling to learn and has no interest in learning, then he is sure that he is difficult to succeed in learning. The role of emotion in learning is gradually being recognized by people. Psychologists have done an experiment to measure children with some intelligence tests. There are two types of test questions: one type is simple and easy to do, children can easily solve it, and they can get rewards right away, but the rewards are small; the other type is complicated and difficult to do, children have to use their brains to solve them, and the rewards must be I can give it in a few days, but I get a bigger reward. Let the two types choose the children to see whether the child chooses to delay or meet. It was found that children who are emotionally impulsive tend to choose immediate satisfaction, while children who are good at controlling impulsiveness often choose to delay satisfaction, and children who choose to delay satisfaction have higher cognitive levels than those who choose immediate satisfaction. This fully demonstrates the impact of emotion on learning objectives and learning outcomes. Development of social skills

Psychologists' surveys have found that socially mature children, because of their strong adaptability and compatriots get along well, are often seen by adults as "capable" and "creative" people. In the companions, there are also many impressions of stability and friendliness. These investigations and impressions enhance the child's

social status and satisfy his respectful needs, thus further inspiring his desire to master skills and develop intelligence.

4. Development of self-awareness

Self-awareness is the subject's understanding of myself and the things around me, especially the relationship between things and my relationship. The basic premise of learning is to distinguish between things - my relationship, that is, to separate one's own world from the outer world. Without this conceptual preparation, learning becomes an empty talk. In self-awareness, there is a very important component, psychologically called "control point", which directly affects the learning effect. The so-called control point is a person who finds out the main force that controls his life, that is, people's views on certain forces that affect their lives and destiny. The younger the age, the more likely it is to look for this power in the outside world, because they don't know what effect and influence "I" can have on "things."

For example, young children's attitude towards learning is often not from their own wishes. Instead of relying on their own strength to control learning, they follow the orders of their parents, cater to the hereditary traditions, or are fresh in their learning. As we grow older, children become more aware of the results of their activities and activities, and the key is not outside, but within themselves. They began to take a serious look at themselves, and the control points were more internal. The process of turning the control point from the outside to the inside is generally completed in adulthood (Hisyamuddin Hashim 2014).

2.7 Readiness Factors to measuring E-Learning Readiness

How to find a comprehensive concept to measure the E-learning readiness of organizations? Which criteria can be included? If we examine the models described above closely, we see certain common parameters that always come back. Psycharis suggests three large categories (Psycharis, 2005): resources, education and environment. Each category contains certain criteria. In the category resources the technological readiness, the economic readiness and the human resources readiness are investigated. Education means the readiness of content and the educational readiness. Environment includes entrepreneurial readiness, leadership readiness and readiness of culture.

Resources: First of all, we want to investigate the technological readiness, about the available technological systems that are provided and the way they are used. The economic readiness examines the willingness of the organization to invest in E-Learning. Implementing E-Learning brings along large costs and the organization

needs to be prepared to make the necessary investments in infrastructure but also foresees a degree of administration support. The human readiness refers to the knowledge and the skills of the employees being the e-learners. An important question is if staff has the necessary basic skills and if they do feel at ease with used technology, necessary investments in infrastructure but also foresees a degree of administration support. The human readiness refers to the knowledge and the skills of the employees being the e-learners. An important question is if staff has the necessary basic skills and if they do feel at ease with used technology.

Education: Whether or not an organization is ready from an educational point of view will be determined by the measurement of the readiness of the content. Is the educational content easily available, is it structured good and is it reusable? But also, the educational readiness is important. It is about the learning styles and the educational needs of the employees.

Environment: The criteria of this category are the entrepreneurial readiness and the readiness of the culture. So, the Flemish hospitals of our case all have their own authority on decision making on how they train their staff.

E-learning readiness involves many components of e-learning, including students, lecturers, technology and the environment. In measuring the level of E-learning readiness there are many factors of four component that can be used. These factors need to be considered seriously in order to avoid the occurrence of failure in the implementation of E-learning (Borotis 2004). For research data analysis (Google scholar), and identify the factors most widely used by researchers to measure the readiness of E-learning readiness in higher education. Main factors are policy makers, regulatory body factors (Kaur 2004), Alasadik believe need to be considered in assessing the readiness of E-learning, namely the competencies, experience and attitudes (Alasadik, 2007). Tahereh et al(2011) assessment of instructors' readiness focus on knowledge, attitudes, skills and habits, technology and pedagogy domain. Patrick (2013), Oketch (2013) and Hamid (2013) respectively use skill, attention, experience; organizational barrier, motivation; technical, culture and content; infrastructure, human resources, budget and finance, psychological and content; ICT facilities, digital equipment and Internet connectivity, e-learning software and digital content assessment E-learning Readiness. Lea Sorilla (2014) and Ochogo analysis E-Readiness Perception, Acceptance, Training , Infrastructure and training programs and budgetary allocation on lecturers respectively.

As the research gradually deepens, E-learning Readiness is more comprehensive, the model is richer, and the research factors are more diverse. Most of

the follow-up studies are from Psychological, Sociological, Human Resource, Financial, Technological Skill, Equipment, Content, Institution, Leadership Among the 13 factors, Culture Policy, some factors are selected for analysis and evaluation of their respective research objects, and there are also studies related to review of evaluation models (see Table 2-2).

In recent years, E-Learning Readiness research has gradually expanded from developed countries (Nleya 2009) to developing countries. The E-Learning Readiness research is flourishing in Africa country Uganda (Omodaonyait G 2011) Nigeria (Awoleye 2014), Asia countries Iran, Malaysia, Thailand (Laohajaratsang T 2009, Saekow A 2011) Hong Kong (So 2008) and Eastern European countries (Saekow A 2011). In China, the research and application of e-learning readiness started late, especially in Ethnic Universities in Western China, although e-learning curriculum construction has been carried out, there is little assessment and analysis on E-learning Readiness fields.

Table 2 Studies on the measurement of E-learning Readiness

Years	Researcher	Topic	Factors
2004	Kuldip Kaur, Zoraini Wati Abas	An Assessment Of E-Learning Readiness at Open University Malaysia	Policy Makers and Regulatory Body
2007	Alaasadik	The Readiness of Faculty Members to Develop and Implement E-Learning: The Case of an Egyptian University	Competencies, Experience, Attitudes
2010	Tahereh Eslaminejad, Mona Masood & Nor Azilah Ngah	Assessment of instructors' readiness for Implementing e-learning incontinuing medical Education in Iran	Knowledge, Attitudes, Skills and Habits Toward E-Learning In Both Technology And Pedagogy Domain
2011	Apitep Saekow and Dolly Samson	E-learning Readiness of Thailand's Universities Comparing to the USA's Cases	Policy, Technology, Financial, Human Resource, Infrastructures
2013	Patrick N. Mafenya	An Investigation of First-Year Students' Pedagogical Readiness to E-Learning and Assessment in Open and Distance Learning: an University of South Africa Context	Skill, Attitude, Experience, Organizational Barrier, Motivation

Table 2 (Continued)

Years	Researcher	Topic	Factors
2013	Oketch, Hada Achieng	E-Learning Readiness Assessment Model in Kenyas' Higher Education Institutions: A Case Study Of University Of Nairobi	Technological, Culture and Content
2013	Hamid Mohammad Azimi	Readiness for Implementation of E-Learning in Colleges of Education ICT	Infrastructure, Human Resources, Budget and finance, Psychological and Content
2013	Ouma, G. O., Awuor, F. M., & Kyambo, B.	e-learning readiness in public secondary schools in kenya	ICT facilities, digital equipment and Internet connectivity, E-Learning software, and digital content
2014	Lea Sorilla Nisperos	Assessing the E-Learning Readiness of Selected Sudanese Universitie	E-Readiness Perception , Acceptance , Training , Infrastructure
2014	Ochogo, N. K., Rambo, C. M., Mbwesa, J. K., & Odundo, P. A	Influence of Institutional Support on Lecturers' Preparedness for E-learning at the University of Nairobi, Kenya.	training programs and budgetary allocation on lecturers
2015	Ilgaz, H., & Gülbahar, Y.	A snapshot of online learners: e-Readiness, e-Satisfaction and expectations.	Individual Properties , ICT Competencies , Access to Technology , Motivation & Attitude , Factors that affects Success
2015	Demir, Ö., & Yurdugül, H.	The Exploration of models regarding e-learning readiness: Reference model suggestions.	Models regarding students' e-learning readiness , Models regarding teachers' e-learning readiness , Multilayer models regarding e-learning readiness
'2015	Parkes, M., Stein, S., & Reading, C.	Student preparedness for university e-learning environments.	Infrastructure, stakeholders' attitude, e-learning tools.
2015	Parlakkiliç, A.	E-Learning Readiness in Medicine: Turkish Family Medicine (FM) Physicians Case.	equipment/infrastructure, online learning style, technological skills, cultural readiness, financial readiness
2015	Horzum, M. B., Kaymak, Z. D., & Gungoren, O. C.	Structural equation modeling towards online learning readiness, academic motivations, and perceived learning.	The scales of online learning readiness, academic motivation, and perceived learning
2016	GHE Gay	An assessment of online instructor e-learning readiness before, during, and after course delivery	online instructor, three phases of an online course, technical infrastructure and desirable characteristics of the ELS, user satisfaction, net benefits of the ELS.

Table 2 (Continued)

Years	Researcher	Topic	Factors
2016	Hsin-Hui Lin, Shinjeng Lin, Ching-Hsuan Yeh, Yi-Shun Wan	Measuring mobile learning readiness: scale development and validation	m-learning self-efficacy , optimism , self-directed learning
2016	Fayiz M. Aldhafeeri, Badrul H. Khan	Teachers' and Students' Views on E-Learning Readiness in Kuwait's Secondary Public Schools	the organizational and individual factors of the two major stakeholder groups (teachers and students)
2016	Sayeh Sadat Mousavi Sahebalzamani, Azam Maleki, Soghrat Faghihzadeh, Sima Ojaghloo, Maryam Noroozi	Assessing E-Learning Readiness among Students of Zanjan Medical Sciences University	access to technology, motivation, ability to learn through media, online group discussions, communication skills, major factor of success in e-learning
2016	Ngampornchai, A., & Adams, J.	Students' acceptance and readiness for E-learning in Northeastern Thailand	self-regulation, computing devices ownership, and level of familiarity with education-related technologies.
2017	Yilmaz, R	Exploring the role of e-learning readiness on student satisfaction and motivation in flipped classroom. Computers in Human Behavior	ELRS (Computer self-efficacy, Internet self-efficacy, Online communication self-efficacy, Self-directed learning, Motivation towards e-learning); MSLQ (Intrinsic goal orientation, Extrinsic goal orientation, Task value, Control beliefs, Self-efficacy for learning and performance, Test anxiety)
2017	Coopasami, M., Knight, S., & Pete, M	E-Learning readiness amongst nursing students at the Durban University of Technology.	Computer self-efficacy (CSE), Internet self-efficacy (ISE), Online communication self-efficacy (OCSE), Self-directed learning (SDL) Learner control (LC) Motivation for learning (ML),
2017	Muharina, A. S., & Kelana,	E-learning readiness measurement on Indonesian student from individual perspective: A case study.	Technology, Innovation, People(human resource), SelfImprovement
2017	Edumadze, J. K., Ogoe, J. I., Essilfie, G., Edumadze, G. E., & Graham, R. E.	E-learning at the University of Cape Coast, Ghana-are our Distance Education Students Technologically Ready?	basic computing and Internet skills, E-learning skills.
2018	Adiyarta, K., Napitupulu, D., Rahim, R., Abdullah, D., & Setiawan, M. I.	Analysis of e-learning implementation readiness based on integrated elr model.	Psychological, Sociological, Human Resource, Financial, Technological Skill, Equipment, Content, Institution, Leadership, Culture Policy.

Table 2 (Continued)

Years	Researcher	Topic	Factors
2018	Obi, I., Charles-Okoli, A., Agunwa, C., Omotowo, B., Ndu, A., & Agwu-Umahi, O.	E-learning readiness from perspectives of medical students: A survey in Nigeria.	Attitude, Content, Technological and Cultural
2018	Adams, D., Sumintono, B., Mohamed, A., & Noor, N. S. M.	E-Learning Readiness among Students of Diverse Backgrounds in a Leading Malaysian Higher Education Institution.	blended learning model
2018	Irene, K., & Zuva, T.	Assessment of e-learning readiness in South African Schools.	People, technology, Institution content, strategy.
2018	Bovermann, K., Weidlich, J., & Bastiaens, T.	Online learning readiness and attitudes towards gaming in gamified online learning—a mixed methods case study.	Intrinsic Motivation, Identified Motivation, Extrinsic Motivation, motivation
2018	Mohammed, Y. A.	E-Learning Readiness Assessment of Medical Students in University of Fallujah.	Attitude toward E-learning, E-learning readiness, Content readiness, Culture readiness, Access to resources, Technical skills
2018	Coşkun, Ö., Özeke, V., Budakoğlu, İ., & Kula, S.	E-Learning Readiness of Turkish Medical Students: A Sample from Gazi University.	Computer self-efficacy (CSE), Internet self-efficacy (ISE), Online communication self-efficacy (OCSE), Self-directed learning (SDL) Learner control (LC) Motivation for learning (ML),
2018	Kristanti Ambar Puspitasari	E-learning readiness of distance learners.	The ability to self-regulate their learning, to be self-directed learners, and to use various software
2019	Al-araibi, A. A. M., Naz'ri bin Mahrin, M., Yusoff, R. C. M., & Chuprat, S. B.	A model for technological aspect of e-learning readiness in higher education.	Eight Technological Factors, Specifically: Software; Hardware; Connectivity; Security; Flexibility of The System; Technical Skills and Support; Cloud Computing; And Data Center
2019	Kiberu, V. M., Scott, R. E., & Mars, M.	Assessing core, e-learning, clinical and technology readiness to integrate telemedicine at public health facilities in Uganda: a health facility-based survey.	Core, E-learning, Clinical and Technology readiness

Table 2 (Continued)

Years	Researcher	Topic	Factors
2019	Rafiee, M., & Abbasian-Naghneh, S.	E-learning: development of a model to assess the acceptance and readiness of technology among language learners.	the complex relationships between the perceived usefulness, perceived ease of use, e-learning motivation, online communication self-efficacy and language learners' acceptance and readiness of e-learning.
2019	Mirabolghasemi, M., Choshaly, S. H., & Iahad, N. A.	Using the HOT-fit model to predict the determinants of E-learning readiness in higher education: a developing Country's perspective.	computer self-efficacy, management support, relative advantage, compatibility, and complexity
2019	Ata, R., & Cevik, M.	Exploring relationships between Kolb's learning styles and mobile learning readiness of pre-service teachers: A mixed study.	the learning styles, optimism, self-directed learning and self-efficacy mother education, monthly income, gender, internet use frequency
2019	Geng, S., Law, K. M., & Niu, B.	Investigating self-directed learning and technology readiness in blending learning environment.	self-directed learning, technology readiness, and learning motivation
2020	Lakshmi, Y. V., Das, J., & Majid, I.	Assessment of e-Learning Readiness of Academic Staff & Students of Higher Education Institutions in Gujarat, India.	Stakeholder's belief and appreciation, e-learning practices as attitude, Re-use of the content

2.8 The E-Learning Readiness analysis instrument and Questionnaire system development

In the process of E-learning readiness research, there are also some basic research methods, mainly literature survey methods and questionnaire system commonly used in Social Sciences and pedagogy to evaluate relevant factors. E-learning readiness measurement instruments are a software system for the preparation of the questionnaire and questionnaire survey of relevant assessment factors. Studying the already existing theory and using our insights of E-Learning and quality aspects of E-Learning we developed an E-Learning Readiness measurement instrument (Schreurs,2008). We developed a structure for the instrument and developed a set of questions based on our self-assessment quality questionnaire. This questionnaire can slightly be changed, and adopted according to the sector in which it is used – if necessary.

Table 3 E-Learning Readiness measurement

<p>1. Learner characteristics</p> <ul style="list-style-type: none"> • ICT skills of the trainees • Motivation for use of E-Learning of the trainees • Do they have a preferred learning style? (prefer presentations including audio, video,) 	<p>3. Management</p> <ul style="list-style-type: none"> • Investment in physical environment • Organization of E-Learning in-house • Investment in good user systems • Investment in E-Learning infrastructure • Learning time during working hours?
<p>2. Available facilities for E-Learning</p> <ul style="list-style-type: none"> • ICT aspects / infrastructure • Learning management system 	<p>4. E-Learning solutions/ courses /processes</p> <ul style="list-style-type: none"> • Information about available course • ICT aspects • Support learning activity • Maintenance of systems • Organization of learning activity itself • Support of the learner

Questionnaire is the main research method of E-Learning Readiness. With the application of the Internet, web-based questionnaires have become more and more widely used. Compared with traditional telephone surveys and home visits, Web surveys have the advantages of short cycle, high efficiency, low cost and wide area, which is a development direction of statistical surveys. Respondents of online surveys use keyboards and mouse to fill out questionnaires. It is faster and faster than filling in a printed questionnaire by hand, and generally has a higher response rate than traditional survey methods (Wang Li 2004). Currently, there are many web development languages, such as PHP, ASP, JSP, Ruby, etc. Among them, the PHP programming language is widely used due to its rich resources, extensibility, and diversity of data interfaces (Backes 2017). MySQL (Zhao 2007) is one of the most commonly used databases due to its good open source nature.

2.9 The role and Significance of E-Learning Readiness

The concept of “readiness” has long been understood as a concept that is identical or similar to “mature.” Many experimental studies have shown that what is learned and how to learn cannot ignore the mature conditions of the learner or the level of physical and mental development. Carmichael’s experiment in swimming, A. Gesell and H. Thompson’s twin-climbing ladder experiments, and ER Hilgard’s four-and-a-half-year-old identical twins Experiments, the results show that maturity is a very important factor in development, and learning beyond mature conditions is ineffective. However, some experimental studies have shown that experience or

education has a major impact in the development process. Say "must be re-examined. This challenge comes from four aspects:

1. Vigotsky proposed a new concept of "preparation". He believes that preparation refers not only to the level of development that children have achieved, but also to the recent development that may be possible. Prospects - the closest areas of development. This involves the interaction of maturity and learning in this concept.

2. J. Bruner sees children's development as Growth under specific educational conditions, rather than as a spontaneous maturity process. According to the structural learning he advocates, the basic knowledge of any discipline can be taught to students of any age in an acceptable form, such as advanced mathematics. The knowledge can be taught to the lower primary school students in an intuitive way. Structural learning theory, like the behavioral learning theory, emphasizes the difference of external reinforcement, but it pays more attention to the inner learning motivation and the joy of learning. Intrinsic reward.

3. J. Piaget pays great attention to children's own role in the environment in his balanced concept.

4. The importance of early learning is the biggest impact on mature advantage. The main argument for this view is Luo KZ. The engraving phenomenon discovered by Lenze.

Too much emphasis on the impact of maturity in development is one-sided, and it is not appropriate to infinitely exaggerate the role of education. It must be acknowledged that maturity and education are the two major factors of development, and the two interact intricately in the process of human development. In addition to the level of physical and mental development, smooth and effective learning is closely related to the following two factors: 1 life experience: 6 years before children enter school is an important period for developing consciousness and enriching life. Rich direct experience is an important foundation for learning cultural knowledge. Because language is just a symbol, if there is no sensible understanding of the corresponding things it represents, these words are meaningless. Some people think that education is reading, prematurely let young children literate and learn culture, in the absence of actual feelings, this is not beneficial. Learning depends on experience and on existing knowledge. Osabelle believes that the study of knowledge is the process of assimilation between existing knowledge and new knowledge. He believes that the most important factor influencing learning is what the learner already has; the learning of knowledge is like snowballing or spiraling. The more basic knowledge, the more effective learning. 2 seeking curiosity: curiosity is a psychological tendency

of people. J. Dewey believes that curiosity has three levels: the initial expression of "biological" power is not sensible; under the "social" stimulation, it is expressed as a hope to further understand the magical world, which is rational. The germination of curiosity; when the educator guides the far-reaching purpose and makes it pursue the exploration to achieve the goal, the curiosity has a certain rationality and turns into curiosity. The cultivation of children's curiosity is the most important issue in preparing for school. In general learning, it is also an important aspect of learning preparation to arouse learning motivation and stimulate interest in learning.

E-Learning Readiness can be defined as the level of readiness of certain institution or organization towards various aspects of the technology of E-Learning, before the whole E-Learning environment being applied for various purposes (Leigh D 2010). Therefore, any E-Learning Readiness will be conducted prior to the introduction of the E-Learning technology itself to the prospective users, whom will be the respondents to the E-Learning Readiness assessment. The typical E-Learning Readiness assessment will measure the users' ability in adapting to technological challenges, collaborative learning and training as well as the synchronous and asynchronous self-paced learning and training.

E-Learning Readiness not only affects the success of new learning, but also affects the efficiency of learning. In the education of the school and higher education, if the educational content and measures can make the students' learning fit with their study preparation, then it can ensure that the students' learning is "economic and reasonable" in terms of time and energy consumption. If the student's learning lags behind the preparation for study, it will waste a lot of learning opportunities. On the contrary, if students learn much ahead of learning readiness, they will not only have difficulty grasping the knowledge and skills they are learning, but also have unpleasant effects, making them afraid and avoiding learning. At the same time, learning will also promote the psychological development of students, and new developments will prepare for further new learning (Liu, 2012).

An assessment of E-learning Readiness is essential for the successful implementation of e-learning as a platform for learning. E-learning readiness is to analyze the influence of various factors on e-learning, such as resources, environment, education, technology, etc., so as to prepare for e-learning. In this study, we choose learning attitude, learning basic skills, computer application skills, self-management skills, learning conditions and environment Five dimensions (five factors) are used to evaluate e-learning readiness of college students, which can basically reflect the readiness of resources, environment, education, technology and other aspects.

CHAPTER III

RESEARCH METHODOLOGY

This research is the research and development process by designing and developing E-Learning Readiness assessment system. The research methodology is as follows:

1. Design and develop an E-Learning Readiness assessment system

According to the research purpose, we use B / S architecture, use PHP technology and MySQL database to develop and complete a Web-based E-learning Readiness system.

E-Learning Readiness Assessment Systems function as follows:

1.1 Learners can register and log in to conduct online surveys, and use IP address detection to automatically avoid duplicate registration and answer questionnaires.

1.2 The questionnaire system can automatically analyze and evaluate the questionnaire in real time, and collect the results of the questionnaire survey in real time to obtain the evaluation results of college students' E-Learning Readiness.

1.3 The system administrator can comprehensively manage the questionnaire system and assign different system usage rights to different personnel.

1.4 School administrators and school deans can log in to view undergraduate students' E-Learning Readiness

2. Population and Sample

2.1 Population

The population was 1356 undergraduate students from the School of Biology and Chemistry and the School of Information Technology who enrolled on 1st semester 2019. Selecting undergraduate students from Universities in ethnic areas as the research object, firstly making up for the lack of research on E-Learning Readiness of undergraduate students in ethnic areas, so as to be able to more fully understand the E-Learning Readiness of Chinese college students. Through comparative research, we can deeply understand the shortcomings of ethnic areas, and provide reference for the country to formulate the development policies of universities in ethnic areas.

2.2 Sample

The sample group was undergraduate students from school of Biology and Chemistry and school of Information Technology. As the fourth-year university students went out for internships, the samples were first-year, second-year, and third-year students in the School of Biology and Chemistry and School of Information and Technology. A total of 642 samples were random selected from the research group to conduct a questionnaire survey. The random sampling method is used, to randomly determine the entire class as the survey target for enrolled students on the 1st semester 2019 (because the fourth-year students did not sample outside school internships) in order to eliminate the impact of differences in learning background on the sample. The researcher determined sample size from (Krejcie 1970). As one of the early School of Xingyi Normal University for Nationalities, the School of Biology and Chemistry has 2 first-level disciplines of biology and chemistry. The number of students is large, and the ability of scientific research and teaching is more prominent. Students in the school participate in the E-Learning course. A good representation of non-computer majors. The School of Information Technology is a college with a background in computer science that reflects the impact of computer knowledge on E-Learning courses. Therefore, in this study, the School of Biochemistry and the School of Information and Technology were selected as research samples.

3. Tools used for data collection (E-Learning Readiness assessment system)

In this study, we developed an E-Learning Readiness assessment system based on PHP technology and MySQL database (Cai Juyuan 2013) which aim to obtain efficient and accurate collection of investigation data. The development process based on the B / S questionnaire system is performed with reference to (Zhang Yahui 2008, Ni Lang 2014) methods. The main development process includes the following aspects:

1. According to the function realization requirements of the system, select the appropriate technology for the development of this system.

PHP (full name Hypertext Preprocessor) is a very popular general-purpose open source scripting language that is mainly used in the development and construction of Web systems. As an object-oriented programming language, it has the advantages of rich resources, diverse database support interfaces, high scalability, and good scalability. When using PHP for Web development, MySQL is one of the most commonly used databases. On the one hand, because MySQL is an open source product and there are many community resources, on the other hand, because PHP provides a large number of operating interfaces for it, it is easy to use (Ni,2014). Software system development based on B/S architecture pattern is gradually becoming a trend (Jin 2013).

In this study, a web-based questionnaire survey system for students was designed and posted on the School intranet for students' convenience. The development of the Web questionnaire system can save not only a large amount of paper and human resources but also the use of online questionnaires to improve the efficiency and accuracy of the questionnaire. IP Registration Verification Procedure of Network Questionnaire can avoid the phenomenon of repeated answers in paper questionnaires (Li 2006, Jin 2013).

This system adopts B/S (Browser/server) mode and is divided into three layers:

- 1) The user interface is written in HTML and JavaScript;
- 2) Database is MySQL5.0;
- 3) All data processing scripts are implemented by PHP storm.

2. Carry out system requirements analysis to determine the overall system requirements and the detailed requirements of each functional module after decomposition.

This system includes 7 function modules,

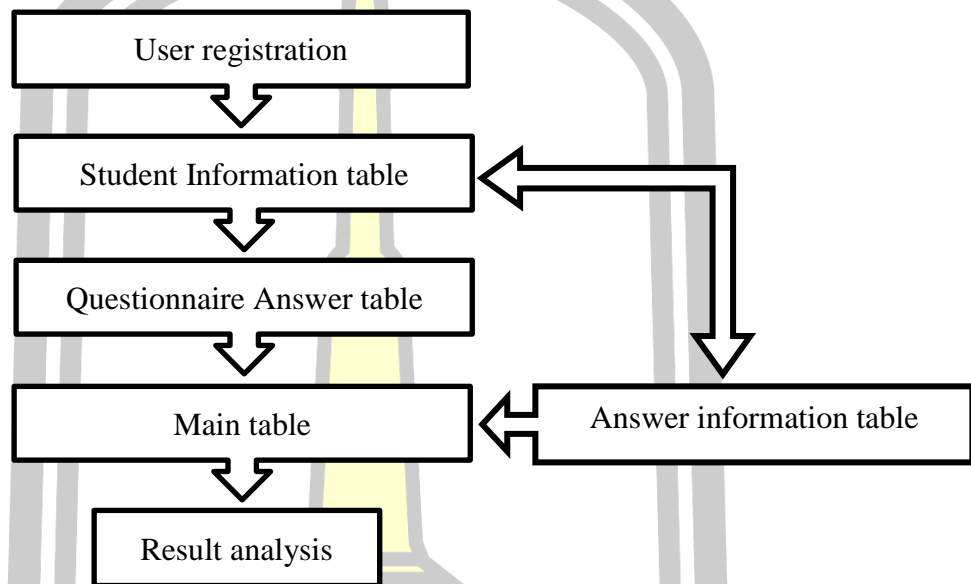
- 1) User registration module
- 2) User questionnaire module
- 3) Administrator module
- 4) School administrator
- 5) Query module
- 6) Results analysis module
- 7) CVS file module.

In this 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, and clearly and intuitively feed the analysis results to the users with authority.

After the user registers and logs in the Questionnaire System, the user can participate in the questionnaire survey. The questionnaire management module is responsible for the generation and deletion of the questionnaire. The administrator system can operate the user management module and the questionnaire management module. The result analysis module is responsible for outputting the final data. Analysis results.

3. System design. According to the system requirements and the characteristics of the technology used, the specific processes of the system and functional business are designed, and the system database design is realized.

The tables involved in this database are user, student information, questionnaire answer, result specified as follows:



1) The Student Information user is used to store information of the registered student, including the student ID, gender, school, age, nation, Father education and Mouth education and the like

2) Registration is required to enter the question and answer page.

3) Questionnaire Answer table, for storing answers to each student questionnaire.

4) The answer information table, the answer information of the saved questionnaire includes information such as the IP of each respondent.

5) Main table, associating users with all information.

6) The result description results, save the user's description of each score segment.

4. Implementation of system function modules

4.1 User Module

1) Registration: To create a user account to use the system, you need to write the following information: student ID, gender, school, age, nation, Father education and Mouth education;

2) Students can only register successfully if all information is filled in correctly;

3) Login/Logout: After successful registration, only when the login is valid, automatically log out after completing the questionnaire.

4) Information display: Count the number of questionnaires published by the user and the number of questionnaires in the delivery, and display the status of the user, whether it is frozen by the administrator;

5) Access permission check: Before displaying the content of each page, it is necessary to verify whether the currently accessed user has logged in, and whether there is permission to access the page (including questionnaire creation, questionnaire management, and this function will be called in the administrator module);

6) In the user module, an interface needs to be provided for the user to enter the creation questionnaire module and the questionnaire management module. For the user with administrator rights, an interface needs to be provided to enter the administrator module.

4.2 User questionnaire module

1) Entering from the user module page, the frozen user cannot access;

2) This module will display the questionnaire answer list of the current user. Listed the following information for each questionnaire: student ID, start time, end time, creation time, current status, and provides the following functional interfaces in the administrator interface: view results, modify, delete;

3) After the questionnaire is submitted, all the answers to the current questionnaire are automatically displayed, and the final score is displayed;

4) The questionnaire needs to clear the response record of the questionnaire, and keep the duplicate questionnaire records private.

5) The questionnaire result operation performed by the administrator will not be operated by the school manager.

4.3 Administrator Module

Users with administrator privileges can enter this module, mainly have the following functions:

1) View all data in the database.

2) Query related data based on keywords.

3) Perform related operations on database data: edit, delete, etc.

4) Download of related data.

4.4 School administrator

- 1) View the total data, but you cannot edit or delete the data.
- 2) Preliminary analysis of viewing data:
 - (A) Mean and standard deviation of sub-items in each dimension of E-learning readiness;
 - (B) Personal factors E-learning readiness;
 - (C) Two school compare

4.5 Query module

The query module is a query operation on the SQL database. The school manager can select the query field according to the drop-down menu, enter a more specific query in the text box at the back, and click the submit button to get the query result. This is achieved in part by the "select" statement. 4) Provide a one-click forwarding button to enable it to be easily forwarded to Weibo, social networking sites, etc.

4.6 Results Analysis Module

- 1) When the user accesses the module, the system will select the display content according to the security mode: for the normal mode, the system will directly display the result analysis page; in other modes, the questionnaire login page will be required to input the password, and the questionnaire will be displayed after the verification is passed;
- 2) Statistical information: results statistics, statistics of the number of people in each option and the percentage of the total number of people, can be displayed in the form of a bar chart and a pie chart; for questions and answers, the message of each participant is displayed; weighted analysis: statistical option rights The sum of the values and the percentages can be displayed in the form of a bar chart and a pie chart;
- 3) Analysis of the number of clickers: display the response trend chart;
- 4) Click on my answer: display the response status of the current IP address;
- 5) Click condition query: the user customizes the logical relationship between the options, between the questions and between the questions, and queries the number of people who meet the various logical conditions;
- 6) Hierarchical analysis and optimal answer: According to the influence factor of the topic and option, the corresponding score is calculated

according to the analytic hierarchy process, and the distribution map of the score and the optimal answer are displayed.

4.7 CVS file module

1) In the administrator mode, you can download the CVS format file of the total data, so you can perform other operations on the total data and back up, use SPSS to get more and more accurate analysis results, and so on.

2) This part of the function is implemented by a separate cvs.php file

5. System test, testing the key functions of the system, analyzing the test results, and optimizing the system design.

Five experts, three teachers (the information see Experts and teachers' information) and 60 students who had experiences in research project education, computer science, software engineer, E-learning, teaching method and educational psychology field, participating the system test. Optimize the system based on experts and users' recommendations and system stress test results. so that the system can meet the requirements of development purposes. Finally, through the way of multi people online at the same time, the system is further improved. The system can be used for multi people simultaneous multi project operation, and the system test results meet the system development requirements.

4. Research Methodology

In this research, the main methodology is to design and develop an E-learning Readiness assessment system, and at the same time comprehensively use questionnaire survey methods, expert survey methods, expert consultation methods, literature survey methods, data statistics methods and other methods to assess undergraduate students' E-learning Readiness.

5. Data Collection

1. Questionnaire preparation

Through literature survey and analysis of the essential abilities of E-Learning winners and the dimensions and projects of E-Learning Readiness evaluation, it is found that E-Learning Readiness has some common characteristics: Firstly, it includes "Self-orientation", "learning independence", "time management, learning control etc. It indicates that E-Learning puts forward higher requirements for learners' self-management ability. Secondly, in a large number of researches, computer skills and learning skills are juxtaposed as an important E-Learning ability, that is, the

importance of computer skills in E-Learning is comparable to the basic learning skills (listening, speaking, reading and writing), which is a necessary learning skill. Third, the scale used in E-Learning Readiness highlights the readiness for cultural identity. The quasi-permanent feature of E-Learning teaching and learning breaks the traditional learning concept, and the opening of E-Learning educational institutions breaks through the public's understanding of traditional campuses. Therefore, learners should recognize and recognize the learning style and culture of E-Learning before they participate in E-Learning learning.

Because of the recognition of the above E-Learning Readiness and existing assessment tools, with reference to the existing questionnaire system (Muse H. E 2003, Simpson 2003, Smith 2005); University of North Carolina, Greensboro, 2011; Min-Ling Hung et al. ,2010; Li et al,2014;Yao, 2015), listen to expert suggestions, preliminary design to form assessment items corresponding to each dimension, and finally form E-Learning Readiness assessment framework consisting of 5 dimensions and 32 evaluation items (Li Juan 2014, Yao Jie 2015)

Dimensions 1: Learning attitude refers to the psychological tendency of learners to learn and their learning situations. It can usually be judged and explained from the aspects of students' attention, emotional state and will state. At the same time, this dimension includes not only attitudes of online learners towards learning objectives, learning difficulties, learning confidence, but also attitudes toward schools and their culture.

Dimension 2: Learning basic skills, explaining how to learn knowledge and how to perform learning, that is, the skills to solve learning, the ultimate performance is to form learning ability (Chen Li 2005).

This dimension includes basic skills such as listening, expression, reading, writing, assignment, preparation, and choice of learning methods and help-seeking methods.

Dimension 3: Computer application skills, that is, the skills of learners to use computers, networks, etc. for effective learning, including information retrieval capabilities, information acquisition and transmission capabilities, information evaluation and application capabilities. This study embodies these capabilities as the most basic application skills for learners to learn online, including online data browsing, using search engines to find data, sending and receiving emails and file transfers, and using networks and software to communicate.

Dimension 4: Self-management skills, that is, the skills of individual learners to self-diagnose learning needs, clarify learning objectives, develop learning plans,

and self-monitoring and managing the implementation process and learning outcomes. This dimension involves two aspects: self-directedness and time management ability. Self-directedness includes planning and implementation, schedule management, learning evaluation, reflection and adjustment. Time management includes engineering contradictions, learning time schedule and learning resistance. Interference ability, etc.

Dimension 5: Learning conditions and environment, that is, the preparation of E-learning learners in terms of learning environment, financial security, and external motivation support.

2. Questionnaire preparation and testing

Through literature survey and analysis of the essential abilities of E-Learning winners and the dimensions and projects of E-Learning Readiness assessment, it is found that E-Learning Readiness has some common characteristics. Base on the recognition of the above E-Learning Readiness and existing evaluation tools, with reference to the existing questionnaire system (Muse, 2003; Simpson, 2003; Kaur and Abas, 2004; Smith, 2005; Min-Ling Hung et al, 2010; Li et al, 2014; Yao, 2015), listen to expert suggestions, finally form E-Learning Readiness assessment framework consisting of 5 dimensions and 32 evaluation items: Learning attitude, Learning basic skills, Computer application skills, Self-management skills, Learning conditions and environment.

According to the content of 32 items in 5 dimensions, the preliminary draft of the questionnaire was designed in the form of Lickett scale of five levels. The five options in the study are fully consistent, consistent, general, non-conforming, and completely non-compliant, respectively assigned 5, 4, 3, 2, 1. Five educational research experts, three teachers and 60 E-Learning learners were invited as the subjects of the first round of the test. In the course of the questionnaire test, we record in detail the suggestions of the subjects for the modification of the design form, the order of the items and the expression of the specific content of the questionnaire. After the questionnaire was revised, we invited experts in the field of education, teachers and learners to test and modify the items that were difficult to understand or have 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 $\alpha = 0.911$, indicating 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, indicating that the online questionnaire system is stable.

3. Experts and teachers' information

There were five experts, three teachers, who had experiences in research project education, e-learning, teaching method and educational psychology field in Xingyi Normal University for Nationalities, China. participate in the content test, review and evaluation of the questionnaire, and put forward suggestions on the modification of the questionnaire. The expert criteria are as follows: have professional knowledge and experiences in the field of research educational management, educational technology, educational research, teaching methods or Computer application, have Master Degree at least. And have experiences in teaching, Student management and part of advising graduate students in the field mentioned above. The experts and teachers' name and qualification:

1) Prof. Zhang Xiang, Deputy dean of School of Educational Sciences, Xingyi Normal University for Nationalities, China.

2) Associate Professor, Dr. Zhang pei, Deputy dean of School of Biology and Chemistry, Xingyi Normal University for Nationalities, China.

3) Prof. Dr. Zhang Shengli, School of Information and Technology, Xingyi Normal University for Nationalities, China.

4) Prof. Dr. Wang Yingjuan, School of Biology and Chemistry, Xingyi Normal University for Nationalities, China.

5) Associate Professor, Dr. Guo Xiyue, School of Information and Technology, Xingyi Normal University for Nationalities, China.

6) Prof. ZhaoYan, Deputy dean of School of Educational Sciences, Xingyi Normal University for Nationalities, China. Director of teaching and research section of educational psychology School of Educational Sciences, Xingyi Normal University for Nationalities, China.

7) Xia Kecan, Lecturer, Secretary of student Party branch of School of Biology and Chemistry.

8) Lu Biao, Lecturer, Instructor of School of information and technology.

Note: According to some references, 5 experts are generally required to evaluate the questionnaire to ensure the validity and validity of the questionnaire. In order to improve the quality of the questionnaire evaluation, 3 teachers (1 teacher of educational psychology and 2 student management teachers) were added to Conduct assessment of the questionnaire and questionnaire guidance to improve the quality of the questionnaire.

6 Statistical Analysis

6.1 Testing the Presupposed Dimension of E-Learning Readiness

In order to further test the rationality of the preset dimensions and determine the analytical framework of the research results, this study used exploratory factor analysis to analyze the results of the survey. Taking characteristic value greater than 0.9 and Rotating load greater than 0.5 as boundaries (in order to avoid loss information, load of some item is slightly less than 0.50), five common factors are obtained. After rotating, 32 items of assessment prepared for E-Learning were basically clustered to 5 principal components according to the original questionnaire result. The result indicating that the preset five dimensions are reasonable. Further shows that the questionnaire is reasonable and effective. Rotational Load and Common Factor Interpretation see Appendix A.

6.2 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 analysis results were used for E-learning Readiness assessment.



CHAPTER IV

RESULTS OF DATA ANALYSIS

4.1 To develop an E-Learning Readiness assessment software system

E-Learning Readiness assessment system mainly involves administrator user and student user. Administrator user includes System Administrator and School Administrator.

The System Administrator has the authority of system resource management, user management and data manual verification. The System Administrator can also query E-Learning readability results and selectively output different types of questionnaire results and data. The data output by the administrator (in CVS format) can be used for more comprehensive statistical analysis.

The School Administrator has the right to view the number of participants in the questionnaire and the college E-Learning readability.

Student users are the participants in the questionnaire. First, they become system users through information registration and administrator review. If the registration information is incomplete or the registration information is wrong, they will return to complete the information again. Only when they meet the system requirements can they become system users. Students log in to the account for questionnaire survey after registration. If they fail to pass the completion and logic verification of the system questionnaire, they will return to the questionnaire to complete and modify the questionnaire, and submit it until the system verification is passed.



The system work flow chart see Figure 4..

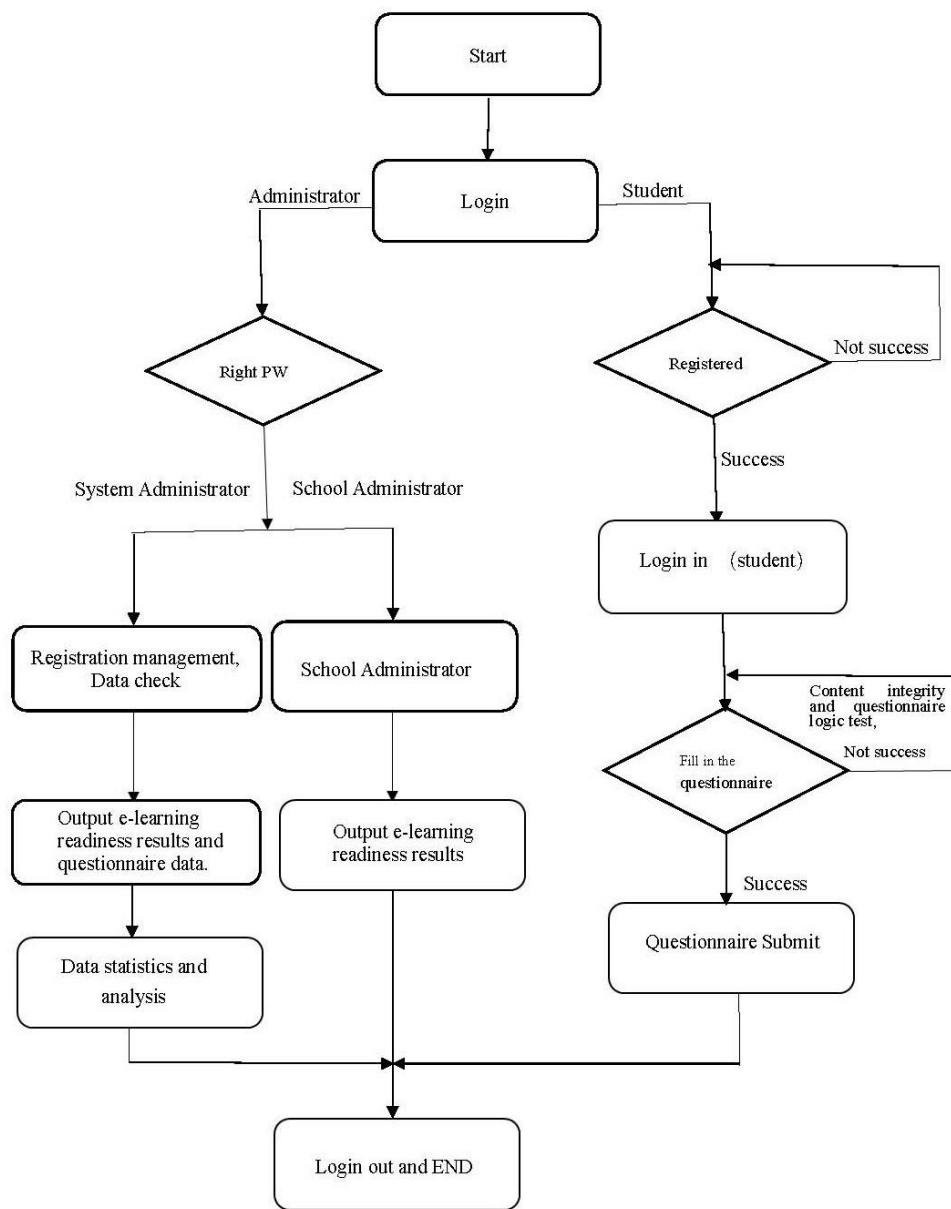


Figure 4 Flow chart of Assessment System

This system includes 7 function modules:

1) User registration module

兴义民族师范学院
XINGYI NORMAL UNIVERSITY FOR NATIONALITIES

问卷调查系统 (Questionnaire system)

学生入口 (Student Login)
管理员入口 (Administrator Login)

注册个人信息 (Register personal information)

学号 (Student ID)

姓名 (Name)

性别 (Gender) 男 Male 女 Female

手机 (Telephone number)

学院 (School)

提交 (Submit)

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Figure 5 User registration

2) User questionnaire module

兴义民族师范学院
XINGYI NORMAL UNIVERSITY FOR NATIONALITIES

问卷调查系统 (Questionnaire system)

学生入口 (Student Login)
管理员入口 (Administrator Login)

kaiwan(ID:61010555004)的问卷
kaiwan(ID:61010555004)'s questionnaire

Q1: I have a sense of responsibility to participate in E-learning ()
 A. Fully compliant B. Compliant C. General D. Does not meet E. does not match at all.

Q2: Basic reading and writing skills
 A. Fully compliant B. Compliant C. General D. Does not meet E. does not match at all.

Q3: Online Information Browsing
 A. Fully compliant B. Compliant C. General D. Does not meet E. does not match at all.

Q4: Develop a suitable study plan

Figure 6 User questionnaire

3) Administrator module

共查询到记录数 (Total) : 613

ID	学号	学院	性别	年龄	民族	生源地	父母学历	题1	题2	题3	题4	题5	题6	题7	题8	题9	题10	题11	题12	题13	题14	题15	题16	题17	题18	题19	题20	题21	题22	题23	题24	题25					
1	20164064101	生化学院	男	21	汉	小学及以下	小学及以下	a	a	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	c	c	b	c		
2	20164064102	生化学院	女	20	汉	大学及以上	高中	c	c	b	d	b	c	b	c	c	b	b	c	c	c	c	c	c	c	c	b	c	b	c	b	a	b	c	a	b	c

Figure 7 Administrator

4) School manager

共查询到记录数 (Total) : 613

学号	学院	性别	年龄	民族	生源地	父母学历	题1	题2	题3	题4	题5	题6	题7	题8	题9	题10	题11	题12	题13	题14	题15	题16	题17	题18	题19	题20	题21	题22	题23	题24	题25								
20164064101	生化学院	男	21	汉	小学及以下	小学及以下	a	a	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	c	c	b	c		
20164064102	生化学院	女	20	汉	大学及以上	高中	c	c	b	d	b	c	b	c	c	b	b	c	c	c	c	c	c	c	c	c	b	c	b	c	b	a	b	c	b	c	a	b	c

Figure 8 School manager r

5) Query module



问卷调查系统 (Questionnaire system)



学生入口(Student Login) | 管理员入口(Administrator Login)

input key: 学号 | search | CVS File

得到记录数 (Total) : 613

管理	ID	学号	学院	性别	年龄	民族	生源地	小学及以下	初中	高中	大学及以上	父亲学历	母亲学历	题1-1	题1-2	题1-3	题1-4	题1-5	题1-6	题2-1	题2-2	题2-3	题2-4	题2-5	题2-6	
编辑	1	20164064101	生化学院	男	21	汉	小学及以下							b	b	b	b	b	b	b	b	b	b	b	b	b
删除	2	20164064102	生化学院	女	20	汉	高中							b	c	b	c	c	b	b	c	c	c	c	c	c

Figure 9 Query module

6) Results analysis module



问卷调查系统 (Questionnaire system)



学生入口(Student Login) | 管理员入口(Administrator Login)

Mean and standard deviation of sub-items in each dimension of E-learning readiness

Mean and standard deviation of sub-items in each dimension of E-learning readiness

Personal factors E-learning readiness

Two school compare

	Investigation item content	Means	Standard deviation
Learning Attitude	1-1 Responsibility awareness of E-learning	3.636	0.8129
	1-2 Clear learning motivation	3.586	0.7644
	1-3 Recognize the learning autonomy required for e-learning	3.705	0.7804
	1-4 Know the characteristics of E-learning	3.241	0.8083
	1-5 think that time and energy should be invested	3.803	0.7688
	1-6 Be prepared for any learning difficulties	3.868	0.7542
	2-1 Basic reading and writing skills	4.044	0.7244
	2-2 Clearly express your personal opinion	3.793	0.7243
	2-3 Know the learning method that suits you	3.705	0.7622
	2-4 Find ways to solve learning problems	3.879	0.7123

Figure 10 The result of E-learning readiness

7) CVS file module.

兴义民族师范学院
XINGYI NORMAL UNIVERSITY FOR NATIONALITIES

问卷调查系统 (Questionnaire system)

学生入口(Student Login) 管理员入口(Administrator Login)

input key 学号 search CVS File

共查询到记录数 (Total) : 613

管理ID	学号	学院	性别	年龄	民族	生源	入学年份	题1	题2	题3	题4	题5	题6	题7	题8	题9	题10	题11	题12	题13	题14	题15	题16	题17	题18	题19	题20	
1	20164064101	化学学院	男	21	汉	小学及以下		a	a	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	b	c	c

administrator.csv 全部显示

Figure 11 The result output

Five experts, three teachers (See Experts and teachers' information) and 60 students who participated in the questionnaire assessment also participated in the system test. Optimize the system based on expert recommendations and system stress test results. so that the system can meet the requirements of development purposes. Finally, through the way of multi people online at the same time, the system is further improved. The system can be used for multi people simultaneous multi project operation, and the system test results meet the system development requirements.

4.2 To Study the Five Components of E-learning Readiness by Using Exploratory Factor Analysis (EFA) Method.

4.2.1 Reliability analysis of questionnaire

In the questionnaire research, the first thing that we need is to determine whether the questionnaire reflects the purpose and intention of the survey, whether all the questions in the questionnaire measures the same content and information; meanwhile, the reliability of the questionnaire data must were obtained from reliability analysis before the analysis of the questionnaire. The reliability itself has nothing to do with the correctness of the measurement results. Its role is to test the stability of the questionnaire itself. Cronbach α coefficient is often used in reliability analysis to measure 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. It is generally believed that α value between 0.5-0.9 indicates that the questionnaire is reliable. If the reliability coefficient α value is lower than 0.5, the survey results of this questionnaire will be unreliable.

The results of 613 valid questionnaires were collected. The results were standardized according to the scoring rules, and then reliability analysis was carried out by using IBM SPSS22 software. The results are shown in the table 2.

The results from Table 2. show that the overall Cronbach α coefficient of the questionnaire is greater than 0.9, and each dimension Cronbach α coefficient of questionnaires is greater than 0.75, indicating that the questionnaire has high reliability and high internal consistency.

Table 4 Reliability analysis

Category	Cronbach's Alpha	No. Item
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

4.2.2 Reliability analysis of questionnaire

The questionnaire with reliability may not have validity, so it is necessary to analyze the validity of the questionnaire

Table 5 KMO and Bartlett test

The data in the above table indicate that KMO value of the questionnaire

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

statistical results is 0.932, and the Bartlett ball test with a significant level of 0.05 is passed. The questionnaire has a high structural validity. The data from the questionnaire is very suitable for factor analysis.

4.2.3 Cluster analysis of questionnaire and factor analysis

The statistical results of the 32 questions (variables) in the questionnaire were analyzed by using IBM SPSS 22.0 software. The statistical results of the 32 questions (variables) in the results of the questionnaire were clustered by SPSS. The clustering results are shown in Figure 4-9. The 32 variables are clustered into 5 branches, 1-1, 1-2, 1-3, 1-4, 1-5, 1-6; 2-1, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 2-8 ; 3-1, 3-2, 3-3, 3-4, 3-5; 4-1, 4-2, 4-3, 4-4, 4-5, 4-6, 4-7, 4-8, 4-9; 5-1, 5-2, 5-3, 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). based on the above clustering results, we can use the five preset common factors (5 dimensions) of Learning attitude, Learning Basic Skills, Computer Application Skills, Self-management Skills, Learning Conditions and Support to assessment E-learning Readiness of undergraduate students us factor analysis method.

variable	5 clustering
1-1	1
1-2	1
1-3	1
1-4	1
1-5	1
1-6	1
2-1	2
2-2	2
2-3	2
2-4	2
2-5	2
2-6	2
2-7	2
2-8	2
3-1	3
3-2	3
3-4	3
3-5	3
4-1	4
4-2	4
4-3	4
4-4	4
4-5	4
4-6	4
4-7	4
4-8	4
4-9	4
5-1	5
5-2	5
5-3	5
5-4	5
5-5	5

Figure 12 The result of Variable clustering

After obtaining common factors through cluster analysis, exploratory factor analysis can be carried out. The results of exploratory factor analysis are as follows:

Table 6 Variance contribution rate

Element	Total variance of interpretation								
	Initial eigenvalue			Extract square sum load			Rotate square sum load		
	Total	Variance %	Cumulative variance %	Total	Variance %	Cumulative variance %	Total	Variance %	Cumulative variance %
1	9.978	31.182	31.182	9.978	31.182	31.182	4.177	13.052	13.052
2	2.501	7.817	38.999	2.501	7.817	38.999	3.824	11.950	25.002
3	1.496	4.675	43.674	1.496	4.675	43.674	3.013	9.416	34.418
4	1.299	4.060	47.733	1.299	4.060	47.733	2.987	9.335	43.753
5	1.232	3.849	51.582	1.232	3.849	51.582	2.505	7.828	51.582
6	1.062	3.318	54.899						
7	.922	2.881	57.780						
8	.887	2.772	60.552						
9	.853	2.664	63.216						
10	.786	2.457	65.673						
11	.757	2.367	68.040						
12	.746	2.331	70.371						
13	.695	2.170	72.541						
14	.638	1.994	74.535						
15	.612	1.913	76.448						
16	.598	1.867	78.316						
17	.574	1.792	80.108						
18	.544	1.700	81.808						
19	.539	1.685	83.492						
20	.522	1.632	85.125						
21	.513	1.604	86.728						
22	.481	1.502	88.231						
23	.466	1.457	89.688						
24	.444	1.387	91.075						
25	.435	1.360	92.435						
26	.407	1.272	93.708						
27	.387	1.209	94.917						
28	.372	1.163	96.079						
29	.361	1.127	97.207						
30	.332	1.039	98.245						
31	.298	.933	99.178						
32	.263	.822	100.000						

Extraction method: principal component analysis

Table 7 Rotation load matrix

	Rotating element matrix ^a				
	Element				
	1	2	3	4	5
Learning Basic Skills 1	.967	.203	.054	.128	.068
Learning Basic Skills 7	.967	.203	.054	.128	.068
Learning Basic Skills 6	.967	.203	.054	.128	.068
Learning Basic Skills 8	.967	.203	.054	.128	.068
Learning Basic Skills 4	.967	.203	.054	.128	.068
Learning Basic Skills 5	.967	.203	.054	.128	.068
Learning Basic Skills 3	.967	.203	.054	.128	.068
Learning Basic Skills 2	.967	.203	.054	.128	.068
Self-management skills 3	.192	.726	.061	.052	.052
Self-management skills 2	.117	.699	.049	.174	.060
Self-management skills 1	.216	.663	.095	.093	.192
Self-management skills 7	.148	.654	.023	.023	.200
Self-management skills 8	.060	.653	.184	.160	.045
Self-management skills 6	.223	.619	.089	.076	.110
Self-management skills 9	.173	.579	.158	.156	.115
Self-management skills 5	.231	.523	.165	.136	.216
Self-management skills 4	.136	.516	.214	.287	.092
Learning conditions and support 5	.008	.103	.788	.042	.149
Learning conditions and support 4	.089	.136	.718	.000	.171
Learning conditions and support 1	-.026	.132	.668	.161	.132
Learning conditions and support 2	.109	.149	.642	.182	.179
Learning conditions and support 3	.071	.146	.573	.072	.434
Learning attitude 2	.224	.129	-.051	.802	.232
Learning attitude 5	.184	.071	.011	.741	.316
Learning attitude 3	.158	.248	.346	.663	-.150
Learning attitude 6	.104	.254	.415	.588	-.150
Learning attitude 1	.178	.332	.107	.504	.127
Learning attitude 4	.063	.337	.213	.389	.194
Computer application skills 2	.104	.186	.266	.130	.711
Computer application skills 1	.054	.186	.267	.205	.667
Computer application skills 4	.121	.323	.049	-.001	.648
Computer application skills 3	.027	.107	.280	.108	.629

Extraction method: principal component analysis.

Rotation method: Orthogonal rotation method with Kaiser standardization

a. Rotation converges after 7 iterations.

Combined with table 4 and table5, the following results can be obtained:

Principal component one: it contains eight questions of learning basic skills, which indicates that principal component one reflects the basic learning ability dimension. Its variance contribution rate is 13.052%, which is the largest one among the five main components, indicating that this main component has the greatest impact on the overall questionnaire.

Principal component two: it contains nine questions of self-management skills, indicating that principal component two is the factor reflecting self-management ability in E-learning readiness, and its variance contribution rate is 11.950%, which is the second largest of the five principal components, indicating that the influence of this principal component on the overall questionnaire lies in the second place.

Principal component three: it includes five questions of learning conditions and support, indicating that principal component three reflects the factors of learning conditions and support dimension in learning readiness, and its variance contribution rate is 9.416%, which is the third largest of the five principal components, indicating that the influence of this principal component on the overall questionnaire is in the third place.

Principal component four: it contains six questions about learning attachment, which indicates that principal component four reflects the factors of learning attachment dimension in learning readiness, and its variance contribution rate is 9.335%, which indicates that the influence of this principal component on the overall questionnaire is in the fourth place.

Principal component five: it includes four questions of computer application skills. It shows that the variance contribution rate of computer application skills dimension in principal component five is 7.828%, which shows that the influence of this principal component on the overall questionnaire is in the fifth place.

In addition, from the Table 5 rotation load matrix, it can be seen that the load of 32 questions is relatively large only on a certain principal component, so we can conclude that each question of e-learning readiness questionnaire has validity.

4.3 Assess E-Learning Readiness of undergraduate students

4.3.1 Assessment of E-Learning Readiness of Xingyi Normal University for Nationalities

Systematic and manual assessment of statistically recovered questionnaires, calculation of questionnaire recovery rate, elimination of invalid questionnaires, calculation of the number of valid questionnaires and the proportion of valid questionnaires. 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 (Table6, Table7).

Table 8 Mean and standard deviation of sub-items in each dimension of E-Learning Readiness

Investigation item content	Means	Standard deviation	
Readiness dimension one 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
Readiness dimension two 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
Readiness dimension three 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 four 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

Table 8 (Continued)

Investigation item content		Means	Standard deviation
Readiness dimension five 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
	5-1 Get support from family	4.342	0.7616

Note: This table

According to the score 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 situation of students' E-Learning is relatively consistent, and the individual differences are small, which shows that students' understanding of E-Learning is generally consistent.

Table 9 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 shows that students' learning attitude and self-management skills score were low, learning conditions and support score were the highest, and learning ability and computer application ability were in the middle level.

4.3.2 Personal Factors Affecting E-Learning Readiness

613 valid questionnaire data are used for personalized data analysis, and the analysis results are as follows (Table 8).

Table 10 Personal Factors E-Learning Readiness

		Learning Attitude	Learning basic skills	Computer Application Skills	Self-management skills	Learning Conditions and Support
Gender	Male (n=244)	3.587	3.764	3.845	3.603	3.966
	Female (n=369)	3.687*	3.821*	3.913*	3.688*	4.062*

Table 10 (Continued)

		Learnin g Attitude	Learnin g basic skills	Computer Applicatio n Skills	Self- managemen t skills	Learning Condition s and Support
Age	18 and below(n=9)	3.750	3.641	3.656	3.764	3.725
	19(n=24)	3.937	4.016	3.854	3.685	4.042
	20(n=126)	3.730	3.778	3.837	3.612	3.997
	21(n=179)	3.752	3.841	3.897	3.677	4.103
	22(n=149)	3.727	3.802	3.946	3.679	4.020
	23(n=97)	3.647	3.765	3.881	3.589	3.979
	24(n=18)	3.842	3.722	3.972	3.802	4.011
	25 and above(n=11)	3.852	3.667	3.750	3.642	3.578
Nation	Han (n=192)	3.618	3.846	3.895	3.642	4.073
	Minority (n=421)	3.661	3.773	3.874	3.655	3.988
Hometown	Guizhou(n=5 78)	3.642	3.795	3.883	3.652	4.014
	Other provinces (n=35)	3.752*	3.796	3.850	3.667	3.949
Student Origin	Rural(n=556)	3.649	3.797	3.881	3.656	4.004
	Urban(n=57)	3.600	3.812	3.905	3.638	4.172*
Father's educational level	Primary school and below(n=224)	3.649	3.776	3.808	3.651	3.992
	middle school(n=20 0)	3.622	3.782	3.876	3.632	3.980
	high school(n=10 5)	3.631	3.877	4.033	3.709	4.162*
	University and above(n=84)	3.575	3.744	3.989	3.558	4.041
Mother's educational level	Primary school and below(n=331)	3.635	3.782	3.833	3.624	3.978
	middle school(n=13 2)	3.623	3.786	3.860	3.686	4.020
	high school (n=111)	3.673	3.948	4.146*	3.857*	4.250*
	University and above(n=39)	3.513	3.670	3.980*	3.587	4.097

Note: *Indicate the significant level was $p < 0.05$

* Indicates that when there are multiple groups data of in one variable, when performing a pairwise comparison between groups, there is a significant difference when comparing with the smallest group data of in the grouping comparison; if a variable has only two groups data, it indicates a significant difference between the groups. the significant level was $p < 0.05$.

Gender, age, nationality, Hometown, place of origin (rural, urban) of undergraduate students and parents' educational background have an impact on E-Learning Readiness of undergraduate students. Results of one-way ANOVA indicated significance differences in the scores of learning Attitude, learning basic skills, Computer Application Skills, Self-management skills and Learning Conditions and Support. Female students' E-Learning Readiness is better than male students in all dimensions.

There are differences in E-Learning Readiness for age at different ages, higher E-Learning Readiness for low age and older age, and low preparation for middle age students. In terms of ethnicity, there is no significant difference between Han students and ethnic minorities ($P > 0.05$). There was no significant difference in the influence of student hometown and urban and rural students in Guizhou on E-Learning Readiness of undergraduate students ($P > 0.05$). There is no significant difference in the influence of father's education on E-Learning Readiness of undergraduate students ($P > 0.05$), but father's high education has a significant effect on improving college students' Learning Conditions and Support dimensions; the mother's different education has significant effects on E-Learning Readiness of undergraduate students, mother high school and university degree on computer application ability, Self-management ability and learning conditions and support ability dimensions had significant effects ($P < 0.05$). The mother's high degree of education has a significant effect on the improvement of college students' readiness.

4.4 Compare the difference of E-Learning Readiness between the School of Biology and Chemistry and the School of Information and Technology

Result 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).

Using the T-test statistics method, the differences in E-Learning Readiness between undergraduate students with different professional backgrounds were analyzed. It mainly analyzes the differences between 32 skills in the School of

Biology and Chemistry and the School of Information Technology, and obtains the differences in E-Learning Readiness between the information technology and other professional background students. Through this research, we hope to find that the advantages and disadvantages of information technology majors and biology and chemistry majors in different dimensions of E-Learning Readiness and different competency projects. The application of the research results will provide a basis guide for the subsequent targeted training of students to carry out E-Learning.

The research results indicate that different professional backgrounds have an impact on E-Learning Readiness of undergraduate students. In computer application ability and learning conditions and support dimensions, students in School of Information Technology are significantly better than students in the School of Biology and Chemistry (see Table 9).

4.4 Compare the Differences in Different Professional Backgrounds

Table 11 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
<i>P</i> value	0.078	0.174	0.015*	0.465	0.018*

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

CHAPTER V

CONCLUSION AND COMMENDATION

5.1 Develop an E-Learning Readiness assessment system

In the research, we use PHP programming language, MySQL database and other necessary technologies to develop a set of E-Learning readability system, which can realize the basic functions of user registration, management, online questionnaire survey, E-Learning readability evaluation, and achieve the expected goal of system development.

A web-based questionnaire survey system for students was designed. The questionnaire system consists of six parts and 7 functional module.

The Student Information part, Students input student information through registration, including the student ID, gender, school, age, nation, family education and mouth education and the like, and identify students through registration information. At the same time, the personal information part and questionnaire results are combined for personal factor data analysis.

Student information management part, students can check and modify their personal information by logging in after registration, but their ID number and name can't be modified, and the optional questionnaire can be displayed at the same time. Students Click to enter the questionnaire answer page.

Questionnaire parts, Administrators can import questionnaires into the system and publish the questionnaires after verification. Registered students who have released the questionnaires can participate in the questionnaires and answer the questions in the questionnaires. The system automatically checks the questionnaires and the logic check of the questionnaires and the qualified questionnaire It can be submitted, and the results will be collected and saved after the submission. It can be used for subsequent data analysis and administrator query and verification.

Information verification part, the information verification part is composed of machine verification and manual verification. The machine verification determines whether it meets the requirements of the questionnaire system through the logical review of different data types and questions before and after the questionnaire, and reminds the user to modify and perfect the input information. The manager of the manual verification part has the right to delete the wrong registration information through the manual verification system and check the data And check, delete invalid data.

Data analysis part, the data analysis part can realize the statistical analysis of the questionnaire results, and can display the statistical and calculation results.

Data output part, the data output part can choose the appropriate format (Screen display, file format output) to output the data generated by the system, mainly through the CVS list format output, the output data can be used directly and for further statistical analysis.

The seven functional modules are User Module, User questionnaire module, Administrator Module, School administrator Module, Query module, Results Analysis Module, and CVS file module. Each module performs a preset function of system design.

5.2 Study Components of E-learning Readiness by Using Exploratory Factor

Analysis Approach.

The concept of reliability and validity (Bailey, 1994) comes from the research on the reliability and validity of tests in psychological measurement. Reliability (Kerlinger& Fred, 1970) is reliability or credibility, which refers to the consistency or stability of the measurement results, that is, whether the measurement tool can stably measure the items it wants to measure. Validity (Kerlinger& Fred, 1970) refers to the degree of correctness, that is to say, the degree to which the measuring tool can really measure the characteristics to be measured. The higher the validity is, the more the measurement results show the real characteristics of the object to be measured.

There are many reliability evaluation methods, such as test retest reliability, parallel forms reliability, split half reliability, internal consistency reliability and scorer reliability. The questionnaire often uses a series of items to measure each concept, so the reliability can be evaluated according to the correlation between these items (Nunnally, 1971; Lee Cronbach, 1951). In this study, SPSS software was used to evaluate the reliability of the questionnaire. Results the reliability of the questionnaire was high and the consistency of the questionnaire was high.

Validity includes content validity (including surface validity and logical validity), and content validity is a subjective indicator evaluated by experts. Modify and confirm the questionnaire through consulting experts to improve the content validity of the questionnaire. In this study, 5 field experts and 3 teachers were consulted to propose amendments to the questionnaire and questionnaire tests to ensure the validity of the questionnaire content. Some scholars (Salleh et al, 2019) believe that the most ideal method for validity analysis is to use factor analysis to measure the structural validity of the scale or the entire questionnaire.

The results of the research validity test confirmed that this questionnaire is suitable for exploratory factor analysis. After cluster analysis, it was found that the 32 questions of the questionnaire were clustered into 5 units, and each unit question corresponds to a preset dimension question, so the preset 5 dimensions are reasonable. We can use 5 elements(dimensions) to conduct exploratory factor analysis. Through the principal component factor analysis results, it is found that the five dimensions can cover 51.582% variance, of which Learning Basic Skills and Self-management skills contribute more than 10%. These two factors contribute to the impact of undergraduate students' E-learning readiness is greatest.

Factor analysis is a statistical technique that studies the extraction of common factors from variable groups. It was first proposed by British psychologist Karl Charles Spearman (Thurstone 1947). The factor analysis method is to construct a factor model and decompose the original observed variables into linear combinations of factors. It is the complexity of research that is simplified.

However, in the study, the explanation of 5 factors' variance only accounted for 51.582%. Compared with the coverage rate of principal component analysis in other questionnaires(Vaculíkova 2016), the result is low, which shows that the survey dimension set in the e-learning readability survey is not enough, and the factors affecting college students in ethnic areas cannot be fully evaluated, which needs further research work.

5.3 Assess E-Learning Readiness of undergraduate students

5.3.1 Assess E-Learning Readiness of Xingyi Normal University for Nationalities in different dimensions

Through questionnaire analysis, it is found that students have low scores in learning attitude and self-management, which indicates that e-learning has the following problems:

In terms of learning attitude, undergraduate students' self-responsibility for learners' E-Learning is low, learning motivation is not clear and the understanding of E-Learning for autonomy is not comprehensive. The average value of corresponding sub-projects is lower than 4.0. In particular, the scores of E-Learning characteristics are the lowest, indicating that undergraduate students have 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; 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, Harrell II, 2012).

The research show (Li and Liu, 2017; Sakiroglu and Dikilitas, 2012) that the

better academic performance, the past success will increase the level of learner motivation. Therefore, students in the western region of China have a poorer academic performance and a lower sense of achievement in the learning process. Learning motivation is 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 have 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 et al, 2018). Therefore, this can explain that the scores of undergraduate students are lower in E-Learning attitudes.

The research (Guo Li 2012) shows that due to the influence of traditional basic education mode, the lack of self-management ability of Chinese college students is a common phenomenon, which is also the reason why the score of self-management capability: of undergraduates in this study is low.

5.3.2 Assess Personal Factors effect on E-Learning Readiness

In the gender aspect of students, female students are better than male students in all dimensions, and they all show significant differences, especially in terms of learning attitude and self-management ability. Research shows (Peng Xiaoyan 2019) that female undergraduate students' 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.

Age, ethnicity, place of origin, and family origin have certain influence on college students' E-Learning Readiness. There are significant differences in individual sub-questions, but E-Learning Readiness of each dimension has an impact, but it does not show significant differences. There are differences in E-Learning Readiness for age at different ages, higher E-Learning Readiness for low age and older age, and low preparation 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 Changquan 2011). It may be that the Han students and ethnic minority students in this school have basically the same birthplaces, and they have similar learning experiences and social living environments.

The influence of nationality, source of origin and family origin on undergraduates' E-Learning Readiness is not obvious in this study. It may be due to the fact that the Han nationality and ethnic minorities are mainly from a province of

Guizhou, and the influence of ethnic culture and the basic education is similar. The difference is mainly due to the fact that students from other provinces are mainly concentrated in the southwestern provinces of China, and their geographical culture is similar. The influence of family origin is relatively small, probably due to the fact that urban family students are mainly from small and medium-sized cities. As China's economy fast improve in recent years, the difference between rural and small-and medium-sized cities, such as the level of economic development, basic education level and learning motivation, are narrowing. father's high education has a significant effect on improving undergraduates' Learning Conditions and Support dimensions. Father's higher education level means higher income level, which can provide students with more adequate learning conditions. The mother's education level significantly affects the undergraduates' E-Learning Readiness, which is closely related to the responsibility and obligation of women in Chinese families to bear more education children. Therefore, the mother's good educational experience has an obvious effect on the improvement of students' E-Learning Readiness. Studies (Hou et al,2012) demonstrate that in modern Chinese society, mothers' burden on more important tasks of educating their children. Mothers is be of critical importance role in children's behaviors, cultural accomplishments, mental health and labor skills and moral sentiments, social skills development and education. This can also explain that the educational level of mothers in this study has a more significant effect on undergraduate students' E-Learning Readiness.

Compared with the existing research results (Li et al,2014; Yao, 2015), it is found that in addition to the dimensions of Learning Conditions and Support, which are close to the results of existing domestic research, E-learning Readiness in other dimensions is at a low level. This shows that colleges and universities in the western region have achieved significant results through national infrastructure and platform construction, learning conditions have improved significantly, and the gap with developed regions has narrowed. However, due to weak basic education, students' learning attitudes, learning consciousness and learning habits need to be strengthened. Western schools and society still need to strengthen guidance and help in the development of students' learning ability and learning motivation.

5.4 Compare the Differences in Different Professional Backgrounds

School of Information Technology undergraduate students are significantly higher than School of Biology and Chemistry in terms of Computer Application Skills and Learning Conditions and Support. This in itself is consistent with the professional

background of School of Information Technology and the School of Information with computer and information communication laboratories and more computer application opportunities. In other dimensions, School of Information Technology scores are not significantly different from School of Biology and Chemistry, but the scores on learning attitudes and learning support are slightly higher. These maybe that E-Learning is a form of self-organized learning based on computer skills and networks. Undergraduate students of School of Information and Technology have the study experience in various computer specialty laboratories. They have a lot of opportunities to use computers for professional learning in traditional teaching. Therefore, they have better computer knowledge and operation skills, as well as Internet application capabilities. The result is consistent with the students' professional characteristics, and the results reflect their professional advantages.

5.5 Conclusions and Commendations

The presuppositions of the five dimensions of this study were further verified by the survey results. The results also show that the overall E-Learning Readiness of undergraduate students to participate in E-Learning learners is good, in which computer application skills and Learning Conditions and Support are adequately prepared, but the overall learning attitudes and self-management skills are insufficient, and the learning skills are medium level. In general:

1. Students have the ability to use the network and E-Learning resources for learning and a certain degree of E-Learning learning awareness.

The popularity of smart terminals and laptops for undergraduates, and the continuous improvement of computer applications among college students, and the use of computers and smart mobile phones to continuously enhance their awareness and ability to learn.

2. Currently, the university provides a platform for undergraduate students to conduct E-Learning, and the content is gradually increasing.

The number of MOOC courses and national top-quality courses is growing, the digital books and video multimedia teaching resources are becoming more and more abundant, the number and quality of E-Learning resources are constantly improving, and benefit from China's advanced communication technology and construction of infrastructure, the quality and speed of network communication are constantly improving.

3. E-Learning Readiness has gender differences among undergraduate students.

Due to the differences in learning motivation, learning ambition, learning time, social psychology and other aspects of male and female, there are differences in E-Learning Readiness, and female undergraduates have high E-Learning Readiness.

4. Undergraduate students have insufficient learning attitude and self-management skills in E-Learning.

At present, college students generally have problems such as poor learning motivation and lack of self-management ability, so there are deficiencies in learning attitude and self-management ability.

5. Lack of motivation for undergraduate students to use E-Learning resources for autonomous learning.

6. E-Learning Readiness of the School of Information and Technology

students shows a certain professional advantage.

At the same time, personal factors such as gender, ethnicity, age, place of origin, and the level of parental education have different degrees of influence on undergraduate' E-Learning Readiness. From the research results, in the future, the university will pay special attention to and explore the following contents in the process of digitalization era of undergraduates.

1. Help learners to establish correct E-Learning concepts and learning attitudes

The readiness of learning attitude directly affects learning motivation and learning outcomes. At present, the world has entered the era of knowledge economy. With the development of modern communication and computer technology, lifelong learning has become an inevitable development trend of learning society. E-Learning is bound to become the primary learning model because of its flexibility and resource richness. Compared with the students in developed areas, due to the influence of economic development, social culture and national characteristics and weak basic education, he students in ethnic areas have obvious deficiencies in learning objectives, learning attitudes and learning aspirations. At present, many undergraduates who participate in E-Learning will receive credits as their main learning objectives. Obtaining the graduation diploma tendency has become an important factor affecting the learner's learning attitude, which leads to the lack of effective learning motivation.

2. Helping undergraduate students improve their self-management ability in e- learning

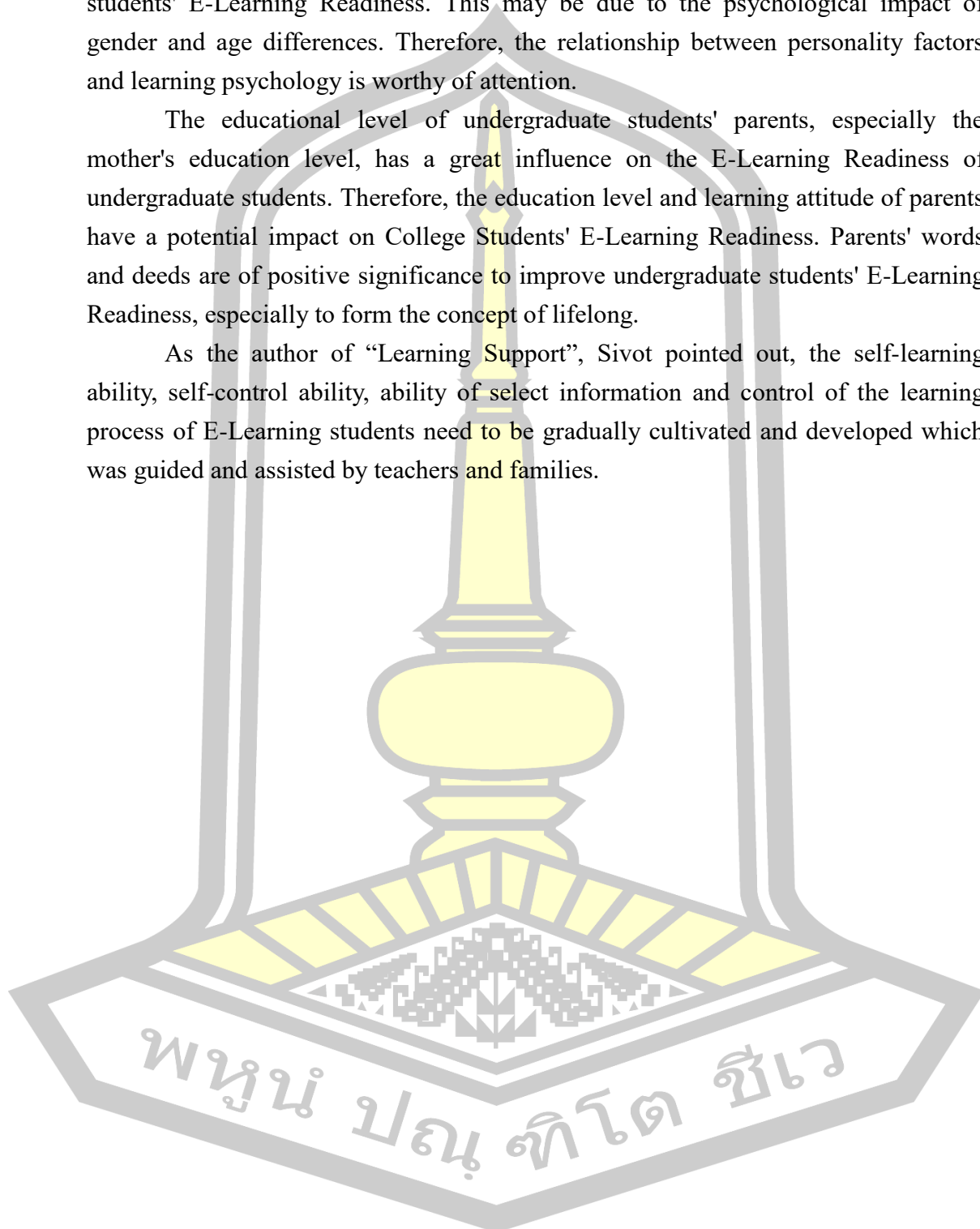
In order to meet the needs of learners while working and learning, the Open University emphasizes open, flexible and diverse learning methods, and puts high demands on learners' autonomy and time investment. The value orientation and E- learning model of learners There is a huge contrast between the inherent requirements, which has paved the way for the lack of motivation, difficulty to escape, and interruption of learning in distance learning. To this end, in the early days of distance learning, the Open University should not only enable learners to understand the diversity and flexibility of distance learning methods, but also help learners to establish correct and objective time and effort in distance learning. Understanding and guiding learners to gradually establish a rhythm suitable for themselves should be an important part of beginners' support service practice.

3. Individual factors have a significant impact on E-Learning ability of undergraduate students, and attach importance to the influence of individual and family factors on E-Learning Readiness of undergraduate students.

Factors such as gender and age have a greater impact on undergraduate students' E-Learning Readiness. This may be due to the psychological impact of gender and age differences. Therefore, the relationship between personality factors and learning psychology is worthy of attention.

The educational level of undergraduate students' parents, especially the mother's education level, has a great influence on the E-Learning Readiness of undergraduate students. Therefore, the education level and learning attitude of parents have a potential impact on College Students' E-Learning Readiness. Parents' words and deeds are of positive significance to improve undergraduate students' E-Learning Readiness, especially to form the concept of lifelong.

As the author of “Learning Support”, Sivot pointed out, the self-learning ability, self-control ability, ability of select information and control of the learning process of E-Learning students need to be gradually cultivated and developed which was guided and assisted by teachers and families.



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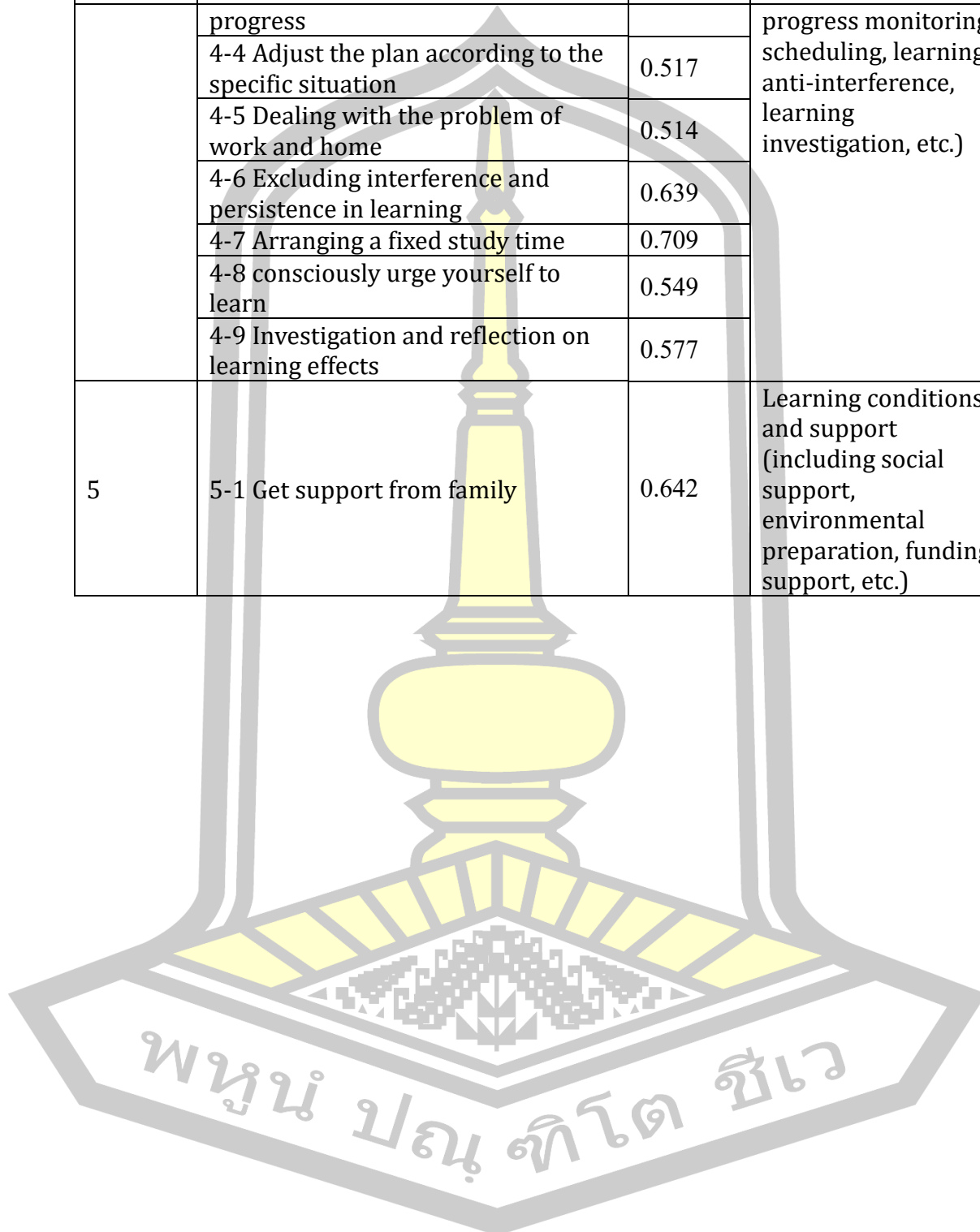
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APPENDIXES

APPENDIX A Exploratory Factor Analysis Rotational Load and Common Factor Interpretation

Common Factor	Investigation item content	spin load transfer	Factor Interpretation
1	1-1 Responsibility awareness of E-Learning	0.693	Learning attitudes (including recognition of E-Learning methods, learning responsibilities, willingness, and coping changes)
	1-2 Clear E-Learning motivation	0.726	
	1-3 Recognize the learning autonomy required for E-learning	0.622	
	1-4 Know the characteristics of E-learning	0.550	
	1-5 think that time and energy should be invested	0.425	
	1-6 Be prepared for any learning difficulties	0.375	
2	2-1 Basic reading and writing skills	0.528	Learn basic skills (including listening, speaking, reading and writing skills, as well as learning methods, communication, problem solving, homework and preparation, etc.)
	2-2 Clearly express your personal opinion	0.566	
	2-3 Know the learning method that suits you	0.665	
	2-4 Find ways to solve learning problems	0.471	
	2-5 Ability to complete homework and preparation	0.485	
	2-6 Professional Basics Tutoring	0.601	
	2-7 Know the path to improve learning efficiency	0.615	
	2-8 Ability to study independently and intently	0.588	
3	3-1 Online Information Browsing	0.660	Computer application skills (including network resource reading, retrieval, utilization, online interaction, etc.)
	3-2 Network Data Retrieval	0.677	
	3-3 Sending and receiving mail and file transfer	0.501	
	3-4 Online Communication and Discussion	0.641	
4	4-1 Develop a suitable study plan	0.676	Self-management skills (including study plan development,
	4-2 Complete the learning task as planned	0.605	
	4-3 Self-monitoring learning	0.581	

Common Factor	Investigation item content	spin load transfer	Factor Interpretation
	progress		progress monitoring, scheduling, learning anti-interference, learning investigation, etc.)
	4-4 Adjust the plan according to the specific situation	0.517	
	4-5 Dealing with the problem of work and home	0.514	
	4-6 Excluding interference and persistence in learning	0.639	
	4-7 Arranging a fixed study time	0.709	
	4-8 consciously urge yourself to learn	0.549	
	4-9 Investigation and reflection on learning effects	0.577	
5	5-1 Get support from family	0.642	Learning conditions and support (including social support, environmental preparation, funding support, etc.)



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