Factors affecting student satisfaction in e-learning

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ABSTRACT

The purpose of this study is to investigate the factors that influence college student satisfaction with e-learning. Authors also attempt to explore the relationship between usage intention and factors affecting e-learner satisfaction. Both qualitative and

quantitative methods were adopted for this study. Data were collected from a survey of 224 Suzhou undergraduates, 213 questionnaire participants and 11 interviewees. The factors affecting satisfaction with e-learning were analyzed by comparing the mean, standard deviation and t-test between satisfied and dissatisfied people. Additionally, correlation analysis and multiple regression analysis were conducted to examine relationships between factor variables (external factors, internal factors) and the usage intention of online courses. There are mainly four findings: Firstly, online education has become a widely used technique in high education institutions. Secondly, external causes such as class interaction and the quality of teachers, have a large impact on student satisfaction. Thirdly, internal causes such as the level of self-discipline and the degree of concentration also influence the level of satisfaction. Finally, both external factors and internal factors affecting e-learning satisfaction had a positive effect on the usage intention of online courses. This research is unique because the sample was based on undergraduates in Suzhou that limited literature has demonstrated. Suzhou is one of the fastest economic cities in China with high demands in e-learning. The findings may assist faculty in designing quality online courses to meet students' needs better. Adequate instructional methods, support, course structure and design can improve student satisfaction.

Keywords: E-learning; college students; satisfaction; online course; course design; learning abilities; learning intention.

1. INTRODUCTION

1.1 Background

Digital advances have led to a major change in learning and behavior. Internet communication, such as electronic mail (email), offers opportunities for students to communicate with teachers online. This can enable remote learning. The rise of instant messaging further has enabled quick communication. This can result in an increase in student's motivation to learn.

E-learning represents the prospect of the educational process with a growing interest in Information and Communication Technologies and responds to the social demands of the emerging education facilities. The development of Information and Communication Technologies has motivated students to take course labeled "e-learning", "online learning", "web-based learning", "web-based training", and "distance learning", among others (Smart and Cappel, 2006; Mora et al., 2017).

Online learning

An increasing number of students are choosing e-learning, one reason is that as living standards have improved, electronic devices are now more common. Furthermore, in the long run, electronic devices are more cost-effective than paper materials, according to Mazal and Ludwig (2015). In addition, it is more convenient for students to receive the updated learning materials.

In the early phases, the online learning platform is restricted to the students or users enrolled in the target courses (Lerman and Miyagawa, 2005). In the 21st century, e-learning started to become more common. In 2001, the Massachusetts Institute of Technology (MIT) set up "Open Courseware," which supplied course material to all through the network. MIT was praised for changing e-learning (Abelson, 2008). Other colleges and organizations attracted to the new education model, began to create their own unique online courses. Coursera, for instance, offers free online course materials to all in close cooperation with universities (Severance, 2012). According to Wuensch, Ozen, Kishore and Tabrizi (2009), network courses would further study how students learn more effectively in the digital age.

1.2 Methodology and findings

This research adopted both qualitative and quantitative methodology in collecting and analyzing data. A number of Suzhou undergraduates were sampled and investigated using interviews and questionnaires to identify factors affecting the online learning satisfaction of college students. Open-ended questions were asked in the interview. Every respondent was also required to answer a questionnaire online or offline. The questions in the questionnaire had a response scale of 1 to 5. SPSS and Excel were used to analyze the combination of qualitative and quantitative data and to provide further analysis.

This research shows that online education has become a widely used technique in higher education institutions in Suzhou. The research also shows that external causes such as class interaction and the quality of teachers have a significant and positive impact on student satisfaction. Internal factors such as the level of self-discipline and the degree of concentration also influence the level of satisfaction with e-learning. Both external factors

and internal factors that affect e-learning satisfaction also had a positive effect on the usage intention of online courses.

1.3 Motivation

In this study, survey respondents were undergraduates in Suzhou. The researcher sought to understand the factors affecting student satisfaction with online educational platforms. Suzhou, a second-tier city near Shanghai, has a number of higher learning institutions, including XJTLU. Approximately 90 percent of XJTLU students will go abroad to study (XJTLU, 2019). This requires them to take the IELTS, TOEFL, GRE, or GMAT tests. Other students are required to take the College English Test (CET) 4 and CET 6. There are also specialized tests for finance and accounting, such as ACCA and CFA. The courses on preparing these kinds of exams are available at many commercial education institutions but are required high training fees for face-to-face learning. In addition, the students' spare time after school is limited. Therefore, the high fees and limited time is increasing the demand for e-learning, which is less expensive and time-saving. Furthermore, the requirement for a variety of professional exams makes students become a large group using online learning courses. Therefore, it is essential to do an investigation from the point of students.

However, although the demand for e-learning is more than before, online education has not popularized among the public even in a city with great education resources like Suzhou. Previous research showed that satisfaction has strong links to the continuous use of intentions (Pereira, Ramos, Gouvêa and Costa, 2015). Therefore, it is important to learn the factors affecting learner satisfaction with e-learning, which impacts e-learners' intention to use online education platforms. Existing literature shows that by using online learning platforms, college students are often discontented with the classroom interactions due to poor communications, limited interactions between students and teachers, and limited feedback. In this research, the questionnaire and interview were based on the existing literature.

1.4 The detailed aims and objectives of this research

- To review previous literature on learner satisfaction with online learning programs and summarize the development history of network courses.

- To assess whether most of the undergraduates prefer online educational platforms to face-to-face learning.

- To explore external factors influencing student satisfaction with e-learning environments.

- To explore internal factors influencing student satisfaction with e-learning environments.

- To determine the different impact of the practical factors that play an essential part in changing user satisfaction with e-learning.

- To gather views and attitudes towards e-learning by questionnaire and interview.

- To analyze undergraduates' usage intention of online courses.

- To sum up the limitations and shortcomings of online educational platforms.

- To put forward suggestions for the future development of digital education.

- To offer advice to college students, thus help them to adopt digital learning more successfully.

1.5 Structure of this paper

This paper can be divided as follows. Section 2 presents the initial literature on the development history of online courses and reviews the previous research on factors playing an important role in changing user satisfaction with distance learning. Section 3 presents three hypotheses based on the result of the questionnaires. Part 4 introduces the methodology used in the research and gives detailed information about distance education. Section 5 is the results and analysis. Part 6 concludes the paper with recommendations and suggestions for future research into digital education.

2. LITERATURE REVIEW

In this section, different literature has been discussed in detail. They were divided into three categories, as follows.

2.1 Identifying e-learning and student satisfaction

Online Learning Programs:

The history of instructional technology is closely linked to specific and misinterpreted research. According to Eaton et al. (2017), due to fifty years of e-learning practice (nearly 30 of them on the network), there is strong evidence that e-learning has been effective for learning and training.

The term "e-learning" or "online course" has been discussed interchangeably by different researchers to include programs, designers, users and media. E-learning separates teachers and students through time and space. It can be defined as the voluntary control of education by learners instead of teachers and non-continuous communication between students and teachers by digital technique (Sarsa & Escudero, 2016).

With the development of internet technology, learning management systems have improved constantly. According to Dagger and his colleagues (2007), the first generation of e-learning platforms supported proprietary formats to manage courses and content-only limited user tracking. The second-generation (current systems) inherited the merits of first-generation and handled the demerits. It starts to pay attention to not only the learning content, but also the learning targets and students' information. Next-generation systems will no longer support one-size-fits-all solutions. They will expand interoperable platforms and types of online services in order to satisfy consumers (Dagger et al., 2007).

Three types of the online course:

Harris, Olesova and Brown (2016) classified digital education into three types, represented a major market of the Chinese digital learning platform. They suggested that the original goal of e-learning was to break the monotony of traditional education because the traditional educational model was restricted by a single teaching media, the textbook, while online courses have multiple forms and formats such as audio-video and even animation. The three types of online courses are pure-text, text and PowerPoints and simulated classrooms. The first is pure-text, in the wake of recorded audio, the screen displayed learning handouts and typical exercises. Thus, it displayed pages on a screen. Text and PowerPoint information can be divided into two main categories: course handouts and explanation (on the PowerPoint). Videos of a lecture could be attached by taking up a small section of the screen, so there is a virtual tutor. The third category is

the simulated classroom in which a recorded tutorial video replaced face to face teaching and learning (Harrris, Olesva and Brown, 2016).

Learner Satisfaction:

The definition of student satisfaction is based on that of customer satisfaction. Zeithaml, Parasuraman, and Berry (1990) suggested that the definition of satisfaction can be calculated by the difference between Consumer experience and expectations. This definition can be applied to educational services (Stone & Thomson, 1987).

According to Oliver and Swan (1989), satisfaction is a sentiment that can be regarded as a personal consideration based on specific experiences and beliefs. Combining the sentiment with student satisfaction, the researcher defined learner satisfaction as attitude, perception and expectation toward a learning experience. Therefore, student satisfaction can be viewed as a primary result of education (Sanders & Chan, 1996).

Student satisfaction is also important for online educational platforms. Data collection and analysis to understand student satisfaction are helpful to educational institutions since they can develop educational programs based on a comprehensive understanding of student needs (Rasli, Danjuma, Yew, & Igbal, 2011). Researchers have suggested that students are inclined to be satisfied when the expectations of the learning environment, course content, quality of the teacher and study achievement are met (Huang & Wang,2012). Therefore, our questionnaire can focus on what makes students feeling more satisfied in e-learning

This paper aims to analyze learner satisfaction with online learning institutions. The evaluative outcomes denote that student satisfaction with digital education may be influenced by external factors and internal factors that are explained below.

2.2 Determining the potential factors and intention

According to Dominici and Palumbo (2012), many factors in e-learning can affect student satisfaction. The aim of their study was to find out the inadequacy of e-curricula and to explore the success factors of e-learning based on interviews of 239 undergraduates from

the Institute of Economics at the University of Palermo. Dominici and Palumbo (2012) identified six key factors affecting distance learning and three of them are used in this paper:

- The lack of teaching activities

At present, the main learning form of e-learning is to watch electronic video courses or access online materials, which focuses on imparting knowledge to students rather than providing guidance. It is difficult for students to master the knowledge without proper guidance.

- The limited interaction between teachers and learners

Because the current designers of distance education pay more attention to the user experience and curriculum content, they often ignore the importance of communication. It is hard for students to ask online teachers or advice just by watching the video program.

- Imperfect technology

In the process of designing an online education platform, it is necessary to invest human and material resources. This requires designers to update information and to provide a better user experience for the students with a convenient interface.

Another study conducted by Michele, Shelley and Swartz (2014) showed the results of three-year research of graduate and college student satisfaction with online instruction at one university. The responses of 566 participants were analyzed and the results show that convenience was the leading cause of influencing students' satisfaction with distance education, representing 40% of the total 280 responses expressing satisfaction. Lack of interaction, including lack of communication with the teachers and learners, was the most significant cause of dissatisfaction with distance education, accounting for 33.2% of the total 286 responses expressing dissatisfaction.

The study focused on affecting the participation of the disabled of their satisfaction by Park (2007) gave authors ideas. Park (2007) summed up the results of eighteen preceding studies and built a model on the basis of four parts to illustrate the reason why college students leave online courses halfway. Park found that external causes such as financial problems, time conflict, and managerial support were factors influencing students to drop

their courses halfway. He also identified characteristics and internal factors such as age, gender, academic integration (instructor follow-up, instructional design, assignment level, and activity level).

Research conducted by Shen, Cho, Tsai and Marra (2013) regarded gender and academic status as a variable in predicting network learning self-efficacy. Self-efficacy is defined as a person's belief in his or her ability to be successful in a given circumstance by offering enough effort. (Bandura,1988). In Shen and his colleagues' research, they classified self-efficacy as the completion of homework, concentration in class, and the intention to learn actively. They concluded that undergraduate satisfaction with online educational platforms could be predicted by student self-efficacy of digital education. Self-efficacy is considered an essential component of excellent online study achievement. The level of self-efficacy decides the level of motivation, which shows how time and effort people can invest during times of crisis. People with a low sense of self-efficacy are unlikely to meet their expectations.

Pereira, Ramos, Gouvêa and Costa (2015) explored factors affecting satisfaction and continuous use intention in online educational platforms in mass organizations. They used a Technology Readiness Index (TRI) and a Decomposed Expectancy Disconfirmation Theory (DEDT). In their study, TRI is a predictor to evaluate the level of the students' intention to use technologies in their learning. DEDT is used to evaluate the student's satisfaction with e-learning by comparing their expectations to the outcome with the actual outcome. If the actual outcome is contrary to the expectation, the dissatisfaction will rise. A total of 343 samples were collected through online questionnaires. The research showed that satisfaction is shown to have strong links to the continuous use of intentions.

A study of students using mobile phones in science instructional settings by Yilmaz (2016) provided authors with different opinions through the subject. The data in Yilmaz's research was collected by a questionnaire form and analyzed by descriptive techniques and content analysis techniques.

The questionnaire was divided into three sections, relating to handset devices, user preference and use of smartphones in the learning environment. The study was inconclusive. Nearly a quarter of participants (23.7%) thought using a mobile phone was

necessary for the learning process. The same number thought it was not required, although they admitted it did make life easier. A Large number of students (61) preferred theoretical courses.

2.3 Further development directions for online courses

Undergraduates may need time to adapt to online courses. They also may need careful guidance. Students need to accept and adapt to new teaching environments and teaching methods. This requires adjusting attitudes and habits. Digital learning requires undergraduates to adapt to learning in virtual spaces, delayed accomplishment and lack of face-to-face contact. All these results in a lack of communication that is perhaps inherent in traditional education. While aiming to improve a student's educational performance, online education should be improved.

Firstly, e-learning is a progressive educational form and provides a wide range of options for students. Different kinds of materials are available for students, such as videos, audios, e-books and so on. In addition, university students are free to choose courses according to their needs from a wide range of subjects and make their personal learning schedules. Rushby and Surry (2016) stated that the online learning platform is a good way to obtain private non-academic information that helps undergraduates to get specific knowledge.

Secondly, it is convenient for students to take online courses. Hassenburg (2009) contends that online educational platforms increase learning opportunities for disabled learners. Students with limited physical mobility can access web-based educational resources, thus improve the quality of their life. A student in rural or isolated areas can also benefit from a global virtual learning community and can interact and communicate with each other in real-time (VanderVen, 1994; Wolfe, 1994).

E-learning develops and explores new educational methods. Due to the nature of distance learning, tutors, teaching materials, textbooks and learners are diversified and in different forms of varieties (Jaggars, 2014). This is unlike traditional education in which teaching materials, tutors, and textbooks are similar and unified and perhaps therefore limited.

Kim, Liu and Bonk (2005) focus on distance learning and make recommendations to directors, teachers and learners, explained as follows.

- Directors: The design of online courses should maximize user satisfaction. Designers are thus expected to create a comfortable teaching environment and improve educational content. Students complain that online educational platforms cannot respond to their requests in time and sometimes they are ignored. Therefore, it is vital for improving after-sales systems.

- Teachers: Perraton (1988) defines the responsibility of the online teacher. Distance education requires teachers to improve their teaching level and their own professional knowledge because of the size of the audience. Teachers also need to increase communication with learners via counseling services or online simulation-based exams.

- Learners: After starting the online course, it is crucial for students to set systematic goals and improve learning efficiency to become more skilled autonomous learners.

In general, although the steady growth and achievement of digital education, there are apparent issues with online courses. According to Johnson and Palmer (2015), e-learning lacks effective communication between students and teachers. People need verbal communication, information transmission and emotional communication in the process of learning. However, online students are less enthusiastic about electronic courses by contacting teachers in limited ways, such as e-mail and BBS (Johnson & Palmer, 2015). Digital education platforms also do not supervise students' after-class learning in terms of the completion status of their work. As a result, students who have poor self-discipline and less self-awareness may not achieve positive outcomes. The virtual teaching environment is, therefore, not ideal for students who need more guidance.

3. HYPOTHESES

The following three literature reviews attempt to demonstrate and support the research hypotheses.

3.1 Hypothesis one: External causes such as class interaction, the quality of teachers, have a significant impact on student satisfaction. The literature review has stated that

external factors easily influence student satisfaction with online educational institutions. These factors could be a result of teachers, the course setting, and the system. This paper mainly focuses on eight external factors and identifies which is most influential by comparing the mean, standard deviation, and t-test between satisfied people and dissatisfied people. Based on this, the first hypothesis is that external causes such as class interaction and the quality of teachers have a significant impact on student satisfaction.

3.2 Hypothesis two: Internal causes such as the level of self-discipline and the degree of concentration have significant influence levels of satisfaction. Liaw (2007) stated that in order to create a better e-learning environment, learners' characteristics must be considered. Since students have different personalities, their abilities, attitudes and motivations need to be tested. Previous studies have shown that student satisfaction with online education is related to their gender and self-efficacy (Shen et al., 2013; Park, 2007). Based on this, the second hypothesis is that internal causes such as the level of self-discipline and the degree of concentration have a significant influence on the level of satisfaction.

3.3 Hypothesis three: Both the external factors and internal factors affecting e-learning satisfaction had a positive effect on the usage intention of online courses. The satisfaction and continuous use intention of online educational platforms are important factors determining the success of online courses. Research shows that e-learning satisfaction is related to the continuous use intention in the context of e-learning (Pereira et al., 2015). In this study, the authors divide influential factors into two categories: external factors and internal factors. This assumption is trying to explore the relationship between factors affecting e-learning satisfaction and the usage intention of online courses.

4. METHODOLOGY

4.1 Description

This research will continue to make a detailed and careful analysis of e-learning based on relevant studies and aimed at investigating the factors that influence college student satisfaction. The authors also attempt to explore the relationship between usage intention and factors affecting e-learner satisfaction. This research has combined quantitative and

qualitative methodologies. Firstly, the data was collected by questionnaires. Respondents' basic information and close-ended questions about potential factors affecting e-learner satisfaction were asked in the questionnaire. Secondly, the statistical analysis was conducted on the data. Finally, face-to-face interviews were carried out to understand the areas that cannot be easily explained by the quantitative method.

4.2 Respondents

The survey respondent is an essential element for the research. This is because the undergraduate is a large community who uses the online learning platform more frequently and is more accessible for authors, this research selected 213 undergraduate students and completed a related online questionnaire survey with them to share their opinions in e-learning.

This paper investigates student satisfaction from two aspects, which are gender and the year of study. Of the 213 survey participants, 59.15% were female, while 40.85% were male. From the aspect of their year of study, 25% were in year 1, 24% were in year 2, 23% were in year 3 and 28% were in year 4. See Figures 1 and 2 for details.
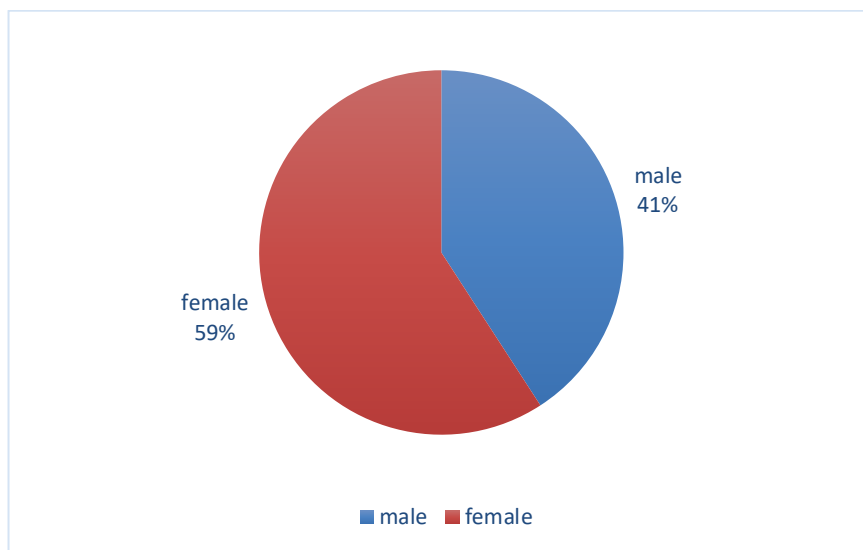

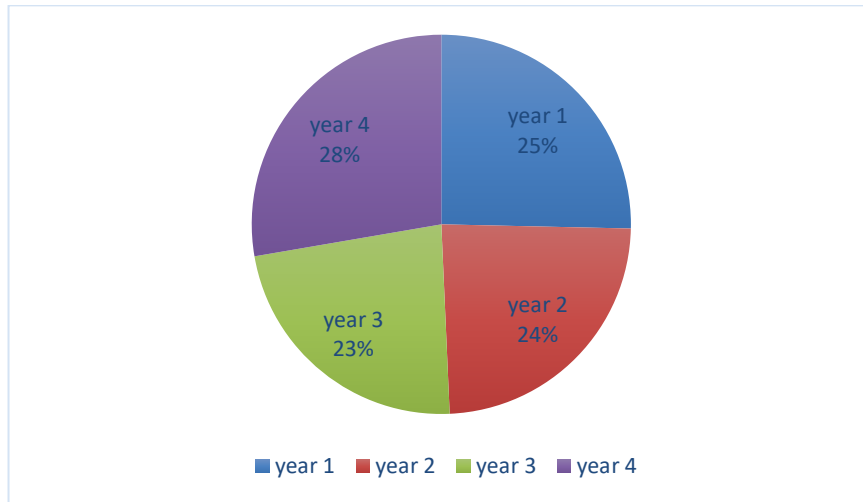Figure 1: Percentage of males and females.

Figure 2: Year of study of respondents.

According to table 1, greater than 50% of the male undergraduates were dissatisfied with e-learning while greater than 50% of the female undergraduates were satisfied with e-learning. The results showed that males and females have different attitudes towards e-learning. But in general, 116 undergraduates were satisfied with e-learning, which was similar to the number of dissatisfied people. According to table 2, with the year of study increasing, the percentage of satisfaction increases while the percentage of dissatisfaction decreases. According to the chart, it can be concluded that the difference between the number of satisfied undergraduates and dissatisfied undergraduates is not large. In addition, gender and academic grades would have an influence on student satisfaction with online education.

Table 1 Student Satisfaction by Gender

Variables	Mean	
	Satisfaction	Dissatisfaction
Male	41 (47.13%)	46 (52.87%)
Female	80 (63.49%)	46 (36.51%)
All	116 (54.46%)	97 (45.54%)

Table 2 Student Satisfaction by Year of Study

Year of Study	Mean	
	Satisfaction	Dissatisfaction
1	28 (51.85%)	26 (48.15%)
2	27 (52.94%)	24 (47.06%)
3	28 (57.14%)	21 (42.56%)

4	38 (64.40%)	21 (35.60%)
All	121 (56.81%)	92 (43.19%)

4.3 Quantitative research

The relationship between the series of variables or factors was tested. Martin and Bridgmon (2012) stated that verifying a hypothesis by identifying the connections between a pair of defined independent variables is key to quantitative research. Elements, factors, and features that can change or vary are all included in the independent variables. These variables might be quantified against unchanging constants.

According to Gunderson and Aliaga (2002), quantitative research explains phenomena by gathering and analyzing numerical data through mathematically-based approaches in particular statistics. A wide-rage sampling would be more suitable and result in a more precise outcome. Therefore, we could adopt this approach for our analysis. Similarly, the essential characteristic of quantitative research was to explore through analyzing a large number of sample data from different points of view.

This paper implemented a quantitative questionnaire, both online and offline. Over 80 percent of the questions in the questionnaire were converted into number-based answers. For example, the answer of gender was converted into 0 (male) and 1 (female), the level of satisfaction was ranked numerically from 1 (very dissatisfactory) to 5 (very satisfactory).

In the original quantitative data, there were 213 unusual answers to identical questions. Researchers can increase efficiency with SPSS (Statistical Package for the Social Science) (Tolmie, Muijs, & McAteer,2011). There are four main advantages of the smart intelligence software: The most striking feature is that the user interface is friendly, the processing speed is fast and the output information is well-formed. Secondly, if the researcher is skillful at the statistical exploration principle and Window operating ability, SPSS can be applied to specific service in scientific work. Thirdly, the input data model is similar to an Excel spreadsheet and is compatible with resources from other databases. Finally, the type of the output file is '.spo' and it can be archived as HTML or text format, which enriches the forms for outcomes output. The arithmetic means frequency, independent sample t-test, variance analysis and regression can be checked during the investigation of

independent variables. The studies are based on sub-factors and total scores. Therefore, it is quite convenient for researchers to analyze and give actual and concise results. In terms of our presented questionnaire, each factor affecting learning effectiveness by e-learning was selected and categorized, as shown in Table 3 below.

Table 3 Example of quantitative Q&A form questionnaire

Gender	0 (male) / 1 (female)
Academic grade	1 2 3 4
Interaction of class	1 2 3 4 5
The effectiveness of learning	1 2 3 4 5
The content of courses	1 2 3 4 5
The design of user interface	1 2 3 4 5
The range of information	1 2 3 4 5
The quality of teachers	1 2 3 4 5
Instant messaging	1 2 3 4 5
Unlimited time and place	1 2 3 4 5
The level of self-discipline	1 2 3 4 5
The level of self-learning	1 2 3 4 5
The ability to memorize	1 2 3 4 5
The level of self-regulation	1 2 3 4 5
Reaction speed	1 2 3 4 5
The degree of concentration	1 2 3 4 5
Few complaints about electronic education.	1 2 3 4 5
Continue using the e-learning	1 2 3 4 5
Increase the use of e-learning	1 2 3 4 5
Recommend e-learning to others	1 2 3 4 5

4.4 Qualitative research

Using qualitative research, the researcher could directly gain respondents' comments and views on e-learning. Quantitative methods can analyze the data logically. In areas that cannot be easily explained by the quantitative method, the qualitative method can be used to understand the rationale behind. Newman and Benz (1998) believed that qualitative research could be used to observe and interpret certain phenomena to propose a theory. Qualitative methodology relates to theoretical analysis, quote collection from persons and verifying the meaning. The objective of this method is to gain an initial understanding of the underlying views from targets. Data analysis is unstructured. Therefore, a collection of structured learning materials for e-learning is helpful and they can be collected from reputable sources and educational service providers, which have credibility, authenticity and good representativeness.

This study used interviews to collect qualitative data. It is also important to simulate the interview process before the formal interview. Eleven interviewees participated. Interviewees were randomly chosen at Wenxing square or the bus stop near the dormitory. The draft of the interview outline is shown below.

- How often do you usually use e-learning?
- How much time do you spend on e-learning per week?
- What are your main purposes of using e-learning?
- What do you focus most on electronic education? Price? Efficiency? The famous master?
- What do you think about the advantages of an online course?
- What do you think of the shortcomings of the online course? How to improve these shortcomings?
- How efficient are you when using education?
- How about your learning efficiency through traditional education?
- Are you satisfied with e-learning applications at present?
- Do you think distance education is very popular now?
- What kinds of educational models do you prefer?
- Do you think e-learning will take the place of traditional education in the future?
- Could you analyze and forecast the developing trend of e-learning?

(The interviewer aimed to ask at least 60 percent of the questions)

4.5 Limitations

The limitations of the survey were clear. The researcher collected 213 questionnaires. This sample was too small to reflect the thoughts of all college students. All survey respondents were college students in Suzhou. The survey was taken as a local rather than taken at the national level. One drawback is online respondents were unlikely to provide long and meaningful answers. A face-to-face interview and survey may address this. However, interviewees may not give accurate answers to the interviewer. These all affect the accuracy of data and, therefore, the evaluation of the results.

5. RESULTS AND DISCUSSION

By combining quantitative analysis (mean, standard deviation, t-test and coefficients) and a qualitative survey (face-to-face interviews), reliability is increased. Conclusions were drawn about the factors affecting user satisfaction in online education. We also identified there were students feeling satisfied and dissatisfied with e-learning. Hence, eight questions for students were used to measure and analyze the rationale behind. Descriptive statistics are presented in Table 4, with each item shown as an independent variable.

5.1 Relationship between external factors and student satisfaction

In terms of external factors, to judge whether or not the factors are significant to student satisfaction, t-tests were conducted towards the eight factors. The results are presented below.

Table 4 Description of external factors

	Satisfaction	dissatisfaction	t-test	
	Mean SD	Mean SD	t	effect-size

Factor						
1. Interaction of class	4.39	0.29	3.02	1.44	2.76*	1.79
2. The effectiveness of learning	4.91	0.29	4.32	0.91	2.34*	1.33
3. The content of courses	4.31	0.28	4.28	1.07	1.59	
4. The design of the user interface	4.13	0.72	3.96	1.68	1.88	
5. The range of information	4.11	0.65	4.08	1.13	0.87	
6. The quality of teachers	4.51	1.42	4.03	0.23	2.24*	0.83
7. Instant messaging	4.36	0.67	3.21	1.54	2.67*	1.75
8. Unlimited time and place	4.50	0.96	4.23	0.45	2.06*	0.76
* P < 0.05; ** p < 0.01						

The figure '*' at the end of t-value means that at the confidence level of 95%, the p-value of this factor is less than 0.05 and the factor is significant to the dependent variable 'Satisfaction'. According to the above table, there are five significant factors: interaction between teachers and students, the effectiveness of learning, the quality of teachers, instant messaging and unlimited time and place. Based on the interview and related literature, these five factors will be discussed.

- Interaction in the classroom- The interaction's mean value of satisfaction group (4.39) is higher than the value of dissatisfaction group (3.02), indicating that a higher level of interaction may affect the student's satisfaction positively. Although online education platforms enable students to hear or perhaps see teachers, share their experience and expertise with one another and teachers are allowed to respond to the students' comments and questions online, the interaction still cannot be as timely or diverse as in the face-to-face classrooms, which may reduce the level of interaction during e-learning. Students are eager for more kinds of teacher-student and peer interaction on the online learning platforms. In order to improve student satisfaction, online learning platforms need to increase after-school activities and interactions in the learning process.

- The effectiveness of learning: The effectiveness of learning means the outcomes students achieve after learning online, including passing exams, getting a good job, having a promotion and so on (DeRouin, Fritzsche, & Salas, 2005). The learning effective's mean value of satisfaction group (4.91) is higher than the value of the dissatisfaction group (4.32), meaning that the better the learning outcome is, the more satisfied the student is more likely to be. E-learning platforms contain a variety of learning materials, including law, medicine, and engineering. Students can choose the courses they require. It is difficult, however, for students to judge whether materials are useful and they may spend a lot of time choosing suitable materials, which may reduce the learning effectiveness. Therefore, in order to improve student satisfaction, online learning platforms should enhance learning effectiveness by making the platforms more highly functional, easier to use and more flexible for students. However, unlike in a face-to-face classroom, teachers cannot effectively supervise students' behaviors during the e-learning, which may lead to poor exam results. Therefore, online learning platforms should take special actions to students lacking self-discipline, such as contacting them through we-chat more frequently.

- The quality of teachers: The mean value of teachers' quality is higher in the satisfaction group than in the dissatisfaction group, indicating that students will be more satisfied with the online learning platform if the teachers of the platform are more qualified. The online learning teacher occupies an important position throughout the distance learning process. They must have professional expertise and be trained in online teaching presentations. Online teachers have to plan for lessons, create courses, and choose textbooks. They have also to determine the degree of student interaction and choose assessment methods (Berge, 1998). Due to the wide range of objects that online courses face, the quality of the teacher is crucial for guiding students correctly. Proper training will help improve the quality of teaching, then improve student satisfaction as a consequence.

- Instant messaging: Instant messaging refers to near-synchronous interaction through email, voicemail, PC and software (Nardi, Whittaker and Bradner, 2000). Another method is videoconferencing. The mean value of instant messaging in the satisfaction group (4.36) is 1.15 higher than that in the dissatisfaction group (3.21), meaning that the more instant messaging will lead to a higher level of student satisfaction.

- Unlimited time and place: Although the difference between satisfied people and dissatisfied people is little in terms of unlimited time and place, which are 4.5 and 4.23, respectively. Still, the p-value shows the significance of the factor 'unlimited time and space' because the existence of this characteristic is important to student satisfaction. Hassenburg (2009) contends that online educational platforms help increase learning opportunities through its unlimited availability. Students can create their own study plan using their devices and are not limited by a rigid timetable. Even in rural or marginal communities separated by perhaps thousands of miles, students still have access to knowledge through online learning (Hassenburg, 2009).

5.2 Relationship between internal factors and student satisfaction

The t-test is also conducted to evaluate the significance of the internal factors. The results from the analyses are presented in Table 5 below.

Table 5 Description of internal factors

	Satisfaction		dissatisfaction		t-test	
	Mean	SD	Mean	SD	t	effect-size
1.The level of self-discipline	4.03	0.87	3.02	0.72	3.77**	2.01
2.The level of self-learning	3.88	0.36	3.42	0.67	2.43*	1.41
3.The ability to memorize	3.56	0.64	3.48	1.12	1.22	
4.The level of self-regulation	4.02	0.84	3.86	1.18	2.74*	1.79
5.Reaction speed	3.79	0.45	3.68	0.80	1.44	
6.The degree of concentration	4.13	0.97	3.68	0.82	2.65*	1.72
* P < 0.05; ** p < 0.01						

As shown in the table, four factors are significant to student satisfaction, which are 'The level of self-discipline', 'self-learning', 'the level of self-regulation' and 'the degree of

concentration'. The figure'*' means the factor is significant at the confidence level of 95% and '**' means the factor is significant at the confidence level of 99%. According to the above table, among the four significant factors, the factor 'The level of self-discipline' is significant at the confidence level of 99% and the other three factors are significant at the confidence level of 95%. The mean values of these factors in the satisfaction group are all higher than those in the dissatisfaction group, indicating that the level of self-discipline, self-learning, both the level of self-regulation and the degree of concentration, have a positive influence on user satisfaction with e-learning. These four factors can be collectively referred to as learning ability and students with better learning abilities tend to be more satisfied with online education platforms (Jivet, 2016). Therefore, the e-learning platforms should find ways to improve students' learning ability, for example, providing courses aimed at training student's learning ability or dividing the target into several small tasks and reward students when they finish these tasks.

Current academic performance and gender may also affect student satisfaction with online education. A series of surveys have shown their impact on e-course satisfaction (Shen et al., 2013; Park, 2007). However, this paper did not examine gender and current academic performance because of the accessibility of qualified data. Further studies, therefore, could investigate the correlation between gender, learning ability and satisfaction with online education.

5.3 The relation between usage intention and factors that affect e-learner satisfaction

Table 6 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.346	0.745		9.856	.000
	External factor	0.351	0.042	0.687	5.471	.000
	Internal factor	0.275	0.038	0.532	4.896	.000
	R	.687				

R^2	.472
$\triangle R^2$	.470
F	239.354***

Table 6 shows the results from the multiple regression analysis. External and internal factors were entered into the regression equation. The adjusted R-square is 0.47. This means that the model explained an almost 47% dependent variable. Regarding the F statistics (239.354), the model is considered to be significant under 5% significance, so the null hypothesis should be rejected. The regression coefficients were 0.351 and 0.275. Both external and internal factors of e-learning satisfaction are shown to have a positive effect on the usage intention of students towards online courses. College students who have a higher degree of satisfaction with online educational platforms are more willing to use them. Besides, external factors such as class interaction, the effectiveness of learning, the quality of teachers, instant messaging and unlimited time or place had the most significant impact on the use intention of online courses. This was followed by internal factors, for instance, the level of self-discipline, the level of self-learning, the level of self-regulation and the degree of concentration.

6. RECOMMENDATIONS AND CONCLUSION

From the results of the questionnaire and interviews, the researchers made suggestions for the four main components of e-learning.

6.1 Recommendations

- Recommendations for online educational institutions

As suggested by one of the interviewees, the quality of the online educational platform's service should be improved. This refers to the quality of response that system users receive from employees and IT staff, including responsiveness, accuracy, reliability, technical competence, and empathy of the personnel. Poor after-sales service and untimely reply are common problems with online educational platforms, based on feedback from our eleven interviewees. For the students who lack self-discipline, the

online education platform should look for interesting and meaningful approaches to improve their level of self-discipline. For example, digital educational institutions could set an incentive system to encourage learners to attend online courses. Once the student attendance rate reaches over 90 percent, they will be provided with additional material rewards, such as a certificate of completion. Additionally, it is important to standardize information quality. Information quality of current network education is jagged, although it provides an amount of learning material, it is a challenge for students to distinguish which material is suitable to them. Therefore, it is necessary to classify information accurately on the basis of different contents (Alkhattabi, Neagu and Cullen, 2010).

- Recommendations for interaction improvement

Online students are eager for more opportunities to communicate with teachers in the online learning environment. In order to increase the level of interaction, it is necessary for an online learning platform to cap the number of students or provide an extended period for questions and answers in each virtual course. On the one hand, the nature of digital education makes it easy to attract a more significant number of students than traditional education. This is difficult for the effective management of students and results in reduced interaction between teachers and students. Therefore, it is critical to calculating the optimal course capacity. On the other hand, if the number of students cannot be restricted, there should be an extended period dedicated to questions and answers instead. Online discussion forums can also be provided. However, the privacy of students should also be considered as in the virtual education environment, since confidentiality is essential for everyone.

- Recommendations for teaching

Firstly, it is essential to improve the quality of online teachers. Results in section 5.1 show that the quality of teachers has a positive impact on student satisfaction. In order to improve the teaching level and develop an innovative teaching style, teachers need to continue to participate in training. At the same time, they should consider student feedback. Learner-centered education has become more and more important. However, it is debatable whether this addresses learner needs. Teachers should be knowledgeable, understand the level of learners and be responsive to their needs. In order to achieve this, it is necessary to provide differentiated content. Teachers may also be able to provide

one-to-one private courses. At present, ordinary university students use the electronic education platform. Despite the high price, one-to-one private tuition should be provided.

- Recommendations for learner adopted e-learning

Results in section 5.2 suggested that each of the learning ability, 'the level of self-discipline', 'the level of self-learning', 'the level of self-regulation' and 'the degree of concentration', has a positive relationship with student satisfaction respectively. Therefore, in order to improve student satisfaction with e-learning, students are advised to pay more attention to improve their learning ability. College students should arrange time reasonably and improve their concentration, which leads to more efficient learning and better results (Mydin, F., 2017).

6.2 The summary

To sum up, this paper had found that class interaction, the effectiveness of learning, the quality of teachers, instant messaging and unlimited time or place were five important external factors that most influence learner satisfaction with e-learning and their relationships were all positive. In terms of internal factors, the level of self-discipline, the level of self-learning, the level of regulation and the degree of concentration also played a significant role in the results. Satisfaction was found to have a positive effect on the usage intention of online courses. In order to improve the development of online courses, both digital education platforms and users should adjust. Digital education platforms could focus more on interaction and communication between teachers and students. In addition to this, the cost performance of online courses could be improved. Students needed to identify learning materials effectively and to enhance their learning abilities.

It was reasonable to assume that the development of online courses would be better with training. Therefore, research into students' expectations for online courses in China would be beneficial. The results of the survey would provide reliable advice on the development of network education in the future.

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Appendices

 Appendix A

Factors Influencing Satisfaction/Dissatisfaction with Online Learning

Factor	S N=280	%	D N=286	%
Convenience	112	40.0	3	1.0
Interaction	9	3.2	58	20.3
Communication	14	5.0	37	12.9
Structure	98	35.0	73	25.5
Clarity	4	1.4	6	2.1
Instructor	10	3.6	23	8.0
Learning Style	18	6.4	40	13.9
Platform	4	1.4	18	6.3
Other	11	3.9	28	9.8

Figure 3 Factors Influencing Satisfaction/Dissatisfaction with Online Learning (Michele, Shelley and Swartz, 2014)
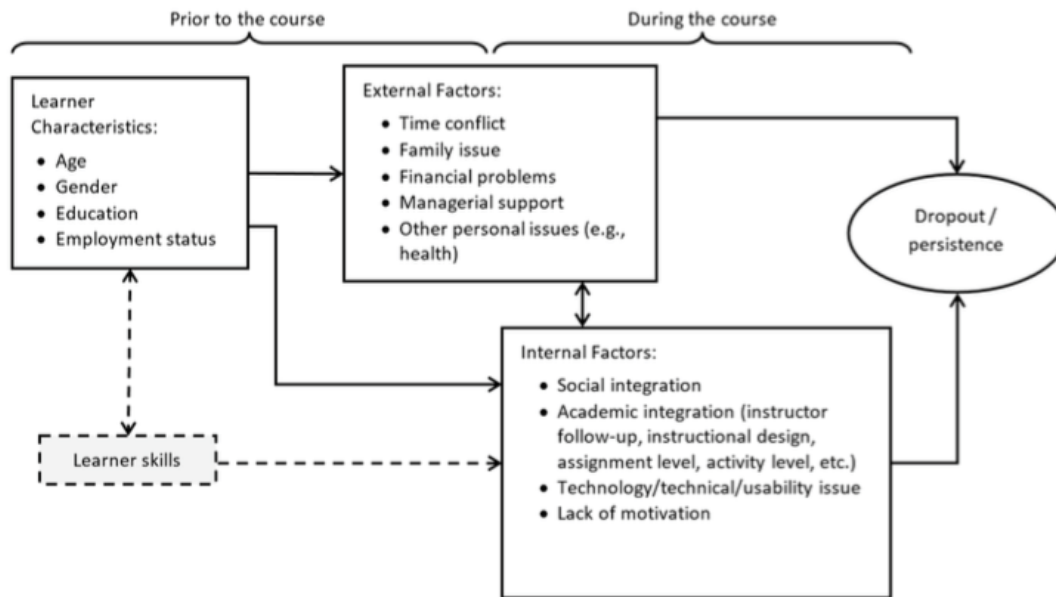
Appendix B

Figure 4 Factors affecting the participation of the disabled and their satisfaction (Park, 2007)

Appendix C

Students views about using mobile phones in educational setting

	Number (N)	Percent (%)
Needs		
Very necessary	37	23.7
Necessary but has difficulties	33	21.2
Not sure	12	7.7
Makes life easier but unnecessary	37	23.7
Totally unnecessary	23	14.7
Missing System	14	9.0
Learning Environment		
Theoretical courses	61	39.1
Applied courses	24	15.4
Field trips	23	14.7
Distance learning	4	2.5
Other	3	1.9
Missing System	41	26.3

Figure 5 Students views about using mobile phones in educational setting (Yilmaz, 2016)