The Evaluation of Students' Perception of E-learning in Higher Education

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ABSTRACT
Nowadays, with the progress of society, especially in recent years with the emergence and development of artificial intelligence, technology and the Internet have been integrated into every aspect of people's lives. In the education industry, there are also the emergence of products combining these technologies, such as webcasting classes, e-libraries, e-learning videos, e-learning APPs and so on, and E-learning system is the collective name of these products.
Since the COVID-19 outbreak, students across the globe have had to be quarantined at home, which has resulted in no way for them to get to the classroom and learn as they used to. However, it is this situation that has led to the rapid development of e-learning systems. Teachers are using live webcasts to deliver lessons to their students, schools are developing apps specifically designed to aid learning, posting e-learning videos on the web, simulating experiments on the web, and so on. Undoubtedly, e-learning systems are a good solution to the problem of geographical restrictions. However, because there is no way for teachers to grasp the learning status of students in real time as they can in the classroom, e-learning systems have still aroused the concern of many people.
Therefore, this project was to investigate the perceptions of university students who have been exposed to e-learning systems about e-learning systems. The project was able to examine the perceptions of e-learning systems among different groups of students by gender, age, year of study and study mode. At the same time, the project categorized the factors affecting e-learning systems into five factors: Autonomy Factor, Problem-solving Factor, Multimedia Factor, Teacher Factor and Student Factor. In this study, questionnaire was used to collect data. 120 questionnaires were received. Based on the results of the survey, the project will analyze the correlation between these factors and the relationship between these factors and demographic information. These results will be useful for educational institutions or individuals to improve e-learning systems in the future.
Keywords: e-learning; Autonomy Factor; Problem-solving Factor; Multimedia Factor; Teacher Factor; Student Factor.

INTRODUCTION
Nowadays, with the development of technologies such as Internet and artificial intelligence, our lives have been raised to a new level. The technology has affected perspective of our society, and one of the most important perspectives is the field of education. Moreover, after the COVID 19 pandemic, online learning has grown tremendously. The students under higher education at this time are the first bench of students who can benefit from the convenient of technology in our study since we are in our early stage of education. During our educational period, we will encounter different educational technologies, such as educational software, course management software, the Internet and video, which we call E-learning system. This E-learning system can provide an effective learning environment for students. In E-learning system, learning activities are based on learner autonomy and interactive learning actions; in addition, learning instruction is based on multiple media. Furthermore, E-learning also offers cooperative learning opportunities. Based on activity theory, the purpose of this study is to examine learners' attitudes toward E-learning systems. Indeed, understanding learners' attitudes toward E-learning systems is necessary to ensure that E-learning stands the best possible chance to succeed.

The objective of this study is to examine the cognitive characteristic of the university students, as well as to investigate the relationship among autonomy factors, problem-solving factors, multimedia learning factors, teacher factors and student factors, in order to find out students' perception towards E-learning in higher education.

LITERATURE REVIEW
1 Concept of E-learning
E-learning refers to the delivery of educational content and experiences through electronic devices such as computers, tablets, or smartphones over the internet. It can take various forms, including online courses, video lectures, interactive simulations, and virtual classrooms (Rosenberg, 2003).

E-learning has the following advantages in modern education. E-learning provides access to education for people who may not have been able to attend traditional classes due to geographical, physical, or time constraints. Learners can study at their own pace and at times that are convenient for them, allowing for a more personalized learning

experience. E-learning often reduces the need for physical resources, making it a cost-effective alternative to traditional education. With advancements in technology, E-learning platforms can offer immersive and interactive learning experiences, enhancing engagement and retention (Moore, 2006). E-learning allows educators to reach a global audience, breaking down geographical barriers and enabling collaboration across borders. E-learning supports the concept of lifelong learning by providing opportunities for continuous skill development and updating knowledge.

2 Evolution of E-learning

The roots of E-learning can be traced back to the early development of computer-based training and instructional design theories in 1960s-1970s (Bakhouyi, 2017). In 1980s-1990s, the emergence of personal computers and the internet laid the groundwork for the delivery of educational content electronically. In the 1990s, CD-ROMs allowed for interactive multimedia learning experiences, paving the way for more engaging educational materials (Smothers et al, 2009). Also, LMS software such as Blackboard and Moodle began to streamline the administration and delivery of online courses. With the popularity of smartphones and tablets, E-learning has been extended to mobile devices, enabling mobile learning. MOOC platforms have democratized access to high-quality education from top institutions. Nowadays, advanced algorithms and AI are being used to personalize learning paths based on individual student performance and preferences. Virtual Reality and Augmented Reality are being integrated into E-learning to create immersive and interactive learning experiences (Cui et al, 2008).

3 Effectiveness of E-learning

There are a lot of studies and research exploring the effectiveness of E-learning compared to traditional classroom instruction. Here are some key findings:

1. A study published in the Journal of Educational Psychology found that students in online courses performed better than those in face-to-face classes, with higher test scores and retention rates (Whitman et al, 2005).
2. The U.S. Department of Education conducted a meta-analysis of 51 independent studies and found that on average, students who engaged in online learning outperformed those receiving face-to-face instruction.
3. Research published in the Journal of Computer Assisted Learning revealed that E-learning can lead to improved student satisfaction and engagement compared to traditional classroom methods (Tirziu & Vrabie, 2015).
4. The American Journal of Distance Education published a review indicating that E-learning is particularly beneficial for learners who are self-directed and motivated, as it allows them to take control of their learning journey (Miller et al, 2017).

While these studies highlight the benefits of E-learning, it is important to note that the effectiveness of any instructional method depends on various factors. Here are some key factors influencing the effectiveness of E-learning:

1. Learner Characteristics: Self-directed learners who are able to manage their time effectively tend to reap the benefits of e-learning environments. Learners' comfort and proficiency with technology affects their engagement and success in e-learning.
2. Instructional Design: Clear learning objectives help guide the design of e-learning materials and assessments and contribute to effective learning outcomes. Interactive and multimedia content can increase learner engagement and promote understanding of complex concepts. Providing timely and constructive feedback and designing effective assessment methods are essential to measuring and enhancing learning.
3. Technological Aspects: Ensuring that e-learning platforms are accessible from a variety of devices and have user-friendly interfaces will promote a positive learning experience. A stable internet connection and reliable hardware are key to E-learning delivery. Protecting learners' data and maintaining secure communication channels are key to building trust in E-learning environments.
4. Social and Collaborative Elements: Opportunities for peer co-operation and discussion can enrich the learning experience by facilitating knowledge sharing and the exchange of different perspectives. Active participation and feedback from the instructor contribute to a sense of community and support in the E-learning environment.
5. Support Systems: Access to timely technical assistance and troubleshooting resources can minimize disruption and frustration for learners. Providing instruction in learning strategies, time management, and self-directed learning skills can empower learners to succeed in e-learning.

4 Technology Integration in E-Learning

With the growth of the Internet, more and more technology is being used in e-learning systems. These technological tools and platforms play a crucial role in facilitating e-learning by offering diverse content delivery models, facilitating interactive and immersive learning experiences, and enabling personalized teaching and learning, ultimately increasing the effectiveness and accessibility of online education. Here are some key technologies:

1. Learning Management Systems (LMS): The LMS platform simplifies the management of online courses, including content delivery, student enrolment and assessment tracking. The LMS provides a centralized hub for

hosting and delivering course materials, making them easily accessible to learners wherever they have an internet connection. Forum, chat and messaging features in the LMS can facilitate interaction between students and teachers (Konstantina et al, 2015).
2. VR and AR: VR and AR technologies provide immersive simulations and visualizations to deepen understanding of complex disciplines such as science, engineering and medical training. VR and AR can provide hands-on training experiences in virtual environments, allowing learners to practice their skills in realistic scenarios.
3. AI: Artificial intelligence algorithms can analyze learners' performance data and provide personalized learning paths based on their strengths, weaknesses and learning preferences. Artificial intelligence-powered chatbots and virtual assistants can provide instant support to learners, answering questions and guiding them through course material.
4. Video Conferencing and Webinars: Platforms for video conferencing and webinars enable live lectures, discussions, and Q&A sessions, fostering real-time interaction between instructors and students. Through these platforms, guest speakers and experts can contribute to the learning experience regardless of geographical constraints.
5. Mobile Learning Apps: Mobile apps provide learners with the flexibility to access course materials and engage in learning activities from smartphones and tablets, supporting mobility and accessibility.

5 Challenges and Barriers in E-Learning Implementation
Common challenges and barriers in implementing e-learning (Goyal, 2012) include:
1. Access to technology and internet connectivity: Many learners may not have access to reliable technology or high-speed internet, limiting their ability to fully participate in E-learning.
2. Lack of technical skills: Some learners and educators may struggle with using the necessary E-learning platforms and tools effectively, leading to frustration and disengagement.
3. Motivation and engagement: Without face-to-face interaction, some learners may struggle to stay motivated and engaged in E-learning environments.
4. Quality of content and instructional design: Ensuring that E-learning materials are engaging, effective, and well-organized can be a challenge for educators and content creators.
Potential solutions to address these challenges include:
1. Providing access to technology and internet: Schools and organizations could consider providing equipment and subsidizing the cost of access to the Internet for learners who do not have access to the Internet. They could also explore offline learning programs and distribute educational materials in physical form.
2. Offering technical support and training: Providing training sessions and resources to help learners and educators become proficient in using E-learning platforms and tools can improve their confidence and effectiveness.
3. Implementing interactive and personalized learning experiences: Incorporating interactive elements such as quizzes, discussions and multimedia content can increase learner engagement. In addition, personalized learning paths based on individual interests and abilities can help to maintain motivation.
4. Investing in professional instructional design: Employing skilled instructional designers and educators to create high-quality E-learning content ensures that materials are well-structured, engaging and aligned with learning objectives.

6 Future Directions and Emerging Trends in E-Learning
AI in E-learning: Integrating AI technologies such as personalized recommendations, adaptive learning algorithms and natural language processing has great potential to improve the efficiency and effectiveness of E-learning experiences (Elizabeth et al, 2003).
Immersive Technologies: VR and AR hold the promise of transforming e-learning by providing immersive and interactive learning environments. Future research may delve into the pedagogical implications and best practices of integrating these technologies into E-learning programs.
Data-Driven Instructional Design: Leveraging learning analytics and big data, future E-learning research could focus on using data-driven insights to inform instructional design, personalize learning pathways, and predict student performance (Verbert et al, 2012).
Workforce Development and Lifelong Learning: Research into the role of E-learning in meeting the needs of adult learners, upskilling and re-skilling the labor force and supporting lifelong learning initiatives can contribute to the development of E-learning with wider societal impact.
These future directions and emerging trends in e-learning have the potential to shape the next generation of educational technology and pedagogy, ultimately redefining the way we learn and teach in the digital age.

RESEARCH METHODOLOGY

In this project, a questionnaire survey has been conducted to collect the data in order to evaluate students' perception of E-learning in higher education. Previous studies have also used questionnaire survey to collect users' perception on technology with different scales, which were found to be effective, whereas the measurement scale

used in this project has been adopted in previous research to measure students' perception on E-learning. Moreover, the method of using survey is very effective because of being widely distributed to the students and spending less time to distribute and collect data. Thus, questionnaire survey has been chosen to collect data in this project.

1 Designing a questionnaire

The questionnaire was divided into 3 parts. For the first part, it contained the questions inquiring the personal information of the respondents, including their age, gender, the universities they attended, their current grade level and major, their mode of study and their GPA. This information was required as comparison between different age, and study mode in their perception in E-learning.

In the second part, there were questions inquiring the previous experience of using technology for learning of the respondents. This information was required as comparison between the respondents with different experience in using computer. There were 5 items in total, 1 of which was about the computer accessibility and 4 were about the quantity of their prior experience on using computer for both educational and non-educational purpose.

The third part contained the questions inquiring university students' perceptions to E-learning. There were 25 questions in this part, 6 of which are related to the Autonomy Factors (AF), 3 of which are for the Problem-solving Factors (PF), 3 for the Multimedia learning Factors (MF), 3 for the Teacher Factors (TF), and the last 10 for the Students' Attitude Factors (SF). Those items were rated from a 5-point Likert type scale, ranging from 1 "strongly disagree" to 5 "strongly agree".

2 Distribution and collection of questionnaires

After the questionnaire has been finalized, a pilot study has been done before distribution in a large scale. 5 questionnaires were distributed out to my friends from various universities, for a pilot study. Piloting the questions on a small group of people could certainly save time in the case that any problems about the questions, wording and design of the questionnaire should be discovered at this stage. They were asked to complete the questionnaires without any explanation or assistance in order to find out whether they could understand the questions by themselves. After the questionnaires have been completed and collected, they were asked to give feedback about the questionnaire individually. It was found that the questionnaire could be understood by all of the participants in this pilot study and the length of the questionnaire was found to be moderate as well.

As soon as the pilot study finished, distribution of questionnaires started. The targets of this survey were university students. They have all experienced with different extent of E-learning systems in university or in high school. So, the information about university students' perception on E-learning and the factors affecting their perception can be collected for this target group. Finally, 120 questionnaires were collected.

3 Data Preparation

After the completion of the distribution and collection of the questionnaires, questionnaire checking has to be done so as to ensure all the questionnaires were fully completed without any missing items.

All the questionnaires collected were only the raw data in this stage. The raw data will be inputted into the data-sheet so as to facilitate data analysis process. Once there was any missing item in any questionnaire, that questionnaire would be discarded.

4 Data Analysis

The statistical tool used in this project was the "Statistical Package for the Social Science" (SPSS). SPSS is a sophisticated piece of software used by many scientists and related professionals for statistical analysis. Moreover, it is user-friendly and basically capable to provide every information output we needed.

Items included in the questionnaire must be valid and reliable in order to collect useful and relevant data. The validation of the measurement scales would be evaluated so as to confirm the psychometric property of this scale is reliable and valid.

Factor analysis is used to identify groups of similar and related items, create and validate scales, ensure that items are associated with the scales, and reduce the number of variables so as to facilitate further analysis. Items should be eliminated if the factor loading or corrected item-total correlation value of the item was lower than 0.3.

The reliability of the scales would be evaluated by the Cronbach's alpha which is a measure of internal consistency indicated how close do the items related to each other. All the scales should exceed the recommended cutoff criteria, i.e. Cronbach's alpha > 0.7, then all the scales could say to be reliable.

After validating the measurement scales, the independent t-test were used for testing the differences between the means of two independent groups while one-way analysis of variance (ANOVA) was used for testing the differences between the means of several groups (more than two groups). In this study, comparison would be made between gender; full-time students and part-time students, more experience and less experience, among different age groups and among grade level.

5 Validation of Measurement Scale

As mention in last section, the validation of the measurement scale would be evaluated in order to confirm its psychometric property. Factor loading and item-total correlations of the items were found out to test for their validity. Table 1 shows the result of factor analysis.

5.1 Factor Analysis

Table 1: Factor Loading of the Measurement Scale

Item	Factor Loading
AF1	.802
AF2	.817
AF3	.813
AF4	.723
AF5	.773
AF6	.510
PF1	.825
PF2	.732
PF3	.851
MF1	.834
MF2	.880
MF3	.824
TF1	.695
TF2	.788
TF3	.776
SF1	.720
SF2	.680
SF3	.765
SF4	.425
SF5	.564
SF6	.642
SF7	.708
SF8	.602
SF9	.763
SF10	.656

The general accepted values of the factor loading and item-total correlation was 0.3. According to Table 3.0, the factor loading of all the 25 items in the questionnaire were larger than 0.3. Thus, this scale was reliable and all the items above had large variance for factor analysis.

5.2 Reliability Analysis

Table 2: Reliability Statistics for Factors

Item	Cronbach's Alpha	N of Items
AF	.929	6
PF	.877	3
MF	.909	3
TF	.836	3
SF	.940	10

The Cronbach's Alphas for each Factor are 0.929, 0.877, 0.909, 0.836, 0.940, which are all higher than the acceptable value 0.7, means that the scale was reliable. Table 2 shows the reliability of factors.

ANALYSIS OF RESULT & DISCUSSION

1 Introduction

This section analyzes the results of the survey. The demographics of the respondents are first discussed to provide some background information about the respondents such as gender, age, university attended, grade attended, major, mode of study, use of computers, and previous experiences. Based on personal information, respondents will be divided into groups for comparison purposes. Then, the descriptive statistics of the scale would be presented and gives the summary of each motivational factor. Independent samples t-test would be presented to give the comparison between gender, mode of study and prior experience. One-way ANOVA would be presented to compare between age, grade levels and access to computers.

2 Demographic Information of Respondents

A total of 120 questionnaires were collected. Among the respondents, 57.5% of the respondents are male and 42.5% are female (Table 3). Participants were with 1.7% aged <18, with 45.0% aged 18-22, with 37.5% aged 23-27, with 15% aged 28-31, and with 0.8% aged >31 (Table 4). Also, 36.7% were CityU students, 14.2% were HKU students, 20.8% were CU students, 16.7% were PolyU students, and 11.7% were from other universities (Table 5). 13.3% were Year 1 students, 17.5% were year 2 students, 15.0% were year 3 students, 34.2% was year 4 or above students, 19.2% were postgraduates, and 0.8% are under other level (Table 6). 27.5% were majored in Art/Social Science/Education, 15.0% were majored in Business, 32.5% were majored in Engineering, 9.2% were majored in Law, 14.2% were majored in Pharmacy/Medicine and another 1.7% were majored in others (Table 7). About the respondents' mode of study, 80.8% were full time students and 19.2% were part time students (Table 8). Finally, 46.6% were more experienced students and 53.4% were less experienced students. The respondent's background was summarized below.

Gender

Table 3: Percentage of Respondents' Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	69	57.5	57.5	57.5
Female	51	42.5	42.5	100.0
Total	120	100.0	100.0	

Age

Table 4: Percentage of Respondents' Age

	Frequency	Percent	Valid Percent	Cumulative Percent
<18	2	1.7	1.7	1.7
18-22	54	45.0	45.0	46.7
23-27	45	37.5	37.5	84.2
28-31	18	15.0	15.0	99.2
>31	1	0.8	0.8	100.0
Total	120	100.0	100.0	

University

Table 5 Percentage of Respondents' Studying University

	Frequency	Percent	Valid Percent	Cumulative Percent
CityU	44	36.7	36.7	36.7
HKU	17	14.2	14.2	50.8
CU	25	20.8	20.8	71.7
PolyU	20	16.7	16.7	88.3
Others	14	11.7	11.7	100.0
Total	120	100.0	100.0	

Grade

Table 6 Percentage of Respondents' Grade Level

	Frequency	Percent	Valid Percent	Cumulative Percent
Year 1	16	13.3	13.3	13.3
Year 2	21	17.5	17.5	30.8

Year 3	18	15.0	15.0	45.8
Year 4 or above	41	34.2	34.2	80.0
Postgraduate	23	19.2	19.2	99.2
Others	1	0.8	0.8	100.0
Total	120	100.0	100.0	

Major

Table 7 Percentage of Respondents' Major

	Frequency	Percent	Valid Percent	Cumulative Percent
Art/Social Science/Education	33	27.5	27.5	27.5
Business	18	15.0	15.0	42.5
Engineering	39	32.5	32.5	75.0
Law	11	9.2	9.2	84.2
Pharmacy/Medicine	17	14.2	14.2	98.3
Others	2	1.7	1.7	100.0
Total	120	100.0	100.0	

Mode of Study

Table 8 Percentage of Respondents' Mode of Study

	Frequency	Percent	Valid Percent	Cumulative Percent
Full time	97	80.8	80.8	80.8
Part time	23	19.2	19.2	100.0
Total	120	100.0	100.0	

3 Descriptive Statistics

3.1 Autonomy Factors

The overall mean of Autonomy Factors (AF) was around 3.25. It means that the respondents rated AF positively. From the five-point scale in the questions of AF, point 3 indicated "NEUTRAL", therefore the respondents tend to agree that they are well able to make active use of e-learning systems to assist their learning. They rated item AF6 "I can find information actively in the e-learning system." the highest. It indicated that university students were confident that make fully use of E-learning systems to search the information they need.

3.2 Problem-solving Factors

The overall mean of Problem-solving Factors (PF) was around 3.17. It means that the respondents rated PF positively. From the five-point scale in the questions of PF, point 3 indicated "NEUTRAL", therefore the respondents tend to agree that E-learning systems are really effective in helping them solve problems. They rated item PF2 "The e-learning system enhances my problem-solving skills." the highest. It indicated that university students were confident that E-learning system can enhance their problem-solving skills.

3.3 Multimedia Factors

The overall mean of Multimedia Factors (MF) was around 3.15. It means that the respondents rated MF positively. From the five-point scale in the questions of MF, point 3 indicated "NEUTRAL", therefore the respondents tend to agree that the multimedia elements of the current E-learning system are welcome. They rated item MF1 "I like colorful pictures in e-learning instruction." the highest. It indicated that university students found the colorful pictures in the e-learning system very useful.

3.4 Teacher Factors

The overall mean of Teacher Factors (TF) was 3.2. It means that the respondents rated TF positively. From the five-point scale in the questions of TF, point 3 indicated "NEUTRAL", therefore the respondents tend to agree that teachers' guidance and advice in E-learning systems went a long way. They rated item TF1 "I like the teacher's help and suggestions in the e-learning system." the highest. It indicated that university students were very willing to get guidance and advice from teachers in the E-learning systems.

4.3.5 Student Factors

The overall mean of Student Factors (SF) was around 3.25. It means that the respondents rated SF positively. From

the five-point scale in the questions of SF, point 3 indicated "NEUTRAL", therefore the respondents tend to agree that the E-learning system has been very helpful and they would recommend it to others. They rated item SF4 "Time flies when I am using educational technologies." the highest. It indicated that university students were well immersed in the use of E-learning systems.

5. Independent Samples T-test

The independent samples T-test is designed to find out whether two groups of factors are statistically different. The text consists of two parts which are "Levene's Test for Equality of Variances" and "t-test for Equality of Means". The Levene test is used to test whether the variances of the two groups are the same and to determine which t-value is more appropriate. If the significance level of the Levene test is greater than 0.05, i.e., the variances of the two groups are equal, the result assuming that the variances of the two groups are equal is used. Otherwise, use results that do not assume that the two groups have equal variances. Meanwhile, "t-test for Equality of Means" can be used to determine whether there is a significant difference between the two groups. If the level of significance (two-tailed) is equal to or less than 0.05, there is a significant difference between the mean scores of the two groups. Otherwise, there is no significant difference between the two groups.

5.1 Comparison of Distribution of Computer Usage between Gender

The significance value under Levene's Test was 0.877, which was greater than 0.05. It means that we can assume that male and female had equal variances and thus the results in the row of "Equal variances assumed" was used. Hence, the value of significance (2-tailed) under "t-test for Equality of Mean" was <0.001, which was less than 0.05. Therefore, there was statistically significant gender difference about Computer Usage Experience.
The mean value for male students was 2.5362 while the mean value for females was 3.8382, which means females had more computer experience than males did.

The above phenomenon may be attributed to the fact that men use computers more for recreational activities such as video games, whereas women use computers more for solving practical problems, and in the process, women accumulate more experience in using computers than men.

5.2 Comparison of Autonomy Factors between Genders

The significance value under Levene's Test was <0.001, which was less than 0.05. It means that we can assume that male and female had no equal variances and thus the values in the row of "Equal variances not assumed" was used. Hence, the value of significance (2-tailed) under "t-test for Equality of Mean" was <0.001, which was less than 0.05. Therefore, there was statistically significant gender difference about Autonomy Factors.

The mean value for male students was 2.7005 while the mean value for females was 3.9967, which means females were more self-directed learners than males in E-learning systems.

The above phenomenon may be attributed to the fact that women are naturally more stable and down-to-earth than men, and are able to immerse themselves in e-learning systems and actively explore knowledge more readily than men.

5.3 Comparison of Student Factors between Genders

The significance value under Levene's Test was <0.001, which was less than 0.05. It means that we can assume that male and female had no equal variances and thus the values in the row of "Equal variances not assumed" was used. Hence, the value of significance (2-tailed) under "t-test for Equality of Mean" was <0.001, which was less than 0.05. Therefore, there was statistically significant gender difference about Student Factors.

The mean value for male students was 2.7058 while the mean value for females was 3.9843, which means female students were more suited to learning with E-learning systems than their male counterparts.

5.4 Comparison of Students' Prior Experience between Study Modes

The significance value under Levene's Test was <0.001, which was less than 0.05. It means that we can assume that full-time and part-time students had no equal variances and thus the values in the row of "Equal variances not assumed" was used. Hence, the value of significance (2-tailed) under "t-test for Equality of Mean" was <0.001, which was less than 0.05. Therefore, there was statistically significant study mode difference about Prior Experience.

The mean value for full-time students was 3.3763 while the mean value for part-time students was 1.8804, which means full-time students had more experience with computers than part-time students.
The reason for this may be that full-time students have more computer time than part-time students and can spend

more energy researching computer use.

6 One-way ANOVA

One-way ANOVA is used to find out if there is a significant difference between the means of two or more independent groups. If the ANOVA significance level is equal to or less than 0.05, then there is a significant difference between the mean scores of the different groups. Otherwise, there is no significant difference between the mean scores of different groups.

6.1 Comparison of Students' Prior Experience between Ages

The significance level under ANOVA was <0.001 ($F=11.154$, $p<0.05$). This indicated that the age groups had significant difference in Students' Prior Experience of computer. From Table 4.25, it showed the mean values for five age groups, which were 1.5000 for aged <18, 3.0926 for aged 18-22, 3.6556 for aged 23-27, 1.7917 for 28-31, and 4.0000 for aged >31. It implied that students aged 18-27 had more experience with computers than any other age group. This is because most undergraduate and postgraduate students are in this age group and will have more opportunities to utilize computers in their academic lives to aid their learning. Therefore, students in this age group are naturally more experienced in computer use than students in other age groups.

6.2 Comparison of Autonomy Factors between Study Years

The significance level under ANOVA was <0.001 ($F=53.001$, $p<0.05$). This indicated that the study years had significant difference in Autonomy Factors. From Table 4.27, it showed the mean values for six study year groups, which were 1.8646 for Year 1, 1.9841 for Year 2, 2.3796 for Year 3, 4.2114 for Year 4, 4.2681 for Postgraduates, and 5.0000 for Others. The mean values increased while the study year increased. It implied that students in the upper grades were able to learn more consciously and actively in the E-learning system than those in the lower grades. This may be due to the fact that more emphasis is placed on student autonomy in acquiring knowledge at the university level than passively receiving knowledge output from teachers. As a result, as the academic year progresses, students become more capable of independent learning.

7. Pearson Correlation among Motivational Components

Pearson Correlation measures the strength of the relationship between two variables and the direction of the relationship between two variables, i.e., positive and negative correlations. If the Pearson's correlation coefficient (r) is positive (+), it means that the value of one variable increases as the value of the other increases and vice versa. If the Pearson correlation coefficient (r) is negative (-), it means that as the value of one variable increases, the value of the other variable decreases. The Pearson correlation coefficient (r) ranges from -1 to +1. If the Pearson's correlation coefficient (r) is close to +1 or -1, the relationship between the two variables is strong and changes in one variable are closely related to changes in the second variable. If the Pearson's correlation coefficient (r) is close to 0, the relationship between the two variables is weak and changes in one variable are not correlated with changes in the second variable. If the significance (2-tailed) value is less than or equal to 0.05, there is a statistically significant correlation between the two variables. If the significance (2-tailed) value is greater than 0.05, there is no significant correlation between the two variables.

7.1 Relationship between Exp and AF

For the relationship between Students' Experience of Computers (Exp) and Autonomy Factors (AF), the Pearson correlation coefficient was 0.782 ($p<0.01$) and the impact of Exp and AF was positive and significant as predicted. Since the Pearson correlation coefficient between Exp and AF was +0.782, the relationship between them was positive and significant. As mentioned by Cohen, the value of r ranging above 0.5 would be classified as a strong correlation. There was a strong positive correlation between Exp and AF. The reason for the above phenomenon may be that proficiency in operating electronic devices such as computers and mobile phones may affect the students' experience of using the e-learning system for learning. Students who are proficient in operating computers will have a better learning experience in the process of e-learning, which will stimulate their enthusiasm for active learning. On the contrary, if they are not proficient in the operation of electronic devices, students need to spend more energy on learning to use the e-learning system, which will weaken their enthusiasm for learning.

7.2 Relationship between AF and PF

For the relationship between Autonomy Factors (AF) and Problem-solving Factors (PF), the Pearson correlation coefficient was 0.893 ($p<0.01$) and the impact of AF and PF was positive and significant as predicted. Since the Pearson correlation coefficient between AF and PF was +0.893, the relationship between them was positive and significant. As mentioned by Cohen, the value of r ranging above 0.5 would be classified as a strong correlation. There was a strong positive correlation between AF and PF. This is because for students who are more proactive in using e-learning systems, they are more adept at utilizing e-learning systems to help them when solving problems. This virtuous circle makes these proactive students perceive the e-learning system as a powerful tool for

solving problems encountered in their daily studies and vice versa.

7.3 Relationship between PF and TF

For the relationship between Problem-solving Factors (PF) and Teacher Factors (TF), the Pearson correlation coefficient was 0.842 ($p<0.01$) and the impact of PF and TF was positive and significant as predicted. Since the Pearson correlation coefficient between AF and PF was +0.842, the relationship between them was positive and significant. As mentioned by Cohen, the value of r ranging above 0.5 would be classified as a strong correlation. There was a strong positive correlation between PF and TF.

CONCLUSION

This project has gathered the perceptions of students from different universities on E-learning systems. All collected data were imported into SPSS software for data collation and analysis. This report is a study of students' perceptions of E-learning systems based on the results of data analysis.

The study found that respondents' gender, age, study year, and study mode had an impact on students' perceptions of e-learning systems. This is demonstrated by the following:

1. Female respondents were more favorable to E-learning systems than Male.
2. Respondents aged 18-27 had the best perceptions of E-learning systems.
3. The more advanced the college student, the more favorably he or she viewed the e-learning system.
4. Full-time students were more favorable to E-learning systems than part-time students.

Also, this project has examined the relationship between some of the factors that influence the E-learning systems and demographic information. The following are the conclusions reached:

1. Female respondents had more experience with computers than male respondents.
2. Females were more self-directed learners than males in E-learning systems.
3. Full-time students had more experience with computers than part-time students.
4. Students in the upper grades were able to learn more consciously and actively in the E-learning system than those in the lower grades.

Finally, the study found that there is also a correlation between the different factors affecting the E-learning system. Here are the conclusions:

1. There was a strong positive correlation between students' experience of computers and autonomy factors.
2. There was a strong positive correlation between autonomy factors and problem-solving factors.
3. There was a strong positive correlation between problem-solving factors and teacher factors.

These are all the conclusions drawn from this project. This information is very useful for organizations or individuals who want to use E-learning systems to aid teaching and learning. This is because they can use this information to optimize the e-learning system and the way it is used to get the most out of the e-learning system.

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