



UNIVERSITY OF WALES

TRINITY SAINT DAVID

MASTER OF BUSINESS ADMINISTRATION

Assignment Title :

**Effectiveness of Virtual Learning during COVID-19 pandemic
(Dissertation)**

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Date : 18 October 2021

Declaration/Statements page

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Abstract

Purpose: The purpose of this paper to investigate how the virtual learning effectiveness are influenced by computer self-efficacy, learning climate, learning satisfaction, and learning challenges.

Methodology / Approach: Quantitative and qualitative approach both adopted in this study. The primary data collection was gathered 5 participants and 165 valid data for focus group and online survey respectively. The collected data are tested by SPSS.

Findings: The result revealed that computer self-efficacy, learning climate and learning satisfaction have positive influence on learning effectiveness except learning challenges. Learning satisfaction and computer self-efficacy have the strong coefficient (r) and learning climate with moderate positive correlation to learning effectiveness.

Originality / Value: This study is to investigate how the virtual learning effectiveness are influenced by computer self-efficacy, learning climate, learning satisfaction, and learning challenges. It can provide comprehensive analysis of the effectiveness of virtual learning for government, commercial institutions, education institutions, internet service providers, lecturers, parents, learners, researchers and marketers.

Managerial Implications: It suggested to provide better environment and enhance digital device to facilitate the virtual learning virtual learning for government, commercial institutions, education institutions, internet service providers, lecturers, parents, learners, researchers and marketers.

Limitations and Further Research: The additional factors can be added to get an in-depth analysis of type of learning effectiveness, provide learning from lecturers to students

Keywords: virtual learning, online learning, computer self-efficacy, learning climate, learning satisfaction, and learning challenges, learning effectiveness

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Chapter 1 Introduction

The world has seen significant changes in the panorama of education the ever-expanding effect of technology since the 1990s. One such development is the adoption of online learning across different learning contexts, whether formal or informal, academic and non-academic, and residential or remotely. We began to witness schools, teachers, and students increasingly adopt e-learning technologies that allow teachers to deliver instruction interactively, share resources seamlessly, and facilitate student collaboration and interaction (Elaish et al., 2019; Garcia et al., 2018). Although the efficacy of online learning has long been acknowledged by the education community (Barrot, 2020, 2021; Cavanaugh et al., 2009; Kebritchi et al., 2017; Tallent-Runnels et al., 2006; Wallace, 2003), evidence on the challenges in its implementation continues to build up (e.g., Boelens et al., 2017; Rasheed et al., 2020).

Recently, the education system has faced an unprecedented health crisis (i.e., COVID-19 pandemic) that has shaken up its foundation. Thus, various governments across the globe have launched a crisis response to mitigate the adverse impact of the pandemic on education. This response includes, but is not limited to, curriculum revisions, provision for technological resources and infrastructure, shifts in the academic calendar, and policies on instructional delivery and assessment. Inevitably, these developments compelled educational institutions to migrate to full online learning until face-to-face instruction is allowed. The current circumstance is unique as it could aggravate the challenges experienced during online learning due to restrictions in movement and health protocols (Gonzales et al., 2020; Kapasia et al., 2020). Given today's uncertainties, it is vital to gain a nuanced understanding of students' online learning experience in times of the COVID-19 pandemic. To date, many studies have investigated this area with a focus on students' mental health (Copeland et al., 2021; Fawaz et al., 2021), home learning (Suryaman et al., 2020), self-regulation (Carter et al., 2020), virtual learning environment (Almaiah et al., 2020; Hew et al., 2020; Tang et al., 2020), and students' overall learning experience (e.g., Adarkwah, 2021; Day et al., 2021; Khalil et al., 2020; Singh et al., 2020). There are two key differences that set the current study apart from the previous studies. First, it sheds light on the direct impact of the pandemic on the challenges that students experience in an online learning space. Second, the current study explores students' coping

strategies in this new learning setup. Addressing these areas would shed light on the extent of challenges that students experience in a full online learning space, particularly within the context of the pandemic. Meanwhile, our nuanced understanding of the strategies that students use to overcome their challenges would provide relevant information to school administrators and teachers to better support the online learning needs of students. This information would also be critical in revisiting the typology of strategies in an online learning environment.

1.1 Background of the Study

The COVID-19 pandemic spotted us unexpectedly. Last year, educational institutions around the world required to implement rapid adjustments to continue to operate while maintaining social distancing. This has created about a major change in our teaching and learning procedures. However, today the world is still responding to COVID-19 step by step, allowing us to see the prevailing impact of new trends, redefining education and transforming our traditional attitude towards education.

Virtual learning has developed an online information system and a crucial education instrument as technological evolution and widespread utilization of the Internet. (Keller C & Cernerud L., 2002)

1.2 Research Motivation

With the emerging trend in digital technology, there is a dearth of studies on how to ameliorate the problems of teaching and learning among the students/learners in Hong Kong with the use of digital technology. The restriction of movements and social distancing imposed by the COVID-19 pandemic have exposed this weakness in the education system of Hong Kong. With uncertainty surrounding the return to the pre-COVID-19 normal, it is becoming increasingly difficult to impart knowledge on the students/ learners, especially those preparing for their exit examinations. This, therefore, calls for an innovative approach with the utilisation of digital technologies to engage the students in teaching and learning. Virtual learning platform has a way to filling this gap in instructional delivery, as it will directly expose the students to the use of online learning to engage them in the teaching and learning process during the period at their respective places.

1.3 Value of the Study

- 1.3.1 Investigate and analyze the current learning behaviors of learners in virtual learning environment (VLE) to understand the status of learners using virtual learning mechanisms and make a summary discussion of their usage.
- 1.3.2 Understand the learners' self-perceived learning effectiveness in virtual learning environment, including their computer self-efficacy, learning climate, learning satisfaction, and learning challenges, to overall evaluate the learning effectiveness of learners using the virtual learning mechanism.
- 1.3.3 Targeting the systematic macro-level to understand those factors distract learners to engage in virtual learning; develop solutions to improve learners' incentives and motivations for virtual learning; and propose improvements to deepen and develop for future virtual learning mechanisms.

1.4 Research Aim

This study aims to determine to know the "Effectiveness of Virtual Learning during COVID-19 pandemic " is to explore the learners at various studying stages from children to adulthood, and how background and various factors influence their effectiveness through longitudinal stratified research. This plan defines virtual learning effectiveness as encompassing computer self-efficacy, learning climate, learning satisfaction, and learning challenges.

1.5 Research Objectives

According to the Hong Kong's researchers to assess the impact of the COVID-19 on students and office workers around the world during February to June 2020. The survey found that only 27% of Hong Kong university students are satisfied with online learning (e-learning was adopted when it first broke out in Hong Kong in early-February 2020). And 60% of the respondents said that online learning is not as effective as classroom teaching. Therefore, if the organizations aim to improve online learning and work efficiency and user satisfaction, they must improve and optimize them. (Lingnan, 2020)

Our life has undergone tremendous changes due to social distancing restrictions under the COVID-19 epidemic, no matter where we are or whether we are a student or an office worker. Most people rely on their laptop to study and work at home, and communicate with instructors, learners, and co-workers through online. The purpose of this study to assess how many people are satisfied and effectiveness with the arrangement of studying online during COVID-19 epidemic.

According to the above research purposes, the questions that this research aims to understand that:

- 1.5.1 Investigate and analyze the current learning behaviors of learners in virtual learning environment (VLE) to understand the status of learners using virtual learning mechanisms and make a summary discussion of their usage.
- 1.5.2 Understand the learners' self-perceived learning effectiveness in virtual learning environment, including their computer self-efficacy, learning climate, learning satisfaction, and learning challenges, to overall evaluate the learning effectiveness of learners using the virtual learning mechanism.
- 1.5.3 Targeting the systematic macro-level to understand those factors distract learners to engage in virtual learning; develop solutions to improve learners' incentives and motivations for virtual learning; and propose improvements to deepen and develop for future virtual learning mechanisms.

In this study, the target audience will be the learners who have participated virtual learning courses during the COVID-19 epidemic to diminish the data gathered and develop the correctness of the research. Firstly, the theoretical basis and requirements of this study are literature review on the principally for the study of the research aspects including computer self-efficacy, learning climate, learning satisfaction, and learning challenges and learning effectiveness. Secondly, this research will establish a focus group to gather their opinions and evaluations on the research through interviews before assembling of this research questionnaires together with pilot test and comprehensive survey through online. Finally, the SPSS instrument to test reliability and validity of the measurements.

1.6 Research Direction

To summarize chapter one, this study could be based on the aims and objectives of research to investigate computer self-efficacy, learning climate, learning satisfaction, and learning challenges and evaluate the learning effectiveness of learners using the virtual learning mechanism.

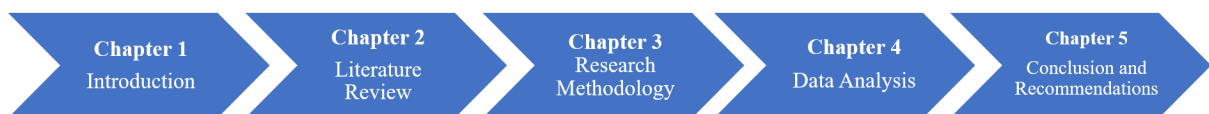


Figure 1.4: Research Direction

Source: From this research

1.7 Background Limitations

There is lack of focus on the research between students and learners' learning experience and aspects such as academic, business or interesting class, etc. Hence, the research principally

presents the effectiveness of virtual learning during COVID-19 pandemic in Hong Kong.

Chapter 2 Literature Review

In December 2019, an outbreak of a novel coronavirus, known as COVID-19, occurred in China and has spread rapidly across the globe within a few months. COVID-19 is an infectious disease caused by a new strain of coronavirus that attacks the respiratory system (World Health Organization, 2020). As of January 2021, COVID-19 has infected 94 million people and has caused 2 million deaths in 191 countries and territories (John Hopkins University, 2021). This pandemic has created a massive disruption of the educational systems, affecting over 1.5 billion students. It has forced the government to cancel national examinations and the schools to temporarily close, cease face-to-face instruction, and strictly observe physical distancing. These events have sparked the digital transformation of higher education and challenged its ability to respond promptly and effectively. Schools adopted relevant technologies, prepared learning and staff resources, set systems and infrastructure, established new teaching protocols, and adjusted their curricula. However, the transition was smooth for some schools but rough for others, particularly those from developing countries with limited infrastructure (Pham & Nguyen, 2020; Simbulan, 2020).

Inevitably, schools and other learning spaces were forced to migrate to full online learning as the world continues the battle to control the vicious spread of the virus. Online learning refers to a learning environment that uses the Internet and other technological devices and tools for synchronous and asynchronous instructional delivery and management of academic programs (Usher & Barak, 2020; Huang, 2019). Synchronous online learning involves real-time interactions between the teacher and the students, while asynchronous online learning occurs without a strict schedule for different students (Singh & Thurman, 2019). Within the context of the COVID-19 pandemic, online learning has taken the status of interim remote teaching that serves as a response to an exigency. However, the migration to a new learning space has faced several major concerns relating to policy, pedagogy, logistics, socioeconomic factors, technology, and psychosocial factors (Donitsa-Schmidt & Ramot, 2020; Khalil et al., 2020; Varea & González-Calvo, 2020). With reference to policies, government education agencies and schools scrambled to create fool-proof policies on governance structure, teacher management, and student management. Teachers, who were used to conventional teaching delivery, were also obliged to embrace technology despite their lack of technological literacy. To address this problem, online learning webinars and peer support systems were launched. On the part of the students, dropout rates increased due to economic, psychological, and academic reasons. Academically, although it is virtually possible for students to learn anything online,

learning may perhaps be less than optimal, especially in courses that require face-to-face contact and direct interactions (Franchi, 2020).

Recently, there has been an explosion of studies relating to the new normal in education. While many focused on national policies, professional development, and curriculum, others zeroed in on the specific learning experience of students during the pandemic. Among these are Copeland et al. (2021) and Fawaz et al. (2021) who examined the impact of COVID-19 on college students' mental health and their coping mechanisms. Copeland et al. (2021) reported that the pandemic adversely affected students' behavioral and emotional functioning, particularly attention and externalizing problems (i.e., mood and wellness behavior), which were caused by isolation, economic/health effects, and uncertainties. In Fawaz et al.'s (2021) study, students raised their concerns on learning and evaluation methods, overwhelming task load, technical difficulties, and confinement. To cope with these problems, students actively dealt with the situation by seeking help from their teachers and relatives and engaging in recreational activities. These active-oriented coping mechanisms of students were aligned with Carter et al.'s (2020), who explored students' self-regulation strategies.

In another study, Tang et al. (2020) examined the efficacy of different online teaching modes among engineering students. Using a questionnaire, the results revealed that students were dissatisfied with online learning in general, particularly in the aspect of communication and question-and-answer modes. Nonetheless, the combined model of online teaching with flipped classrooms improved students' attention, academic performance, and course evaluation. A parallel study was undertaken by Hew et al. (2020), who transformed conventional flipped classrooms into fully online flipped classes through a cloud-based video conferencing app. Their findings suggested that these two types of learning environments were equally effective. They also offered ways on how to effectively adopt videoconferencing-assisted online flipped classrooms. Unlike the two studies, Suryaman et al. (2020) looked into how learning occurred at home during the pandemic. Their findings showed that students faced many obstacles in a home learning environment, such as lack of mastery of technology, high Internet cost, and limited interaction/socialization between and among students. In a related study, Kapasia et al. (2020) investigated how lockdown impacts students' learning performance. Their findings revealed that the lockdown made significant disruptions in students' learning experience. The students also reported some challenges that they faced during their online classes. These include anxiety, depression, poor Internet service, and unfavorable home learning environment, which were aggravated when students are marginalized and from remote areas. Contrary to Kapasia et al.'s (2020) findings, Gonzales et al. (2020) found that confinement of students during the

pandemic had significant positive effects on their performance. They attributed these results to students' continuous use of learning strategies which, in turn, improved their learning efficiency.

Finally, there are those that focused on students' overall online learning experience during the COVID-19 pandemic. One such study was that of Singh et al. (2020), who examined students' experience during the COVID-19 pandemic using a quantitative descriptive approach. Their findings indicated that students appreciated the use of online learning during the pandemic. However, half of them believed that the traditional classroom setting was more effective than the online learning platform. Methodologically, the researchers acknowledge that the quantitative nature of their study restricts a deeper interpretation of the findings. Unlike the above study, Khalil et al. (2020) qualitatively explored the efficacy of synchronized online learning in a medical school in Saudi Arabia. The results indicated that students generally perceive synchronous online learning positively, particularly in terms of time management and efficacy. However, they also reported technical (internet connectivity and poor utility of tools), methodological (content delivery), and behavioral (individual personality) challenges. Their findings also highlighted the failure of the online learning environment to address the needs of courses that require hands-on practice despite efforts to adopt virtual laboratories. In a parallel study, Adarkwah (2021) examined students' online learning experience during the pandemic using a narrative inquiry approach. The findings indicated that Ghanaian students considered online learning as ineffective due to several challenges that they encountered. Among these were lack of social interaction among students, poor communication, lack of ICT resources, and poor learning outcomes. More recently, Day et al. (2021) examined the immediate impact of COVID-19 on students' learning experience. Evidence from six institutions across three countries revealed some positive experiences and pre-existing inequities. Among the reported challenges are lack of appropriate devices, poor learning space at home, stress among students, and lack of fieldwork and access to laboratories.

Although there are few studies that report the online learning challenges that higher education students experience during the pandemic, limited information is available regarding the specific strategies that they use to overcome them. It is in this context that the current study was undertaken. This mixed-methods study investigates students' online learning experience in higher education. Specifically, the following research questions are addressed: (1) What is the extent of challenges that students experience in an online learning environment? (2) How did the COVID-19 pandemic impact the online learning challenges that students experience? (3) What strategies did students use to overcome the challenges?

This study will investigate the virtual learning usage elements of learner and relevant literature on virtual learning effectiveness, computer self-efficacy (Marakas et al., 2004), learning climate (Evers, 2012), learning challenge (Olutola and Olatoye, 2015) directly influence learner's satisfaction. (DeLone and McLean, 2003)

2.1 Computer Self-efficacy

2.1.1 Definition

The literature related to computer self-efficacy related to the usage of computers to perform specific work-related tasks as computer self-efficacy: "The judgment of a person's ability to operate a computer. It does not concern about what a person has achieved in the past, but a judgment about what a person can achieve in the future" (Compeau and Higgins, 1995, p. 192). Computer self-efficacy individuals' judgment of their capabilities to use computers in diverse situations (Marakas et al., 2004)

To evaluate and investigate the computer self-efficacy of instructors and learners in the virtual learning environment is the significance of this research on expansion of current computer self-efficacy literature by using modernized instruments.

2.1.2 Measurement

This study discusses the role of individuals' beliefs about their abilities to competently use computers (computer self-efficacy) in the determination of computer use. A survey of virtual learners was conducted to develop and validate a measure of computer self-efficacy and to assess both its impacts and antecedents. Computer self-efficacy was found to exert a significant influence on individuals' expectations of the outcomes of using computers, their emotional reactions to computers (affect and anxiety), as well as their actual computer use. An individual's self-efficacy and outcome expectations were found to be positively influenced by the encouragement of others in their work group, as well as others' use of computers. Thus, self-efficacy represents an important individual trait, which moderates organizational influences (such as encouragement and support) on an individual's decision to use computers. Understanding self-efficacy, then, is important to the successful implementation of systems in organizations. The existence of a reliable and valid measure of self-efficacy makes assessment possible and should have implications for organizational support, training, and implementation.

2.2 Learning Climate

2.2.1 Definition

Constructive learning climate fosters and accelerates the discussion of opinions and knowledge within the organization, thereby boosting learning satisfaction (Prieto and Revilla, 2006) whatever working or learning (Hopson and Lawson, 2011) and instructors or learners (Evers, 2012).

2.1.2 Measurement

To evaluate and investigate the learning climate and environment which impact on the effectiveness of the virtual learning.

Student wellbeing relies on positive, trusted and supportive environments, basic material needs being met, good mental, social, emotional and physical health, learning, participation and a positive sense of culture and identity. A whole-school approach to health and wellbeing is integral to positive student engagement, learning, growth, relationships and achievement.

Positive relationships between learners and tutors can help students feel connected and engaged in their learning. Maintaining relationships with tutors and students, and teaching social and emotional skills, helps students to make informed decisions, build resilience and actively participate in decisions about their learning.

2.3 Learning Satisfaction

2.3.1 Definition

Learners' values construct a socio-emotional support, and a cohesive and positive VLE with small group (Brophy, 1999; Jucks, Paechter, & Tatar, 2003). Learners' engagement in teamwork, their motivation to participate in VLE and learning satisfaction are also based on mutual support (Concannon, Flynn, & Campbell, 2005). Learners have their preferences time, venue, and the regulation of learning processes (Narciss, Proske, & Körndle, 2007). Learners' motivation affected by the crucial trait of self-regulation (Pintrich, 2000).

Learning satisfaction is an emotional variable, it can influence on learners determine to continue or terminate of a course. (Chiu, Hsu, Sun, Lin, & Sun, 2005; Levy, 2007).

2.3.2 Measurement

To evaluate and investigate the learning satisfaction which influence on the effectiveness of the virtual learning.

Learner satisfaction is aggregate feelings or affective responses to distinguishable factors while interacting with the e-learning system. Learn more in: Evaluating Learner Satisfaction in a Multiplatform E-Learning System.

The only way to find out if your learners are satisfied with your training is to ask them. You can create a simple post-course satisfaction survey using a variety of free online survey-creation tools. These tools allow you to quickly create simple surveys and receive the results via email.

The present paper discusses the elaboration -based on factors identified in the researched literature- and the first steps in the validation process of *students' learning satisfaction questionnaire (SLSQ)*. A sample of 80 students, ages ranging from 25 to 57, participated in this initial phase of the research. The developed instrument consists of 4 items grading on a five-points Likert scale the level of satisfaction that students feel regarding different aspects of learning. Data processing consisted in factor analysis for validation and the calculation of the Cronbach's alpha coefficient for establishing reliability.

2.4 Learning Challenges

2.4.1 Definition

Magnitude factors effect on learning challenges, “technical factors are IT infrastructure (Cantoni et al., 2004; Sarrab, 2013), human factors (including IT skills, instructors and learners’ awareness) (Bhuasiri et al., 2012; Kasse and Balunywa, 2013; Sangrà Et al., 2012), institutional factors (poor institutional conditions, lack of policy consistency with e-learning activities, etc.) (Ansong et al., 2017; Dadzie, 2009), teaching factors (Cantoni et al., 2004), system design challenges affecting IT interactivity and instructional design (Ansong et al., 2017; Bhuasiri et al., 2012; Kasse and Balunywa, 2013 ; Olutola & Olatoye, 2015). To promote the adoption and dissemination of virtual learning, policy makers must minimize the impact of these challenges on organisation.”

2.4.2 Measurement

To evaluate and investigate the learning challenge which influence on the effectiveness of the virtual learning.

2.5 Learning Effectiveness

2.5.1 Definition

Assessing the effectiveness of virtual learning is critical. The primary objective of this evaluation is to determine the effectiveness or appropriateness of a virtual learning system, given a particular educational goal”” (Wild et al., 2002; Shim et al., 2007). Significant studies have evaluated various measures of e-learning effectiveness (Roffe, 2002; Mhod et al., 2004; Marks et al., 2005).

However, these technical rational views also oversee the influence of "human subjectivity" (Kant, 1999) on the results of online education learning when virtual learning is performed. It is extremely straightforward to fall into excessive "techno-romantic" (Coyne, 1999), leading to the lack of critical perspective. Suppose the various limitations of different educational contexts on virtual learning (Benyon & Mackay, 1989, p. 305).

2.5.2 Measurement

In related studies in the field of online learning, the constructivist-oriented (Cady et al., 2006) learning theory gives learners more power to actively participate in the learning process (e.g., Richter et al., 2013; Wang & Odell, 2002)., respects learners' subjectivity, and takes care of the subject of human subjectivity in the learning process.

2.6 Associations of Factors of Learning Effectiveness

In the virtual learning space, the instructor's model of curriculum philosophy centered on the learner, or the instructor will lead to different curriculum design models, and students will also have very different learning results.

In addition, the interaction of students with various factors in the online virtual learning space also affects their online learning to varying degrees, adding to the complexity and unpredictability of virtual learning results. Therefore, technological tools are not the only factor that determines or affects students' learning outcomes. The “human” factor challenges the assumption that “as long as technological tools or platforms are upgraded; learners’ learning effectiveness can be improved”.

The technical rational thinking mode emphasizes the effective instillation of existing knowledge. In the learning process, the subjectivity of students is not valued. Teaching and learning are both a technology. In a strong goal-oriented curriculum, students have critical thinking ability (Jhurani and Demkowicz, 2012). The training of students will not be their concern. Although students may indeed learn all subject knowledge and content under training, it cannot help students become individuals who can think and develop independently to meet the challenges of the future world.

In this research, hypotheses are formulated and tested with computer self-efficacy, learning climate, learning satisfaction and learning challenge.

H1: Computer self-efficacy has a significant positive impact on learning effectiveness.

H2: Learning climate has a significant positive impact on learning effectiveness.

H3: Learning satisfaction has a significant positive impact on learning effectiveness.

H4: Learning challenge has a significant positive impact on learning effectiveness.

Chapter 3 Research Methodology

This research implements an empirical study approach. Based on literature discussion and theoretical construction questions are transformed into research questions and factors for instance independent and dependent variables are identified sequentially. Design a questionnaire and categorize the responses of the sample before conducting quantitative research and analysis. The questionnaire sample towards the research question and its factual condition to provide normative recommendations from descriptive awareness and cognitive application.

In this chapter, it will explain the research methods to define the scope of research; the principles of questionnaire design and its scoring; describe the sampling and its results of questionnaire.

3.1 Research Methods

This chapter presents the research design, population and sample of this study, research method, data collection procedures and statistical analysis of data.

3.1.1 Research Model

In this study, the assumptions could be reviewed to define the possibility of the research framework for “computer self-efficacy (Marakas et al., 2004), learning climate (Evers, 2012), learning challenge (Olutola and Olatoye, 2015), learning satisfaction. (DeLone and McLean, 2003) and the effectiveness of virtual learning during COVID-19.

Therefore, the following hypotheses are proposed and the figure 3.1 shown the research of this study.

H1: Computer self-efficacy has a significant positive impact on learning effectiveness.

H2: Learning climate has a significant positive impact on learning effectiveness.

H3: Learning satisfaction has a significant positive impact on learning effectiveness.

H4: Learning challenge has a significant positive impact on learning effectiveness.

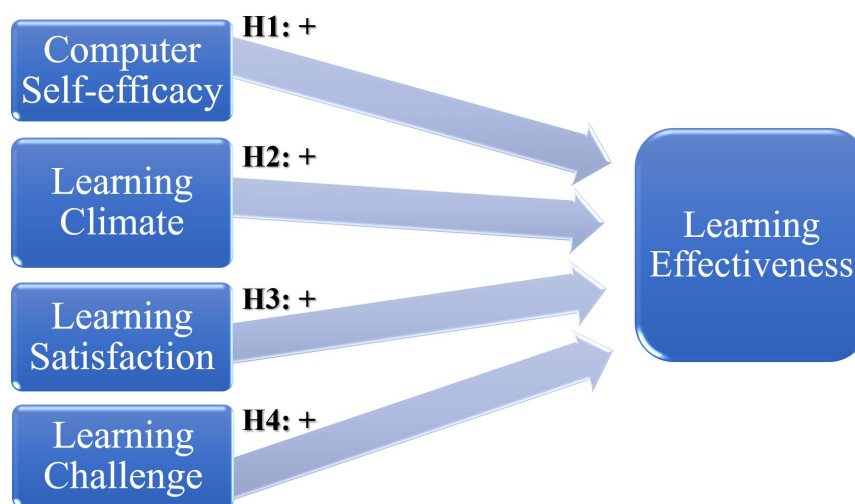


Figure 3.1: Research Model

Source: From this research

3.1.2 Research Methods Approach

This research both used a quantitative approach and qualitative approach. For quantitative approach, it is utilized to test the hypothesis and theories. It is also driven by a numerical depiction of observations to assess phenomena, the elaborated phenomena should be quantifiable and measurable (Bahrish and Kim, 2012). Indispensable condition in the quantitative approach is to ensure a maximum of objectivity for high levels of validity and reliability (Tonelli and Zambaldi, 2018). For qualitative approach allows for higher levels of complexity and focuses on exploring ideas and formulating hypothesis (Waldrop, 1992). It seeks to analyze verbal discourse through interviews for data collection and analysis (Carroll and Rothe, 2010).

3.2 Data Collection

In this study, both secondary and primary data will be gathered. Rabianski (2003) claimed that primary data is collected.

3.2.1 Secondary Data

Secondary Research depends on both of quantitative and qualitative secondary data collected from previously researchers' literature review, journals, textbooks, articles, government publications and online resources. Data is easily accessible, save time and inexpensive but insufficient information and different format. To recognize three aspects of virtual learning and

its effectiveness. (Fachienelli, et al, 2015) Synthesize relevant information to identify the value of virtual learning, evaluate its influencing factors and design the structure of virtual learning mechanism and the questionnaire that impact of the effectiveness of virtual learning.

3.2.2 Primary Data

Primary research adopts online survey to collect data directly in specific issue with qualified sample or focus group to collect data from a small group directly. (Dilshad and Latif, 2013) Structured questionnaires have a good mix or open or close ended questions by 5-Liket scale (Duffy, et al. 2012) based on the considerate influence on effectiveness of virtual learning after literature review. (Nugraha and Putra, 2015) The online questionnaire is compiled by using Google Form, an online questionnaire design software widely used by researchers, to create and distribute online questionnaires, collect, and analyze data related to effectiveness of virtual learning. (Novak, Hoffman and Yung, 1999). It is straightforward to access an online survey and gather data. The system can also collect data completely from the respondents.

The primary data collection procedures are as below (Figure 3.2):



Figure 3.2: Primary Data Collection Procedure

Source: From this research

i. Focus Group

Focus group is utilized because it helps to spawn theories about virtual learning experience and effectiveness. Braun and Clarke (2006) claimed that it is associated with identifying, examining, and delineating patterns across datasets that are important in explicating a phenomenon. Consequently, the focus group conducted with 5 participants to in-depth dip out their experience of virtual learning in this study. It was held on 28 August 2021 via face-to-face meeting with 3 females and 2 males were invited and persuaded to express beliefs spontaneously as it normally consist of 5 to 10 participants (Stalmeijer et al., 2014). The discussion focus on which factors would impact the effectiveness of virtual learning through computer self-efficacy, learning climate, learning satisfaction, learning challenge (Appendix B).

ii. Questionnaire Design

Dawes (2008) claimed that Likert scale analysis is one of the most common used, it is utilized to gather information on a range of phenomenon. Armstrong (1987) indicated that the 5-point Likert scale surveys have found a wide range of applications in different areas of business and marketing. It's an essential tool for measuring people's opinions on various business developments, conducting market research, or working on new marketing strategies. The 5-point Likert scale offers two positive, two negative, and one neutral attitude towards the statement in question.

As a reliable source of easily quantifiable data, Likert scales have found its place in all kinds of statistical calculations. After gathering data using a Likert survey, statisticians can use different kinds of t-tests to analyze the answers to Likert scale based questions and come up with different kinds of complex statistical data. Whatever the field of study, Likert scale surveys can be used to measure a wide range of sentiments and opinions, including agreement, value, relevance, likelihood, satisfaction, quality, importance, and more.

Table 3.1: Questionnaire design

Questions	Question Category	Factors	Types Data	Variables	Researcher
Section 1 Q1-4	Target Question (Cooper and Schindler, 2003)	Computer self-efficacy	5-point Likert Scale (Sandlowski, 2004)	Independent (Fetisov, 2017)	Compeau and Higgins (1995) Marakas et al. (2004)
Section 2 Q1-4		Learning climate			Hopson and Lawson (2011) Evers (2012)
Section 3 Q1-4		Learning satisfaction			Keller (1983) Del Barrio, Romero-Frias and Arquero (2013)
Section 4 Q1-4		Learning challenges			Dadzie (2009) Olutola and Olatoye (2015)
Section 5 Q1-4		Learning effectiveness		Dependent (Fetisov, 2017)	Viswanath et al. (2012) Somayeg et al. (2016)
Section 6 Q1-4	Classification Question (Metzier & Croft, 2005)	Personal information	Categorical Data (Sloane and Morgan, 1996)		Kwahk & Kim (2017)
Section 7 Q1-2		Personal experience			Mohamed at al. (2018)

Source: From this research

iii. Pilot Test

A pilot study is a small-scale experimental to evaluate feasibility and areas of improvement before implementation of full-scale research project.

A pilot test showed the construct to be both reliable and valid while providing the opportunity to insert refinements to the research tool (Dikko, 2016). Teijingen and Hundley (2001) pointed out that the pilot test is defined as a trial run conducted in preparation of a full-scale research and may be conducted specifically to pre-test a research instrument. It is useful in both qualitative and quantitative research (Tashakkori & Teddie, 2003). The pilot test conducted 25 It is suggested a minimum sample size of 12 subjects for the pilot test (Julious, 2005). The pilot test conducted with 30 sample size in this study (Appendix C).

The sample online surveys were conducted on 14 to 17 August 2021. To access a deeper understanding of the effectiveness of virtual learning and collect valuable opinions. After the deletion of 4 sample data, Cronbach's Alpha is 0.886 as analyzing data for 26 sample size by SPSS. In respond of feedbacks that the online survey would fine tune some wording to enhance the reliability (Table 3.2).

Table 3.2: Reliability Test of Pilot Test Survey's Questionnaire

Factors	Pilot Questionnaire Design (Data collection: 14 to 17 Aug 2021) ¹		Amendment of Questionnaire Design (Data collection: 19 Aug 2021) ²		Reason of Amendment
	Cronbach's Alpha	Number of questions	Cronbach's Alpha	After deleted the number of questions	
Computer self-efficacy	0.818	4	0.886	-	-
Learning climate	0.394	4	0.707	-	-
Learning satisfaction	0.830	4	0.885	-	-
Learning challenges	0.024	4	0.720	-	-
Learning effectiveness	0.590	4	0.741	-	-
Total	0.859	20	0.938	18	

¹1st Sample size for Pilot Test: 20 (conducted on 18 August 2021)

²2nd Sample size for Pilot Test: 30 but deleted 4 invalid data, final data: 26 (conducted on 24 August 2021)

Source: From this research

Source: From this research

3.3 Final Survey

The final questionnaire was conducted online via Google survey by using a 5-point Likert scale from 10 to 18 September 2021, it took approximately 5 minutes to complete the questionnaire. The data analysis was conducted by using SPSS on 19 September 2021.

Both the questionnaire and the FGD were conducted online via Google survey and MS Teams, respectively. It took approximately 8 minutes to complete the questionnaire. Online surveys was used because of the ongoing lockdown in the city. The interviewer ensured that the participants were comfortable and open to talk freely during the FGD to avoid social desirability biases (Bergen & Labonté, 2020). These were done by informing the participants that there are no wrong responses and that their identity and responses would be handled with the utmost confidentiality. With the permission of the participants, the FGD was recorded to ensure that all relevant information was accurately captured for transcription and analysis.

The present study adopted a descriptive, mixed-methods approach to address the research questions. This approach allowed the researchers to collect complex data about students' experience in an online learning environment and to clearly understand the phenomena from their perspective.

This study involved 165 (78 male and 87 female) learners in Hong Kong. These participants were student, employed, self-employed, unemployed, retired whose ages ranged from 25 to 56 or above. The learners have been engaged in online learning for at least one time. The students belonged to varies education background from certificate or below to doctorate level but were equipped with the basic online learning equipment and computer skills necessary for their participation in virtual learning classes.

Informed consent was sought from the participants prior to their involvement. Before students signed the informed consent form, they were oriented about the objectives of the study and the extent of their involvement. They were also briefed about the confidentiality of information, their anonymity, and their right to refuse to participate in the investigation. Finally, the participants were informed that they would incur no additional cost from their participation.

The data were collected using a retrospective self-report questionnaire and a focused group discussion (FGD). A self-report questionnaire was considered appropriate because the

indicators relate to affective responses and attitude (Araujo et al., 2017; Barrot, 2016; Spector, 1994). Although the participants may tell more than what they know or do in a self-report survey (Matsumoto, 1994), this challenge was addressed by explaining to them in detail each of the indicators and using methodological triangulation through FGD. The questionnaire was divided into two sections: (1) the rating scale section for the computer self-efficacy, learning climate, learning satisfaction, learning challenges and learning effectiveness, (2) participant's personal information section and the background information on the virtual learners' experience. The personal information section asked about the students' personal information (gender, age, education level and employment status), while the background information section explored the online learning mode and devices used (multiple selection) in class and learners' length of engagement in online classes. Researcher reviewed the questionnaire for transparency, correctness, and substance and appearance legitimacy. The piloting of the instrument revealed that the tool had good internal consistency (Cronbach's $\alpha = 0.938$).

The FGD protocol contains two major sections: the participants' main questions and background information. The items in the *main questions section* covered questions relating to the students' overall attitude toward online learning during the pandemic, the reasons for the scores they assigned to each of the challenges they experienced, the impact of the pandemic on students' challenges, and the strategies they employed to address the challenges. The same experts identified above validated the FGD protocol. The *background information section* asked about the gender, age, educational level, employment status, internet access device and learning hours per week.

Both the questionnaire and the FGD were conducted online via Google survey and MS Teams, respectively. It took approximately 5-10 minutes to complete the questionnaire. Online surveys was used because of the unpredictable lockdown in the city. The interviewer ensured that the participants were comfortable and open to talk freely during the FGD to avoid social desirability biases (Bergen & Labonté, 2020). These were done by informing the participants that there are no wrong responses and that their identity and responses would be handled with the ultimate confidentiality. With the permission of the participants, the FGD was recorded to ensure that all relevant information was accurately captured for transcription and analysis.

3.3.1 Target population

The definition of the population includes the geographic area (country, region, town, etc.)

covered by the population and the age and gender. It is also important to specify the exclusion of any population group, such as certain ethnic groups, non-citizens or those who cannot speak a particular national language (Brinkhof, et al., 2016).

The study was related to virtual learning during COVID-19 pandemic. In Hong Kong, the lifelong learning is a norm, hence, the learners age group covers from young students to retirees.

Table 3.3: The current Hong Kong population demographics in 2020

https://www.censtatd.gov.hk/en/web_table.html?id=1A

Source: Census and Statistics Department (2021)

3.3.2 Sample size

The determination of sample size is the act of selecting the number of observations or replicates to include in the statistical sample. The sample size is an important feature of any empirical study whose goal is to infer the population from the sample. In practice, the sample size used in the study is based on the cost of data collection and the need for adequate statistical power. There may be several different sample sizes involved in a complex study (Suresh and Chandrashekara, 2012).

Before calculation a sample size, it is required to determine a few things about the target population and the sample such as population size, margin of error (confidence interval), confidence level and standard of derivation. The most common confidence intervals are 95% confident.

The tolerated level of error is not over 10% (Rumsey, 2011). Hence, 95% confidence level and 7% tolerated level of error (Table 3.4) and the result of equation reveals that the minimum 155 sample size should be collected (Appendix E). The 155 respondents are conducted by online survey.

Table 3.4: The calculation of sample size

Equation: $n = (Z/e)^2 pq$	For the calculation	
	Z	1.96 confidence level 95%
	e	7.0% a tolerated level of sampling error
	p	0.27 successful rate; from pilot test
	q	0.73 failure rate

Source: Charan and Biswas (2013)

3.3.3 Sampling Method

Common sampling methods include simple random sampling (complete random sampling from the population), systematic sampling (regular population demographics and periodic selection), stratified sampling (dividing the population into different categories and randomly selecting from within each category), Matching random samples (dividing the population into two groups according to the criteria and then randomly assigning them to the group), panel sampling (applying the same test to randomly selected groups over time) or judgement sampling and so on (Acharya, et al., 2013). Since this study does not require a sampling frame, it is done in the form of judgment sampling, so this study will apply judgment sampling.

Judgment sampling is a method of statistical and quantitative studies of non-randomly selected people. When the investigators are very familiar with their field of study and have a better understanding of the survey, this sampling method can be used to obtain highly representative samples.

Since it took only about 1 month to set up a research question, study the background of the virtual learning and set up focus group discussion.

With the formal questionnaire collected and analyzed, sorted out, further discussions and amendments with the tutor, etc., it takes about two months to arrange. Therefore, the time for arranging the formal questionnaire cannot be more than one and a half months. Therefore, “judging sampling” is the most suitable method on this study.

3.4 Analysis Technique(s)

Data analysis techniques enable researchers to view the data collected and infer or determine from the information. Most techniques focus on the application of quantitative techniques to review the data.

After collecting the questionnaire data in this study, invalid questionnaires were deleted, and then the valid questionnaires collected were scored and the data were processed with SPSS for windows 12.0 statistical package software. Data analysis in this study includes Descriptive statistics, Reliability test, Factors' analysis, Correlation analysis and Multiple liner regression (MLR) Test.

i. Descriptive Statistics

Descriptive statistics are the type of information presented in fewer words to explain the fundamental characteristics of data in the research such as the mean and standard deviation (SD), the relevant factors are computer self-efficacy, learning climate, learning satisfaction, learning challenges and learning effectiveness and the number of frequency of demographics. It summarizes a set of observations to interface the enormous information in simply way (Mishra et al., 2019).

ii. Reliability Test

Reliability test is the degree to which values are consistent through any continual test. Hajjar (2018) indicated that correlations are excellent (more than or equal to 0.9); high (0.8) and acceptable (0.7). Overall, the reliability statistics is excellent in 0.918 (Table 3.5)

Table 3.5: Acceptability of Reliability Test

0.9	Excellent reliability
0.8	High reliability
0.7	Acceptable reliability

Source: Hajjar (2018)

Case Processing Summary

		N	%
Cases	Valid	165	100.0
	Excluded ^a	0	.0
	Total	165	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's	
Alpha	N of Items
.918	18

Computer Self-efficacy

Reliability Statistics

Cronbach's	
Alpha	N of Items
.817	4

Learning Climate

Reliability Statistics

Cronbach's	
Alpha	N of Items
.730	3

Learning Satisfaction

Reliability Statistics

Cronbach's	
Alpha	N of Items
.906	4

Learning Challenges

Reliability Statistics

Cronbach's	
Alpha	N of Items
.707	3

Learning Effectiveness

Reliability Statistics

Cronbach's	
Alpha	N of Items
.879	4

Source: Hajjar (2018)

iii. Factor Analysis

Factor analysis is a tool that is utilized to minimize many variables into fewer number of factors (Hadi et al., 2016). Kaiser-Meyer-Olkin (KMO) test also can be used, it is a statistic that indicates the proportion of variance in the variables that may be caused by underlying factors (Kaiser & Rice, 1974). Kaiser (1974) claimed that high values (nearly to 1.0) shows that a factor analysis may be useful with the data; the low value (lower than 0.50), the results of the factor analysis is useless (Table 3.6). To examine the important factors for computer self-efficacy, learning climate, learning satisfaction, learning challenges and learning effectiveness if eigenvalues are greater than 1 with the percentage of explained variance.

Table 3.6: Total Variance explained

Value of KMO	Indication
0.9	Marvelous
0.8	Meritorious
0.7	Middling
0.6	Mediocre
0.5	Miserable
Lower than 0.5	Unacceptable

Source: Kaiser (1974)

iv. Correlation Test

Correlation coefficient formulas are utilized to figure out how strong a relationship is between data. Shieh (2006) pointed out that the value of the correlation coefficient of close to -1 shows a strong negative relationship, close to 1 shows a strong positive relationship and a result of zero shows no relationship at all. Also, it will be utilized the guide that Evans (1996) recommended for the absolute value of r (Table 3.7). To test the relationship between computer self-efficacy, learning climate, learning satisfaction, learning challenges on learning effectiveness.

Table 3.7: The absolute value of r

The absolute value of r	Indication
0.80-1.00	Very strong
0.60-0.79	Strong

0.40-0.59	Moderate
0.20-0.39	Weak
0.00-0.19	Very weak

Source: Evans (1996)

v. Multiple Linear Regression (MLR) Test

MLR test is a statistical tool that uses several explanatory variables to forecast the result of a response variable. Aiken and West (1991) indicated that purpose of MLR is to model the linear relationship between the explanatory (independent) variables and response (dependent) variables. The R^2 measure is the most utilized measure of error and goodness of fit for linear models. The estimation of R^2 indicates how much variation in the response is explained by the model which lies somewhere around 0.0 and 1.0. The higher of R^2 means the better model fits the data and stronger relationship between the variables (Novin, 1992). The variance inflation factor (VIF) is one of the most common conventional collinearity diagnostic techniques, VIF greater 1 and less than 10 which means variables are correlated to each other and do not have multicollinearity problem (Liao & Valliant, 2021).

A population model for a multiple linear regression model is written as following:

$$y_i = \beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_p x_{ip} + \epsilon$$

Where, for $i = n$ observations:

y_i = Dependent variable

a_i = Explanatory values

β_0 = A constant term

β_p = Slope coefficients for each explanatory variable

ϵ = The model's error term

Figure 3.8: Formula of Multiple Linear Regression Equation

Source: Friedrich (1982)

Implementing the formular of this study case:

Learning effective (y_i) = a_i + β_1 Computer Self-efficacy + β_2 Learning Climate + β_3 Learning satisfaction + β_4 Learning challenges

3.5 Ethical of Study

Systematic sampling is tremendously suitable for the researchers to establish, conduct, analyze samples to minizine risk of data exploitation in research.

Effectively collect questionnaires through the procedures of file creation, error detection and analysis of the SPSS statistical package software.

3.6 Research Limitations

Anticipated the limitations of this research study related to lack of secondary data as certain

data is threshold and inadequate; quality primary data collection is very challenging during COVID-19 pandemic and time constraints to conduct simultaneously with other learning activities. (Creswell, 2002)

Chapter 4 Data Analysis

To address the research questions, we used both quantitative and qualitative analyses. For the quantitative analysis, we entered all the data into an excel spreadsheet. Then, we computed the mean scores (M) and standard deviations (SD) to determine the level of challenges experienced by students during online learning. The mean score for each descriptor was interpreted using the following scheme. The equal interval was adopted because it produces more reliable and valid information than other types of scales (Cicchetti et al., 2006).

For the qualitative data, we analyzed the students' responses in the open-ended questions and the transcribed FGD using the predetermined categories in the conceptual framework. Specifically, we used multilevel coding in classifying the codes from the transcripts (Birks & Mills, 2011). To do this, we identified the relevant codes from the responses of the participants and categorized these codes based on the similarities or relatedness of their properties and dimensions. Then, we performed a constant comparative and progressive analysis of cases to allow the initially identified subcategories to emerge and take shape. To ensure the reliability of the analysis, two coders independently analyzed the qualitative data. Both coders familiarize themselves with the purpose, research questions, research method, and codes and coding scheme of the study. They also had a calibration session and discussed ways on how they could consistently analyze the qualitative data. Percent of agreement between the two coders was 86 percent. Any disagreements in the analysis were discussed by the coders until an agreement was achieved.

This study investigated students' online learning experience in higher education within the context of the pandemic. Specifically, we identified the extent of challenges that students experienced, how the COVID-19 pandemic impacted their online learning experience, and the strategies that they used to confront these challenges.

4.1 Descriptive Statistics

In this Chapter, primary data collection is summarized. The quantitative data gathered with the focus group discussion and online survey.

4.1.1 Focus Group Discussion

The 5 invited respondents all have virtual learning experience. Respondents would use multi-devices to explore internet.

4.1.2 Final Survey

An online survey was conducted to investigate the

Table 4.1: Response Rates by Date

>>>

Source: From this research

Table 4.2: Summary of Demographic Information of 165 Sample Respondents

		Survey Method			Cumulative Percent
		Frequency	Percent	Valid Percent	
Valid	Face-to-face	26	15.8	15.8	15.8
	Online Survey	139	84.2	84.2	100.0
	Total	165	100.0	100.0	

Source: From this research

4.1.3 Demographic Information of Respondents

The purpose is to describe the demographic information of the respondents, as well as the responses relating to the gender, age, occupation, access device mainly use, time spend on online learning per week.

4.1.3.1 Gender

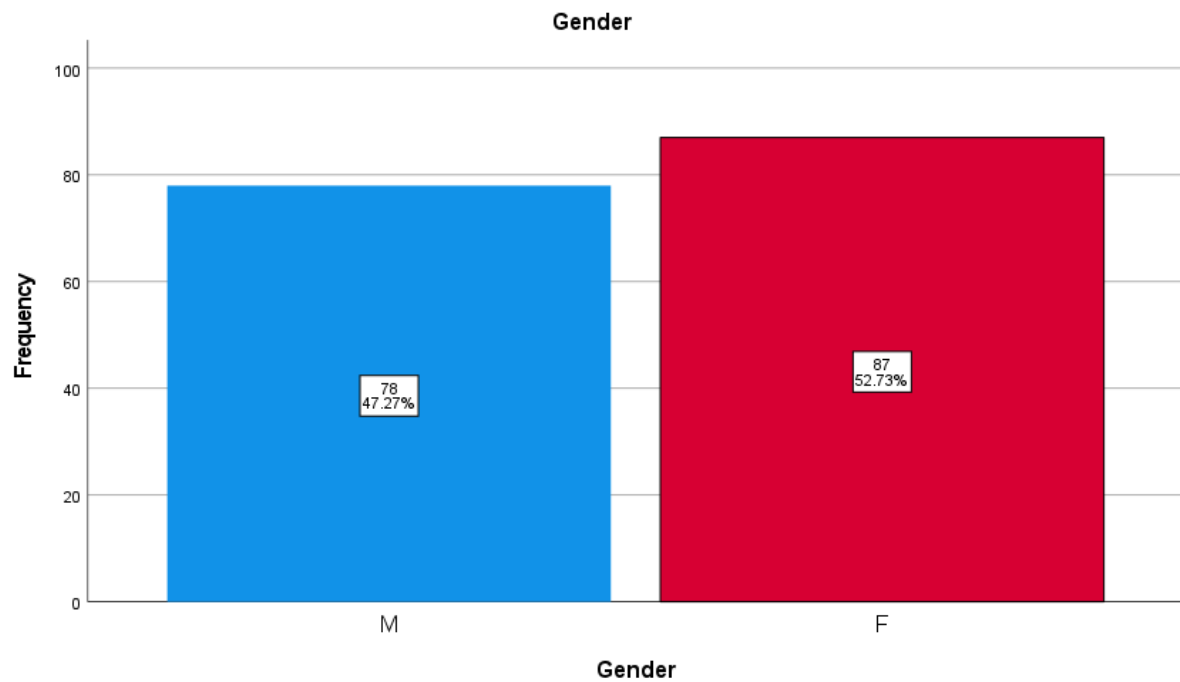


Figure 4.1: Bar Chart of Respondents' Gender

Source: From this research

Figure 4.1 shows that 78 respondents (47.27%) are male, and 87 respondents (52.73%) are female, which are distributed 165 samples. The result reveals that female is more likely to enroll the virtual learning. Nowadays, the population of female online learners with a slightly increase, compares to the level of male learners and internet usage has become more popular among females (Bae & Lee, 2011). The number of female online learners is expected to increase, because of the online learning environment is experiencing an amazing process. (Raman, 2019).

4.1.3.2 Age

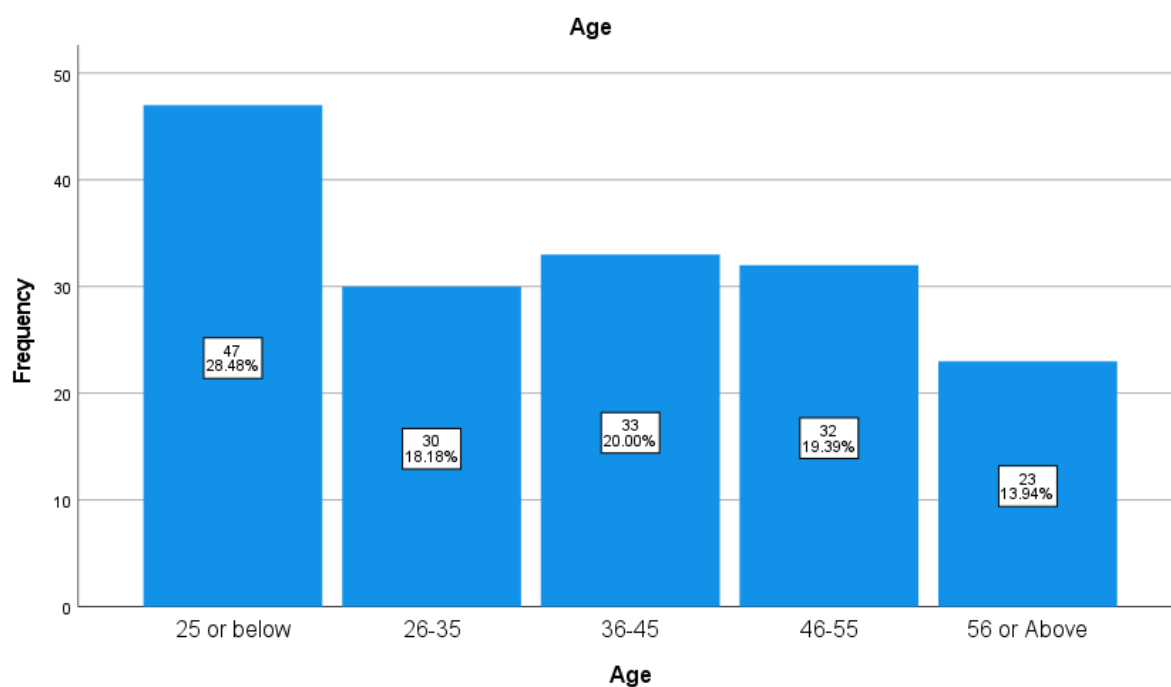


Figure 4.2: Bar Chart of Respondents' Age

Source: From this research

Figure 4.2 illustrates the distribution of five age groups amongst the 165 respondents. The majority respondents are the group aged 25 or below which 47 respondents (28.48%). Additional three groups are almost 60% which consists of aged 36-45 with 33 respondents (20%); aged 46-55 with 32 respondents (19.39%) and aged 26-35 with 30 respondents (18.18%). The minority 23 respondents are the group aged 56 or above.

Ke & Kwak (2013) emphasized the increased use of the network for education has extended the range of the learner population from a homogenous profile of 'out of high school' learners for the age of 18 years is gradually more intergenerational (Ke & Kwak, 2013).

4.1.3.3 Education Level

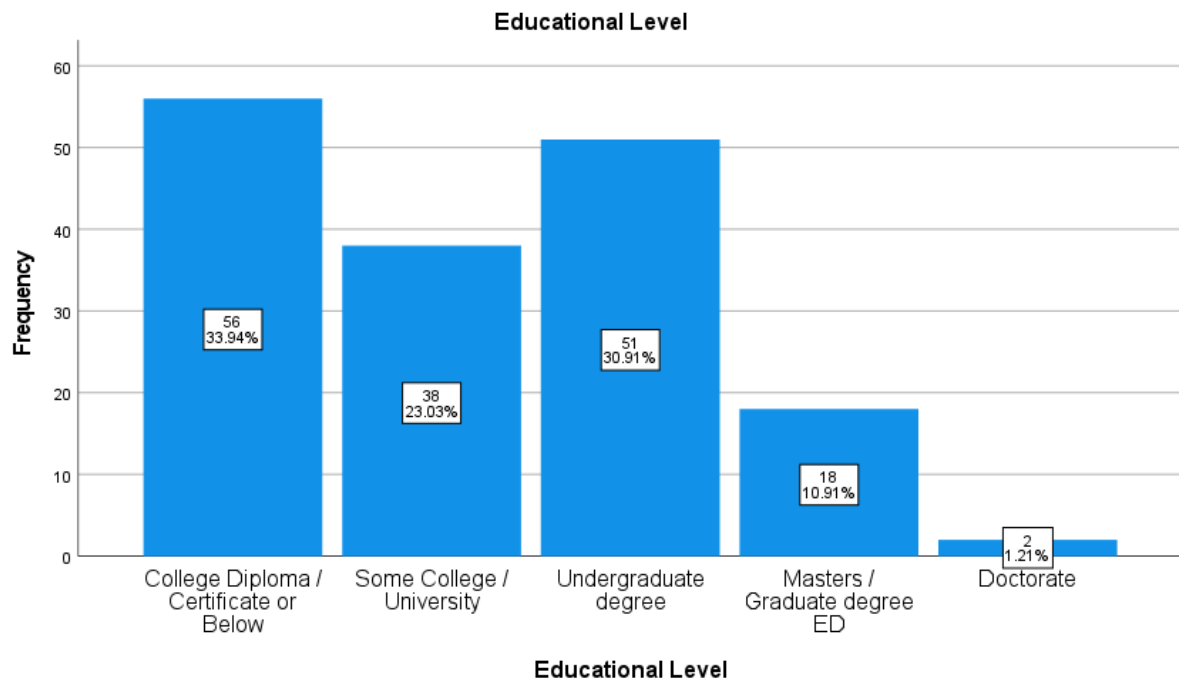


Figure 4.3: Bar Chart of Respondents' Education Level

Source: From this research

Figure 4.3 illustrates the categorization of educational level, 56 (33.94%) were college diploma/certificate or below and undergraduate degree students, 51 (30.91%) were undergraduate degree students, 38 (23.03%) were some college/ university students, 18 (10.91%) were masters/graduate degree students, while the remaining 2 (1.21%) were doctorate students.

4.1.3.4 Employment Status

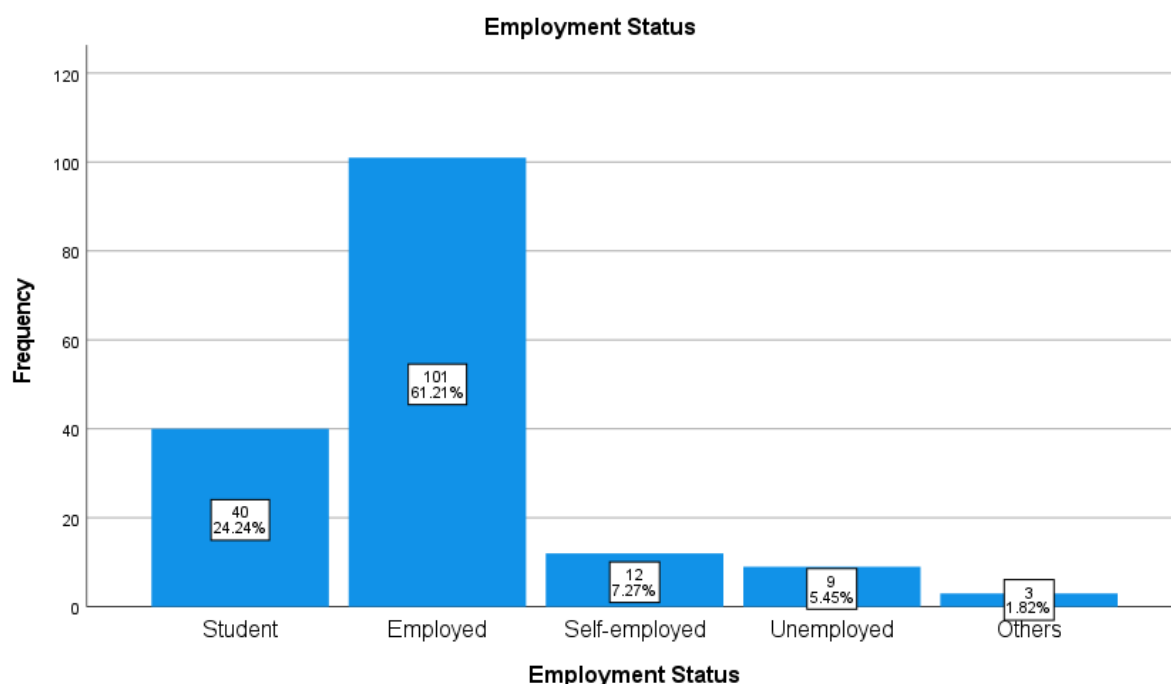


Figure 4.4: Bar Chart of Respondents' Employment Status

Source: From this research

Figure 4.4 shows the distribution of employment status between 165 respondents, 101 (62.21%) were employed, 40 (24.24%) were student, 12 (7.27%) were self-employed, 9 (5.45%) were unemployed and 3 (1.82%) were retired. Hamburg (2005) indicated that employees were significantly growth rate of online learning.

4.1.3.5 Multi Digital Device for Access the Internet

Table 4.3 revealed that among those respondents used their digital devices for virtual learning, two third of smartphone (33.45%) and laptops (32%) are the main type of digital devices that are subsequently used to explore the internet purposes. One third of desktop computer (18.55%) and Tablet PC such as iPads and TouchPads (16%) are much less frequently (Table 4.3). The Communications Trust (2020) revealed that a quarter of respondents were preferred to use laptops than table PC.

Table 4.3: Respondents' Multi Digital Device for Access the Internet

Devices to Explore the Internet	Repeat one or more selected devices	%
---------------------------------	-------------------------------------	---

Desktop computer	51	18.55
Laptop	88	32
Tablet PC	44	16
Smartphone	92	33.45
Total	275	100

Source: From this research

4.1.3.6 Time Spend on Online Learning per Week

Table 4.4 revealed that among those respondents' time spent on online learning per week, two third of less than or equal to 5 hours (37.6%) and 6-10 hours (33.3%) on online learning per week. One third of spent time of 11-15 hours (13.9%), 16-20 hours (7.9%) and greater than or equal to 21 hours (7.3%). A recent statistic found that the average duration of daily mobile internet usage among internet users amounted to 3 hours and 45 minutes. (Johnson, 2021) which is significantly different from the respondents of time spend on online learning.

Table 4.4: Respondents' Device for Time Spend on Online Learning per Week

Estimated number of hours for online learning per week					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than or equal to 5 hours	62	37.6	37.6	37.6
	6-10 hours	55	33.3	33.3	70.9
	11-15 hours	23	13.9	13.9	84.8
	16-20 hours	13	7.9	7.9	92.7
	greater than or equal to 21 hours	12	7.3	7.3	100.0
	Total	165	100.0	100.0	

Source: From this research

4.1.4 Cross-Tabulation for Learning Effectiveness by Demographic Factors

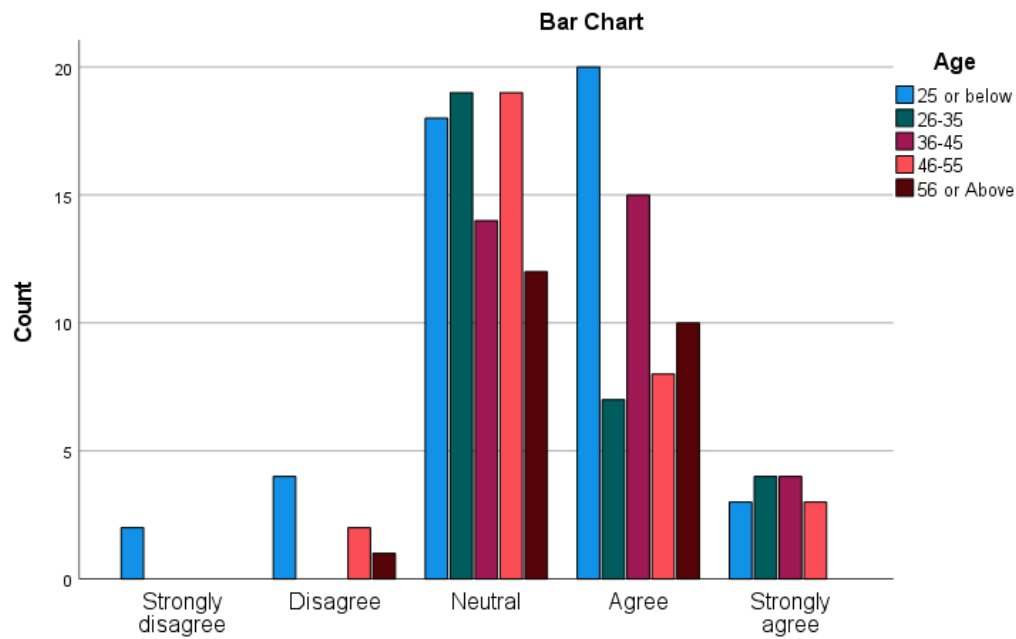
Cross-tabulation is a vital method of investigating associations between factors. The sample is dividend into subgroups to discover how an impact differs from subgroup to subgroup by cross-tabulation (Carroll, 1990). In the previous research, also found that demographic factors influence the effectiveness of virtual learning and have a strong relationship towards the learner's age is a potential predictor of student online learning success. (Knowles, 1989; Wojciechowski & Palmer, 2005).

In this study, cross-tabulation has been conducted to found out if gender has associated with learning

effectiveness which can be applied in the real life.

4.1.4.1 Learning Effectiveness and Age

Figure 4.5 and Table 4.5 reveal that 36.40% agree, 8.5% strongly agree, total 44.9% (74/165) gathered from respondents who are believed that virtual learning learned can be applied in the real life. The current study included 165 respondents with 28.48% between 25 or below years old, 20% between 36 and 45 years old, 19.39% between 46 and 55 years old, 18.18% between 26 and 35 years old and the remaining 23 respondents being over 56 years old. However, 57.6% (19/165) respondents who between 36 and 45 years old were totally agree and agree on learning effectiveness, 49% (23/165) respondents who between 25 or below years old were totally agree and agree on learning effectiveness, 43.5% (10/165) respondents who being 56 or above years old were totally agree and agree on learning effectiveness, 36.6% (11/165) respondents who between 26 and 35 years old were totally agree and agree on learning effectiveness and 34.4% (11/165) respondents who between 26 and 35 years old were totally agree and agree on learning effectiveness. According to the results, the respondents between 36 to 45 years old and 25 or below years old who believe that learners have learned can be applied in the real life as the most learning effectiveness. Butaray and Yukselturk (2015) have also studied if students' demographics, such as age, gender, and computer literacy, could have an impact on performance in an online course.



EF4. What I have learned can be applied in the real life.

Figure 4.5: Bar Chart of Learning Effectiveness: What I have learned can be applied in the real life.

Source: From this research

Table 4.5: Factor for Learning Effectiveness

EF4. What I have learned can be applied in the real life. * Age Crosstabulation

			Age					Total
			25 or below	26-35	36-45	46-55	56 or Above	
EF4. What I have learned can be applied in the real life.	Strongly disagree	Count	2	0	0	0	0	2
		% within Age	4.30%	0.00%	0.00%	0.00%	0.00%	1.20%
	Disagree	Count	4	0	0	2	1	7
		% within Age	8.50%	0.00%	0.00%	6.30%	4.30%	4.20%
	Neutral	Count	18	19	14	19	12	82
		% within Age	38.30%	63.30%	42.40%	59.40%	52.20%	49.70%
	Agree	Count	20	7	15	8	10	60
		% within Age	42.60%	23.30%	45.50%	25.00%	43.50%	36.40%
	Strongly agree	Count	3	4	4	3	0	14
		% within Age	6.40%	13.30%	12.10%	9.40%	0.00%	8.50%
Total		Count	47	30	33	32	23	165

% within Age	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
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Source: From this research

4.1.5 Scatter Plot Matrix

Scatter plot matrix is allows visualizing the relationship between the variables and capturing the structure of association among the variables (Chambers et al., 1976).

In Figure 4.6, x-axis indicates computer self-efficacy, which learners have the confidence to learn online at their own pace, whilst y-axis show that learning effectiveness, learners have learned can be applied in real life. The following appears that those plots are focused on the right top corner, which has the positive correlation to above factors. Most of the respondents reveal that when the learners have the confidence to learn online at their own pace, they have learned can be applied in real life. In contrast, when the learners lack of the confidence to learn online at their own pace, they have learned cannot be applied in real life. (Peng and Wu, 2006)

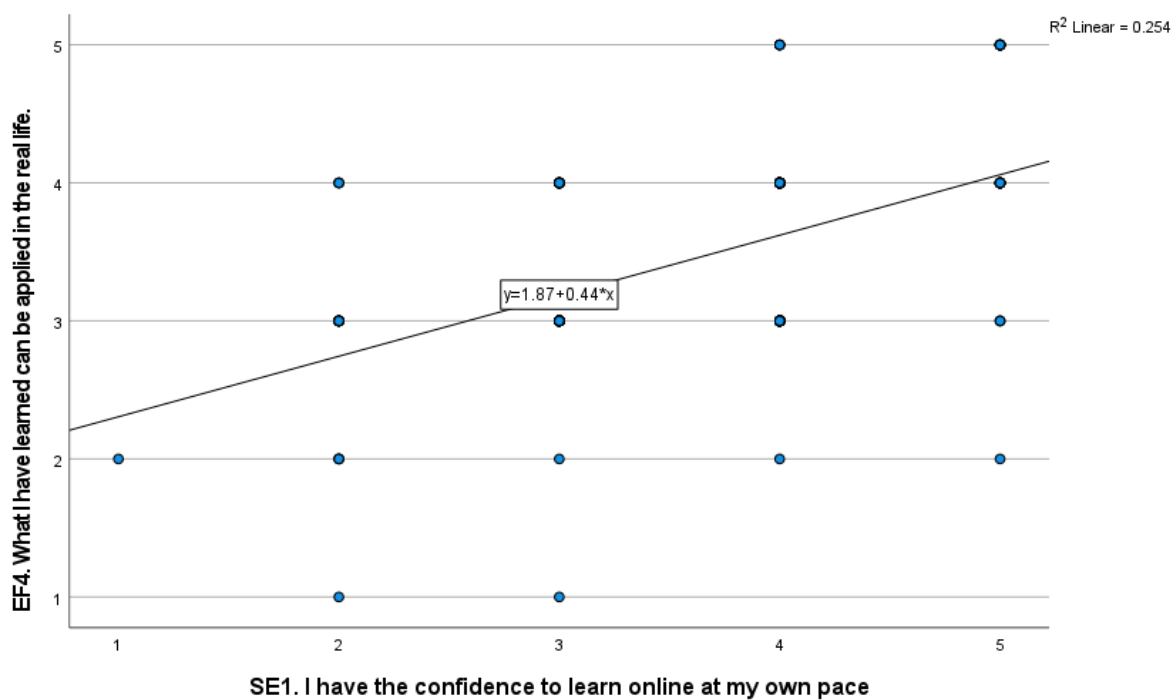


Figure 4.6: Scatter Plot Matrix of Learning Effectiveness and Computer Self-efficacy

Source: From this research

In Figure 4.7, x-axis indicates learning climate, which learners believe this e-learning mode is

less-stressful, whilst y-axis show that learning effectiveness, which learners have learned can be applied in real life. The following appears that those plots are focused on the right top corner, which has the positive correlation to above factors. Most of the respondents reveal that when the learners believe this e-learning mode is less-stressful, they have learned can be applied in real life. In contrast, when the learners believe this e-learning mode is stressful, they have learned cannot be applied in real life. (Morris and Yoon, 2006)

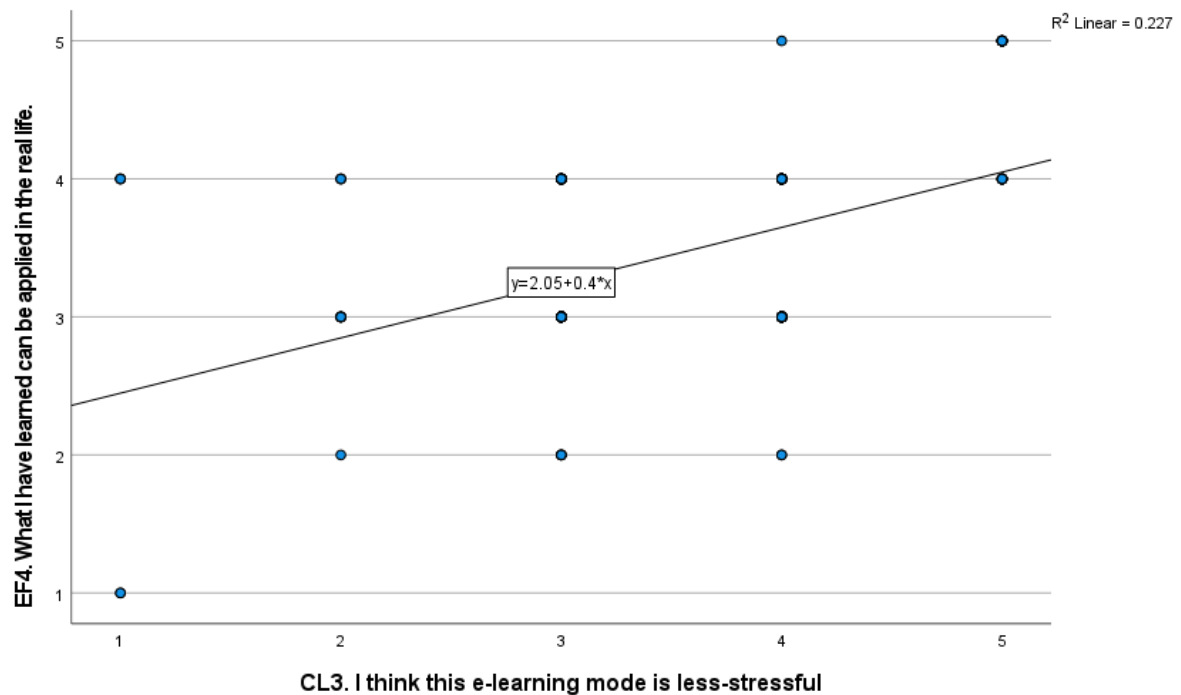


Figure 4.7: Scatter Plot Matrix of Learning Effectiveness and Learning Climate

Source: From this research

In Figure 4.8, x-axis indicates learning satisfaction, which learners satisfied with the e-learning environment, whilst y-axis show that learning effectiveness, which learners have learned can be applied in real life. The following appears that those plots are focused on the right top corner, which has the positive correlation to above factors. Most of the respondents reveal that when the learners satisfied with e-learning environment, they have learned can be applied in real life. In contrast, when the learners unsatisfied with e-learning environment, they have learned cannot be applied in real life. (Kuo and Belland, 2016)

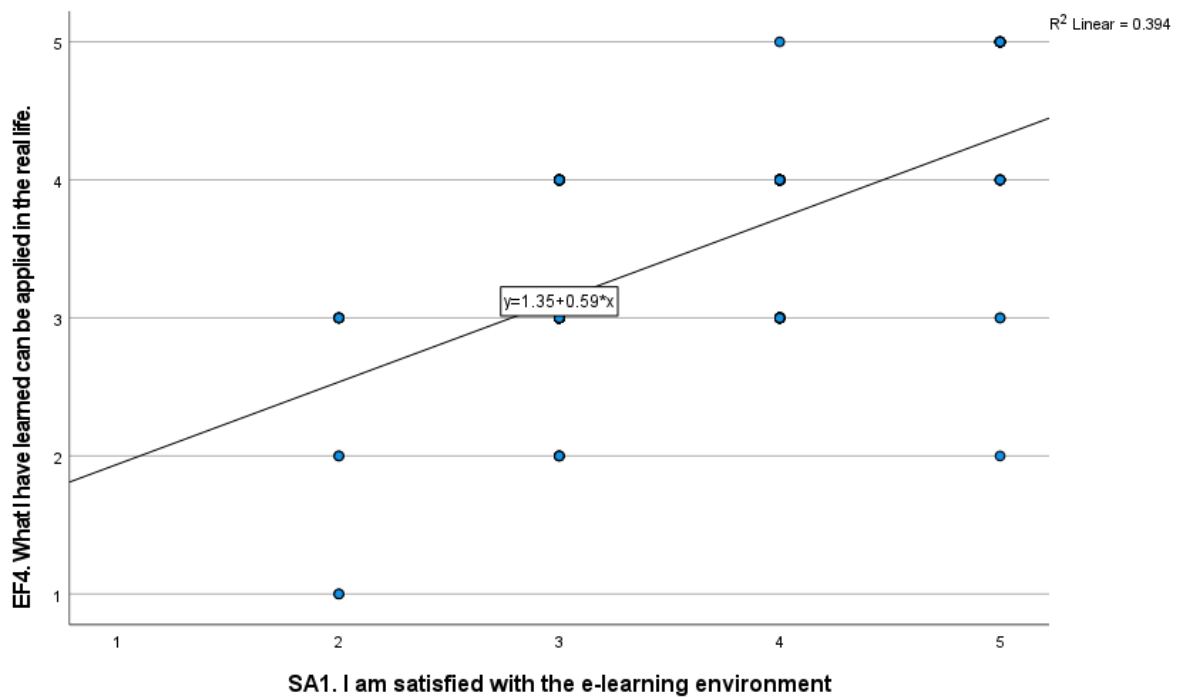


Figure 4.8: Scatter Plot Matrix of Learning Effectiveness and Learning Satisfaction

Source: From this research

In Figure 4.9, x-axis indicates learning challenges, which learners considered several distractions at home, whilst y-axis show that learning effectiveness, which learners have learned can be applied in real life. There is no apparent relationship between the variables. Learners believe several distraction at home and they have learned cannot be applied in real life to have no correlation. (Kuo and Belland, 2016)

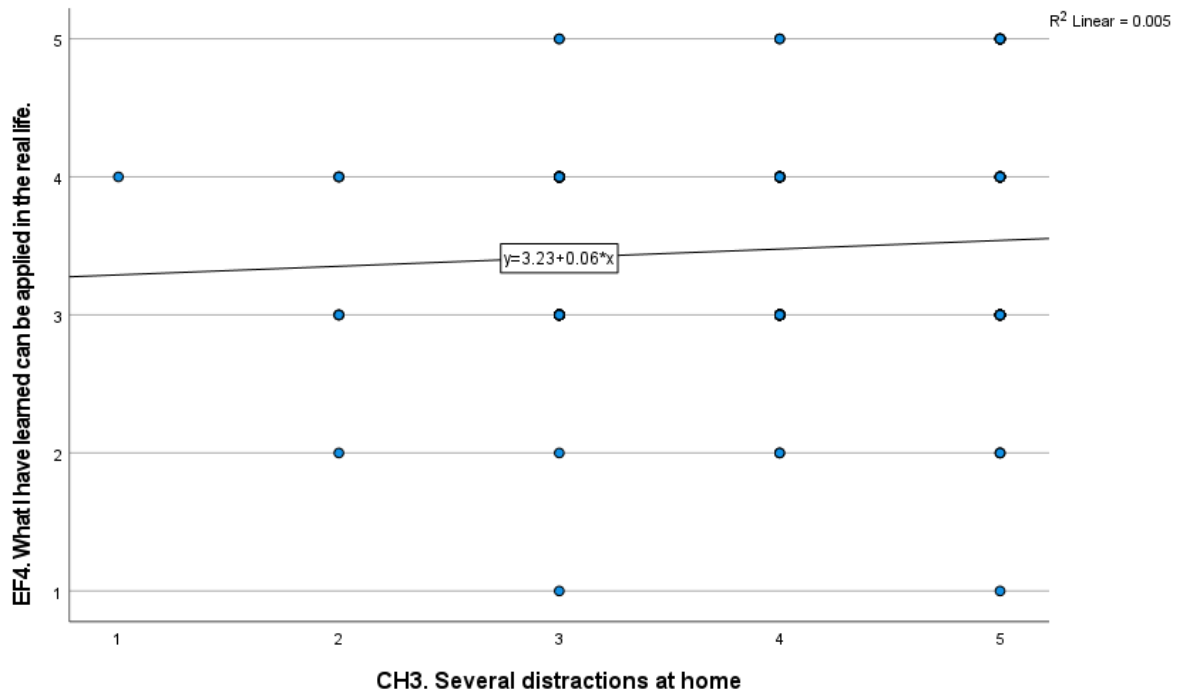


Figure 4.9: Scatter Plot Matrix of Learning Effectiveness and Learning Challenges

Source: From this research

4.1.6 The Highest Means of Each Factor with Standard Deviations

Figure 4.10 reveals the mean scores of each factor on virtual learning effectiveness. Table 4.6 reveals the highest and lowest mean of questions with standard deviations from each factor at virtual learning effectiveness. Learning challenges has the highest mean of 3.83 with standard deviation 0.888. Learning climate has the lowest mean of 3.01 with standard deviation 0.972. The result reveals learning challenges are significant for several distractions at home when virtual learning. In contrast, learning climate is not often communicate and interact with their peers.

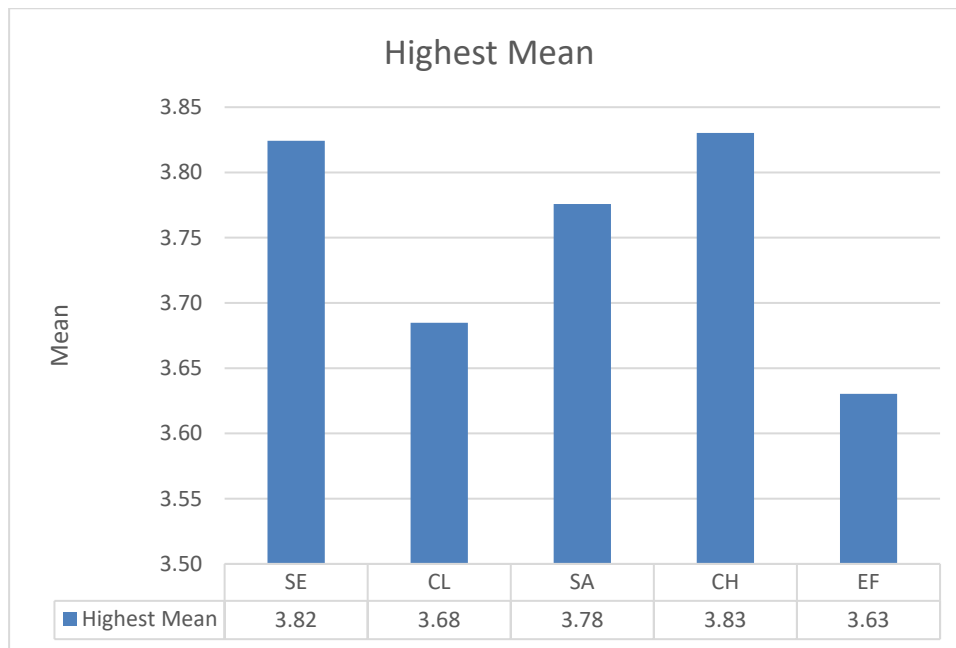


Figure 4.10: The Highest Means of Each Factor

Source: From this research

Table 4.6: The Highest and Lowest Means of Each Factor

	N	Minimum	Maximum	Mean	Std. Deviation
SE4. I think I can use the computer efficiently	165	2	5	3.82	0.826
SE2. I read the course materials repeatedly to sharpen my computer skills	165	2	5	3.48	0.801
CL1. I can ask my lecturer questions that I did not understand	165	2	5	3.68	0.739
CL2. I communicate and interact more with my peers	165	1	5	3.01	0.972
SA2. I am satisfied with the learning flexibility of this course	165	1	5	3.78	0.814
SA4. I would recommend these courses to other friends or colleagues	165	1	5	3.47	0.838
CH3. Several distractions at home	165	1	5	3.83	0.888
CH1. Costly equipments	165	1	5	3.47	0.720
EF3. I am able to summarize what I have learned.	165	2	5	3.63	0.775
EF4. What I have learned can be applied in the real life.	165	1	5	3.47	0.761
Valid N (listwise)	165				

Source: From this research

4.1.7 Reliability Test

For this chapter, inferential statistics are utilized to analyze the sample data and investigate relationships between variables.

Table 4.7 shows the reliability test result of different survey methods. According to Table 3.5, the value of Cronbach's Alpha is more than or equal to 0.9 are excellent reliability and 0.8 is high reliability. Results from face-to-face and online survey of the value of Cronbach's Alpha are 0.947 and 0.915 which are at excellent reliability.

Table 4.8

Table 4.7: Reliability Test by Survey Methods

Survey Method	Cronbach's Alpha	N
Face-to-face	0.947	26
Online Survey	0.915	139
Total	0.918	165

Source: From this research

Table 4.8: Reliability Test Result of Each Factor

Factors	This research	
	Cronbach's Alpha	Items*
Computer self-efficacy	0.817	4
Learning climate	0.730	3
Learning satisfaction	0.906	4
Learning challenges	0.707	3
Learning effectiveness	0.879	4
Total	0.918	18

*Items = No. of Questions

Source: From this research

4.1.8 Factor Analysis

Table 4.9 shows that the result of factor analysis can be utilized as the KMO, the rotation method used varimax with Kaiser normalization and the KMO value is 0.920. It reveals that the result is marvelous (Table 3.6). Field (2000) indicated that the Bartlett's test of p-value is lower than 0.05, it means there is sufficient variance and correlation matrix. The p-value is 0 shows that all variables can be utilized in this analysis.

Table 4.9: Kaiser-Meyer-Olkin Measure of Sampling Adequacy

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.920
Bartlett's Test of Sphericity	Approx. Chi-Square	1858.342
	df	153
	Sig.	<.001

Source: From this research

Table 4.10 and Figure 4.11 shows that the components which eigenvalues are greater than 1 which reveal that the relevant factors are significant (Jeong, 2009). The figure shows that 58.993% of variance is accounted for 5 factors. The eigenvalues of 1 to 4 factors are 8.677 comprising 48.204%. Hence, all factors of this study is critical factors.

Table 4.10: Total Variance Explained

Total Variance Explained				
Component	Factor	Initial Eigenvalues		
		Total	% of Variance	Cumulative %
1	Computer self-efficacy	8.677	48.204	48.204
2	Learning climate			
3	Learning satisfaction			
4	Learning effectiveness			
5	Learning challenges	1.942	10.789	58.993

Extraction Method: Principal Component Analysis.

Source: From this research

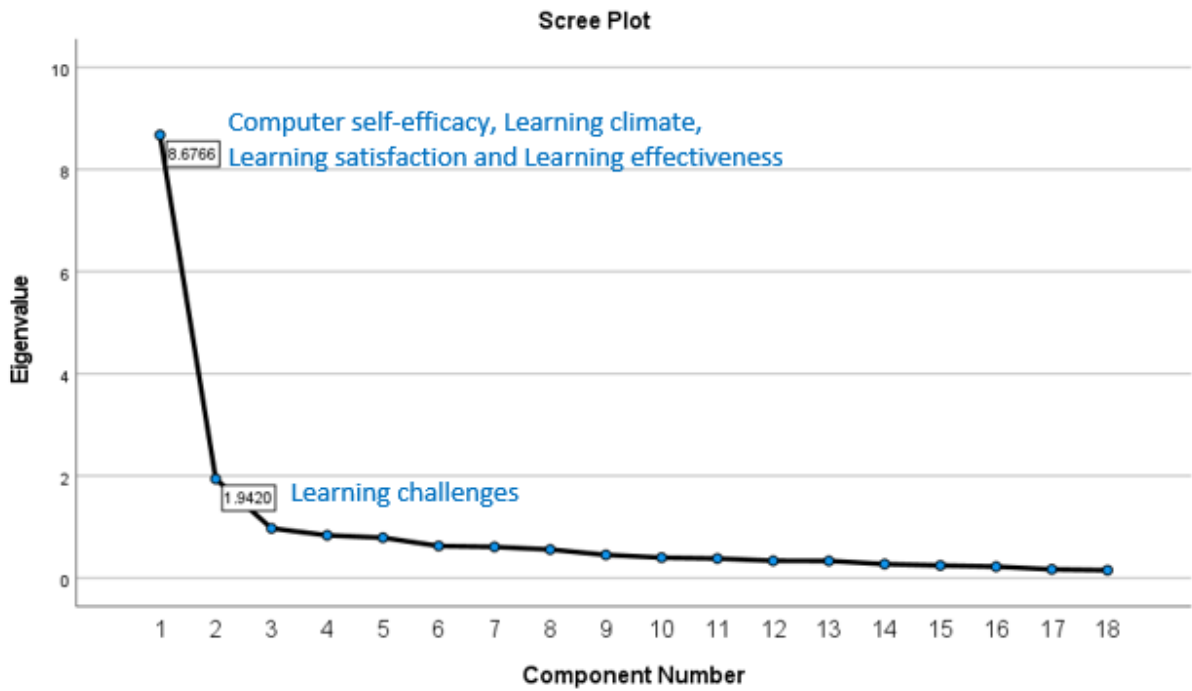


Figure 4.11: Scree Plot for Eigenvalues

Source: From this research

Table 4.11 shows 5 factors generated by the analysis. Factors 1 to 5 represent computer self-efficacy, learning climate, learning satisfaction, learning effectiveness, and learning challenges

Table 4.11: Rotated Component Matrix^a for Factor's Analysis

Rotated Component Matrix ^a		
	Component	
	1	2
SE1. I have the confidence to learn online at my own pace	0.731	
SE2. I read the course materials repeatedly to sharpen my computer skills	0.650	
SE3. I make full use of the Internet to master learning materials	0.765	
SE4. I think I can use the computer efficiently	0.655	
CL1. I can ask my lecturer questions that I did not understand	0.733	
CL2. I communicate and interact more with my peers	0.648	
CL3. I think this e-learning mode is less-stressful	0.718	
SA1. I am satisfied with the e-learning environment	0.801	
SA2. I am satisfied with the learning flexibility of this course	0.765	
SA3. I am satisfied with the overall e-learning outcome	0.885	

SA4. I would recommend these courses to other friends or colleagues	0.837	
EF1. I have learnt to identify the important of a theme/ a subject.	0.799	
EF2. I am very interested and motivated to learn more.	0.773	
EF3. I am able to summarize what I have learned.	0.810	
EF4. What I have learned can be applied in the real life.	0.771	
CH3. Several distractions at home		0.847
CH2. Unstable Internet connection		0.789
CH1. Costly equipments		0.726

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

Source: From this research

4.1.9 Correlation Test for H1 to H4

Figure 4.12 and Table 4.12 summarizes the Pearson correlation coefficient (r) of this study and other researches. The result reveals that learning satisfaction is positive correlated to H3 learning effectiveness, containing the highest $r=0.713$, H1 computer self-efficacy and learning effectiveness ($r=0.625$). According to Table 3.7, the strong positive correlation indicates that the higher level of learning satisfaction and computer self-efficacy impact stimulates the higher level of learning effectiveness. Furthermore, H2 learning climate and learning effectiveness ($r=0.558$) which is the moderate positive correlation. H4 learning challenges reveals that there is no correlation between learning challenges and learning effectiveness.

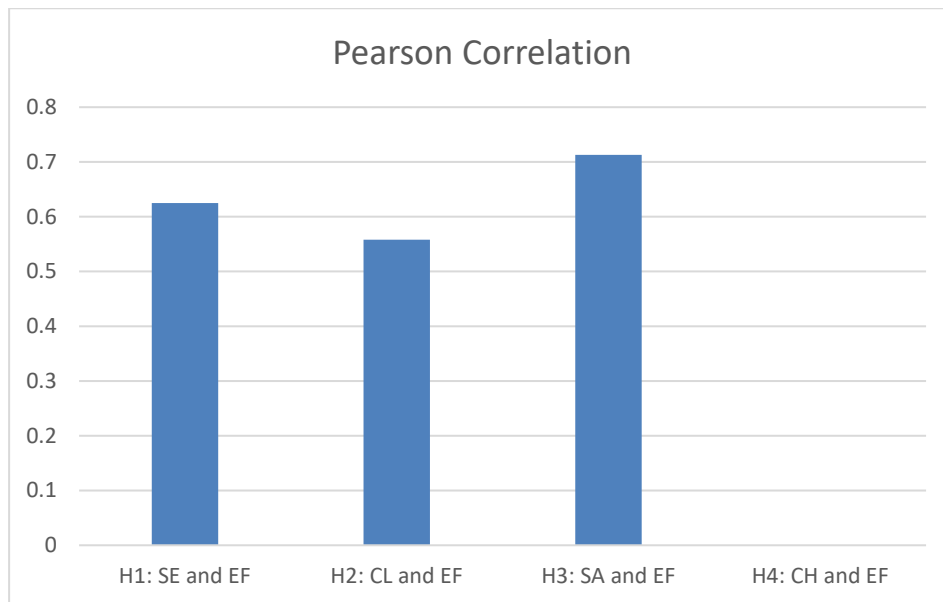


Figure 4.12: Comparison of Pearson Correlation between Variable with Other Research

Source: From this research

Table 4.12: Comparison of Pearson Correlation between Variable with Other Research

	Pearson Correlation	p-value	
H1: SE and EF	0.625**	0.000	Support
H2: CL and EF	0.558**	0.000	Support
H3: SA and EF	0.713**	0.000	Support
H4: CH and EF	-	0.968	Not Support

** correlation is significant at the 0.01 level (2-tailed)

Source: From this research

4.1.10 Regression Model for Learning Effectiveness

In this study, if utilized the multiple liner regression (MLR) test by stepwise, the model 4 is the best result and the p-value $0.001 < 0.05$. The Model Summary R^2 shows 62.2% of the variation in learning effectiveness (Table 4.13) can be explained by learning satisfaction, computer self-efficacy and learning climate for the regression model.

Table 4.13: Model Summary for Regression Model

Model Summary ^e				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
4	.789 ^d	.622	.613	.398

d. Predictors: (Constant), SA4. I would recommend these courses to other friends or colleagues , SE4. I think I can use the computer efficiently , SE3. I make full use of the Internet to master learning materials , CL2. I communicate and interact more with my peers

e. Dependent Variable: EF1. I have learnt to identify the important of a theme/ a subject.

Source: From this research

Refer to ANOVA Table 4.14, the p-value = 0.001 which is lower than 0.05, the corresponding confidence level is 99.9%. H4 is rejected and thus the regression model is concluded to be valid.

Table 4.14: ANOVA^a for Regression Model

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
4	Regression	41.842	4	10.460	65.874	<0.001 ^e
	Residual	25.407	160	.159		
	Total	67.248	164			

a. Dependent Variable: EF1. I have learnt to identify the important of a theme/ a subject.

e. Predictors: (Constant), SA4. I would recommend these courses to other friends or colleagues , SE4. I think I can use the computer efficiently , SE3. I make full use of the Internet to master learning materials , CL2. I communicate and interact more with my peers

Source: From this research

According to Table 4.15 (coefficients table) indicates that p-value = 0.210, 0.388 and 0.136 which is less than 0.05. Hence, H4 is rejected. Hence. Learners would recommended these courses to other friends or colleagues, learners can use the computer efficiently, learners can make full use of the internet to master learning materials and learners communicate and interact more with their peers is the most important factors because of unstandardized coefficients of β value is 0.296, 0.195, 0.184 and 0.090 respectively. Also, the standardized coefficients are positive value, it shows that there is positive relationship between learning satisfaction, computer self-efficacy and learning climate with learning effectiveness. These important factor

at 5% significant level.

In this result, VIF greater than 1 and less than 10 which means do not have multicollinearity problem. The equation for learning effectiveness is as below:

Learning effectiveness = 0.762 + 0.296 learning satisfaction (SA4 – Recommend these courses to others) + 0.195 Computer Self-efficacy (SE4 – Use computer efficiently) + 0.184 Computer Self-efficacy (SE3 – Use of the Internet to master learning materials) + 0.09 learning climate (CL2 – Communicate and interact more with peers)

Table 4.15: Coefficients Table for Regression Model

Coefficients ^a							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
4 (Constant)	.762	.183		4.174	<.001		
SA4. I would recommend these courses to other friends or colleagues	.296	.056	.388	5.277	<.001	.437	2.287
SE4. I think I can use the computer efficiently	.195	.045	.252	4.297	<.001	.688	1.453
SE3. I make full use of the Internet to master learning materials	.184	.058	.210	3.183	0.002	.544	1.837
CL2. I communicate and interact more with my peers	.090	.040	.136	2.252	0.026	.645	1.551

a. Dependent Variable: EF1. I have learnt to identify the important of a theme/ a subject.

Source: From this research

Figure 4.13 histogram of purchase intention indicates the pattern is normality. Figure 4.14 shows the regression model is good for the analysis because of the residuals are independent with valid

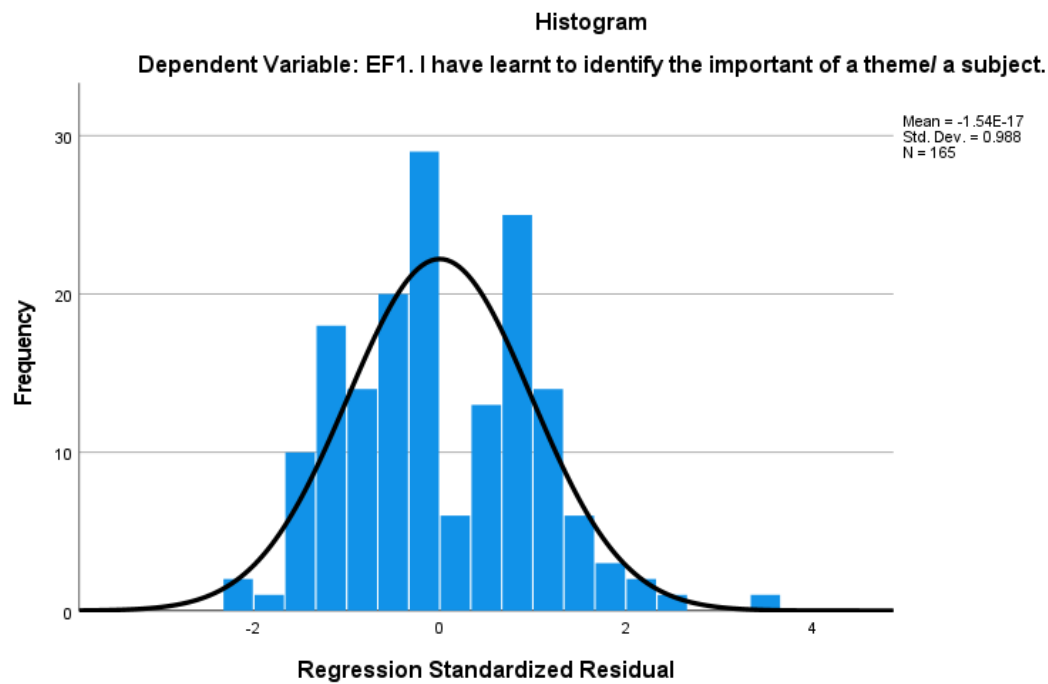


Figure 4.13: Histogram of Learning Effectiveness

Source: From this research

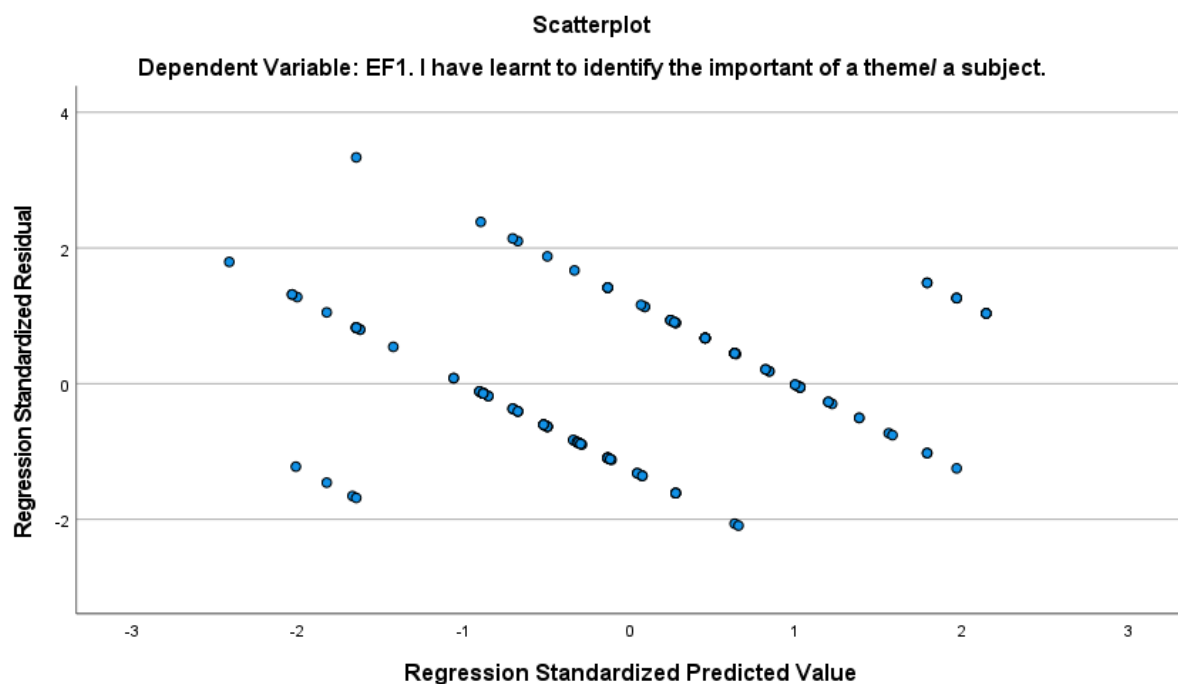


Figure 4.14: Scatter Plot of Learning Effectiveness

Source: From this research

4.1.10 Hypothesis Testing by Using Correlation and Regression Analysis

According to the previous chapters reveal the relationships between the variables. By combining the results of correlation and regression model, the following is the analysis of correlation and regression for testing the hypothesis (Figure 4.15)

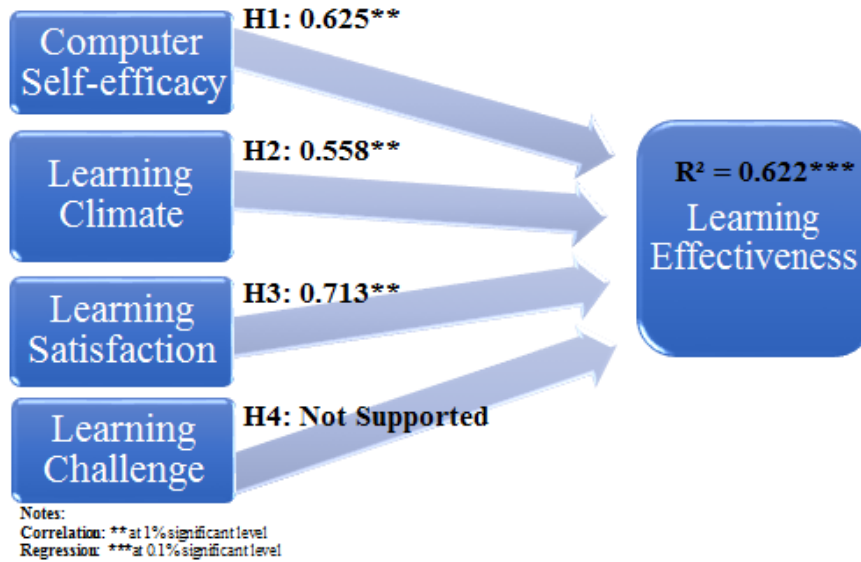


Figure 4.15: Research Model with Analysis Results

Source: From this research

Table 4.16 indicates the correlation and regression are positive amongst H1-H3 and all hypotheses are supported, except H4.

Table 4.16: Result of the Research Hypotheses

Hypotheses		Correlation r^{**}	β	Test Result
H1	Computer self-efficacy has a significant positive impact on learning effectiveness.	0.625**	0.252***	Supported
H2	Learning climate has a significant positive impact on learning effectiveness.	0.558**	0.136*	Supported
H3	Learning satisfaction has a significant positive impact on learning effectiveness.	0.713**	0.388***	Supported
H4	Learning challenge has a significant positive impact on learning effectiveness.	-----	-----	Not Supported

*Correlation is significant at 0.01 level

** Correlation is significant at 0.05 level

***Correlation is significant at 0.001 level

Source: From this research

4.1.11 Summary

In this chapter, the various analyses have been utilized to test the formulated hypotheses. In the beginning, the reliability test was utilized, and the result is high reliable. Next the factor analysis was applied and all factors of research models are important by which CRM is the most important factor. Then, correlation test was adopted for H1 to H4, the result indicates H1-H3 are positive correlated to learning effectiveness., except H4. Finally, MLR test was used, the variation in learning effectiveness can be explained by computer self-efficacy, learning climate, learning satisfaction.

Chapter 5: Conclusions and Recommendations

5.1 Conclusions

The current study explores the challenges that learners experienced in an online learning environment and how the pandemic impacted their online learning experience. The findings revealed that the online learning challenges of students varied in terms of type and extent. Their greatest challenge was linked to their learning environment at home, while their least challenge was technological literacy and competency. Based on the learners' responses, their challenges were also found to be aggravated by the pandemic, especially in terms of quality of learning experience, mental health, finances, interaction, and mobility. With reference to previous studies (i.e., Adarkwah, 2021; Copeland et al., 2021; Day et al., 2021; Fawaz et al., 2021; Kapasia et al., 2020; Khalil et al., 2020; Singh et al., 2020), the current study has complemented their findings on the pedagogical, logistical, socioeconomic, technological, and psychosocial online learning challenges that students experience within the context of the COVID-19 pandemic. Further, this study extended previous studies and our understanding of learners' online learning experience by identifying both the presence and extent of online learning challenges and by shedding light on the specific strategies they employed to overcome them.

Overall findings indicate that the extent of challenges and strategies varied from one student to another. Hence, they should be viewed because of interaction several many factors. Students' responses suggest that their online learning challenges and strategies were mediated by the resources available to them, their interaction with their teachers and peers, and the school's existing policies and guidelines for online learning. In the context of the pandemic, the imposed lockdowns and students' socioeconomic condition aggravated the challenges that students experience.

While most studies revealed that technology use and competency were the most common challenges that students face during the online classes (Rasheed et al., 2020), the case is a bit different in developing countries in times of pandemic. As the findings have shown, the learning environment is the greatest challenge that students needed to hurdle, particularly distractions at home (e.g., noise) and limitations in learning space and facilities. This data suggests that online learning challenges during the pandemic somehow vary from the typical challenges that students experience in a pre-pandemic online learning environment. One possible explanation for this result is that restriction in mobility may have aggravated this challenge since they could not go to the school or other learning spaces beyond the vicinity of their respective houses. As

shown in the data, the imposition of lockdown restricted learners' learning experience (e.g., internship and laboratory experiments), limited their interaction with peers and lecturers, caused depression, stress, and anxiety among peers. All these adversely impacted students' learning experience. This finding complemented earlier reports on the adverse impact of lockdown on students' learning experience and the challenges posed by the home learning environment (e.g., Day et al., 2021; Kapasia et al., 2020). Nonetheless, further studies are required to validate the impact of restrictions on mobility on learners' online learning experience.

Among all the different online learning challenges, the students experienced the least challenge on technological literacy and competency. This is not surprising considering a plethora of research confirming Gen Z students' (born since 1996) high technological and digital literacy (Barrot, 2018; Ng, 2012; Roblek et al., 2019). Regarding the impact of COVID-19 on learners' online learning experience, the findings reveal that teaching and learning quality and learners' mental health were the most affected. The anxiety that students experienced does not only come from the threats of COVID-19 itself but also from social and physical restrictions, unfamiliarity with new learning platforms, technical issues, and concerns about financial resources. These findings are consistent with that of Copeland et al. (2021) and Fawaz et al. (2021), who reported the adverse effects of the pandemic on students' mental and emotional well-being. This data highlights the need to provide serious attention to the mediating effects of mental health, restrictions in mobility, and preparedness in delivering online learning.

Nonetheless, students employed a variety of strategies to overcome the challenges they faced during online learning. The varying strategies of students confirmed earlier reports on the active orientation that students take when faced with academic- and non-academic-related issues in an online learning space (Fawaz et al., 2021). The specific strategies that each learner adopted may have been shaped by different factors surrounding him/her, such as available resources, student personality, family structure, relationship with peers and lecturers, and aptitude. To expand this study, researchers may further investigate this area and explore how and why different factors shape their use of certain strategies.

Several implications can be drawn from the findings of this study. First, this study highlighted the importance of emergency response capability and readiness of learning institutions in case another crisis strikes again. Critical areas that need utmost attention include (but not limited to) national and institutional policies, protocol and guidelines, technological infrastructure and resources, instructional delivery, staff development, potential inequalities, and collaboration

among key stakeholders (i.e., parents, students, teachers, school leaders, industry, government education agencies, and community).

Second, the findings have expanded our understanding of the different challenges that students might confront when we abruptly shift to full online learning, particularly those from countries with limited resources, poor Internet infrastructure, and poor home learning environment. Schools with a similar learning context could use the findings of this study in developing and enhancing their respective learning continuity plans to mitigate the adverse impact of the pandemic.

This study would also provide students relevant information needed to reflect on the possible strategies that they may employ to overcome the challenges. These are critical information necessary for effective policymaking, decision-making, and future implementation of online learning.

Finally, the findings provided us a nuanced understanding of the interdependence of learning tools, learners, and learning outcomes within an online learning environment; thus, giving us a multiperspective of hows and whys of a successful migration to full online learning.

5.2 Recommendations

All educators, families, and policymakers take seriously their responsibility to focus attention not only on curriculum-based elements of education, but also the feel and environmental quality of the school and the work to ensure the right people are in the right roles. They are explicit with common unequivocal language and actions about the values, personalization, and beliefs and norms they want to pervade in face-to-face training.

Just as a positive workplace climate improves happiness, attendance, and engagement, positive learning climates in schools, early learning centers, and homes increase student success.

There are reliable and tested methods for measuring the extent to which the learning environment of a learning center feels safe and caring, in turn fostering connection among students, parents, teachers, and administrators.

Improving climate can mitigate the impact of area crime and poverty on student performance. Researchers have found the belief that impoverished, high-crime communities produce unsafe and unhealthy schools cannot be supported. The focus of control for school success and behavior is primarily inside the building—schools can control school climate; the community does not dictate it.

Positive climate improves student engagement and performance. Research shows that not only are several aspects of learning climate and connectedness related to student achievement, but also that positive changes in these areas are related to significant gains in student scores on statewide achievement tests.

These findings move beyond simply knowing virtual learning with good climate and connectedness are likely to have good learners' achievement, while virtual learning with poor climate and connectedness are likely to have poor learners' achievement. They show that changing a learning climate and connectedness for the better is associated with increases in learners' academic performance.

Research has demonstrated a strong relationship between virtual learning center connectedness and educational outcomes.

Climate impacts the social-emotional development of learners. A learning climate that includes positive lecturer and peers' interaction, as well as opportunities for and encouragement of peers' teamwork, leads to social-emotional health.

What has been made clear through this pandemic is the importance of disseminating knowledge across borders, companies, and all parts of society. If online learning technology can play a role here, it is incumbent upon all of us to explore its full potential.

5.2.1 Theoretical Implications

This research analyzes the learning effectiveness of virtual learning. Several factors which can impact the learning effectiveness are explored. It also reveals the difference of Hong Kong learners on learning effectiveness of virtual learning.

Learning satisfaction and Computer self-efficacy are significantly influenced by learning effectiveness.

From the previous search also indicated that there is a vital role of the learning effectiveness (Del Barrio, Romero-Frías & Arquero, 2013) (Marakas et al., 2004).. It has a consistent result with this study according to the correlation test, the result reveals learning satisfaction and computer self-efficacy is positive correlated to learning effectiveness (H3 & H1), containing the strong correlation (r).

Learning climate also found that there is moderate positive correlation with learning effectiveness study. From the previous research revealed the learning climate impacts learning effectiveness. (Hopson & Lawson, 2011) (Evers, 2012). Proper learning climate can be achieved a

5.2.2 Managerial Implications

5.3 Limitations

Some limitations in this study need to be acknowledged and addressed in future studies. One limitation of this study is a small sample size of 165 and it exclusively focused on students' perspectives. Future studies may widen the sample by including all other actors taking part in the teaching–learning process. Researchers may go deeper by investigating teachers' views and experience to have a complete view of the situation and how different elements interact between them or affect the others.

Future studies may also identify some teacher-related factors that could influence students' online learning experience. In the case of students, their age, sex, and degree programs may be examined in relation to the specific challenges and strategies they experience. Although the study involved a relatively large sample size, the participants were limited to college students from a Philippine university. To increase the robustness of the findings, future studies may expand the learning aspects such as academic, business or interest class from different geographical regions.

As a final note, this pandemic has undoubtedly reshaped and pushed the education system to

its limits. However, this unprecedented event is the same thing that will make the education system stronger and survive future threats.

5.4 Further Research

The typology of challenges examined in this study is largely based on Rasheed et al.'s (2020) review of students' experience in an online learning environment. These challenges are grouped into five general clusters, namely self-regulation (SRC), technological literacy and competency (TLCC), student isolation (SIC), technological sufficiency (TSC), and technological complexity (TCC) challenges (Rasheed et al., 2020).

SRC refers to a set of behavior by which students exercise control over their emotions, actions, and thoughts to achieve learning objectives. TLCC relates to a set of challenges about students' ability to effectively use technology for learning purposes. SIC relates to the emotional discomfort that students experience because of being lonely and secluded from their peers. TSC refers to a set of challenges that students experience when accessing available online technologies for learning. Finally, there is TCC which involves challenges that students experience when exposed to complex and over-sufficient technologies for online learning.

To extend Rasheed et al. (2020) categories and to cover other potential challenges during online classes, two more clusters were added, namely learning resource challenges (LRC) and learning environment challenges (LEC) (Buehler, 2004; Recker et al., 2004; Seplaki et al., 2014; Xue et al., 2020). LRC refers to a set of challenges that students face relating to their use of library resources and instructional materials, whereas LEC is a set of challenges that students experience related to the condition of their learning space that shapes their learning experiences, beliefs, and attitudes. Since learning environment at home and learning resources available to students has been reported to significantly impact the quality of learning and their achievement of learning outcomes (Drane et al., 2020; Suryaman et al., 2020), the inclusion of LRC and LEC would allow us to capture other important challenges that students experience during the pandemic, particularly those from developing regions. This comprehensive list would provide us a clearer and detailed picture of students' experiences when engaged in online learning in an emergency. Given the restrictions in mobility at macro and micro levels during the pandemic, it is also expected that such conditions would aggravate these challenges. Therefore, this paper intends to understand these challenges from students' perspectives since they are the ones that

are ultimately impacted when the issue is about the learning experience. We also seek to explore areas that provide inconclusive findings, thereby setting the path for future research.

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Appendix A: Dissertation Gantt Chart

[illegible]

Appendix C: Sample size

To find out the sample size

$$n = \frac{(Z/e)^2}{pq}$$

$$n = \frac{3.8416}{0.0049} \times 0.26923077 \times 0.730769$$

$$n = 155 \text{ at least sample size}$$

- Z 1.96 confidence level 95%
- e 7.0% a tolerated level of sampling error
- p 0.27 successful rate; from pilot test(EF2. I am very interested and motivated to learn more.); p=7/26
- q 0.73 failure rate

EF2. I am very interested and motivated to learn more.

		Frequency	Percent	Valid Percent
Valid	Disagree	1	3.8	3.8
	Neutral	18	69.2	69.2
	Agree	7	26.9	26.9
	Total	26	100.0	100.0

你好!本人就讀於本人現正於 University of Wales Trinity Saint David 就讀工商業管理學系。
現正進行一份關於評估 COVID-19 大流行期間虛擬學習的有效性的畢業論文研究。

以下調查問卷將有兩個部份, 所需時間為 5-10 分鐘。

在下列所兩個部份剔出正確答案。此問卷調查採取匿名方式填寫。

而閣下所提供的 資料亦只作為學術研究分析之用, 不會對外公開或用作商業用途。

敬請放心填寫, 多謝合作。

Hi, I am a student who studying in Business Administration program in University of Wales Trinity Saint David.

I am now conducting a research to assess the effectiveness of virtual learning during the COVID-19 pandemic for my dissertation study.

This questionnaire will have 2 sections and only take you about 5-10 minutes.

Please put a tick into the correct answer box for all section.

All the information collected will be kept confidential and for academic purpose only.

Your opinion will be very useful to us. Thank you so much for your cooperation.

The questionnaire is used to assess the effectiveness of virtual learning during the COVID-19 pandemic.

The information will be used for research purposes only.

The research team will keep the collected data confidential and reports will not include any information that can identify the participants.

該問卷旨在評估 COVID-19 大流行期間虛擬學習的有效性。

該信息將僅用於研究目的。

研究團隊將對收集的數據保密, 報告中不會包含任何可以識別參與者身份的信息。

- ☐ I agree to take part in the study by filling out this questionnaire. I understand that I am voluntarily participating in the survey and I am free to withdraw at any time.
我同意通過填寫這份問卷來參與這項研究。 我明白我是自願回答調查的及我可以隨時退出。

第一部份: (請在正確的答案中畫上刷號 ✓) Section 1: (Please tick into the correct answer box ✓)
(1) 表示 "非常不同意", (5) 表示 "非常同意". (1) represents "Strongly disagree". (5) represents "Strongly agree"

			(5) Strongly agree (5) 非常同意	(4) Agree (4) 同意	(3) Neutral (3) 中立	(2) Disagree (2) 不同意	(1) Strongly disagree (1) 非常不同意
1	<u>Computer Self-efficacy</u> 1. I have the confidence to learn online at my own pace 2. I read the course materials repeatedly to sharpen my computer skills 3. I make full use of the Internet to master learning materials 4. I think I can use the computer efficiently	<u>電腦自我效能</u> 1. 我有信心按照自己的節奏在線上學習 2. 我反覆閱讀課程材料以提高我的電腦技能 3. 我充分利用互聯網掌握學習資料 4. 我想我可以有效地使用電腦	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐
2	<u>Learning Climate/Environment</u> 1. I can ask my lecturer questions that I did not understand 2. I communicate and interact more with my peers 3. I think this e-learning mode is less-stressful 4. I think face-to face training is the most suitable	<u>學習氛圍/環境</u> 1. 我可以向我的講師提出我不明白的問題 2. 我與學習的同伴有更多的互動和交流 3. 我認為這種電子學習模式壓力較小 4. 我認為面授培訓最合適	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐
3	<u>Learning Satisfaction</u> 1. I am satisfied with the e-learning environment 2. I am satisfied with the learning flexibility of this course 3. I am satisfied with the overall e-learning outcome 4. I would recommend these courses to other friends or colleagues	<u>學習滿意度</u> 1. 我對電子學習環境感到滿意 2. 我對課程的學習靈活性很滿意 3. 我對在線上學習的整體效果感到滿意 4. 我會向其他朋友或同事推薦這些課程	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐
4	<u>Learning Challenges</u> 1. Costly equipments 2. Unstable Internet connection 3. Several distractions at hom 4. Anixety about the impact of the Coronavirus on my academic performance	<u>學習挑戰</u> 1. 昂貴的設備 2. 網絡連接不穩定 3. 家裡的各項干擾 4. 擔心冠狀病毒影響了我的學習成績	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐
5	<u>Learning Effectiveness</u>	<u>學習效果</u>					

	1. I have learnt to identify the important of a theme/ a subject. 2. I am very interested and motivated to learn more. 3. I am able to summarize what I have learned. 4. What I have learned can be applied in the real life.	1. 我學會了識別主題的重要性 2. 我非常有興趣並有動力去學習更多 3. 我能夠總結我所學到的東西 4. 我所學到的能應用到現實生活中	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐	☐ ☐ ☐ ☐
第二部份: 個人資料 (請在正確的答案中畫上剔號✔) Section 2: Personal Information (Please tick into the correct answer box✔)							
1	Gender	性別	☐ (1) Male ☐ (2) Female	(1) 男 (2) 女			
2	Age	年齡	☐ (1) 25 or below ☐ (2) 26-35 ☐ (3) 36-45 ☐ (4) 46-55 ☐ (5) 56 or Above	(1) 25歲或以下 (2) 26-35歲 (3) 36-45歲 (4) 46-55歲 (5) 56歲以上			
3	Educational Level	教育程度	☐ (1) College Diploma / ☐ (2) Some College / U ☐ (3) Undergraduate deg ☐ (4) Masters / Graduate ☐ (5) Doctorate	(1) 大專文憑/證書或以下 (2) 一些學院/大學 (3) 本科學位 (4) 碩士/研究生學位 (5) 博士學位			
4	Employment Status	就業狀況	☐ (1) Student ☐ (2) Employed ☐ (3) Self-employed ☐ (4) Unemployed ☐ (5) Others (please spe	(1) 學生 (2) 受僱 (3) 自僱人士 (4) 失業者 (5) 其他 (請具體說明)			
5	Which device did you use to browse the Internet?	您使用哪種設備瀏覽互聯網?	☐ (1) Desktop computer ☐ (2) Laptop ☐ (3) Tablet PC ☐ (4) Smartphone ☐ (5) Others (please spe	(1) 桌上電腦 (2) 手提電腦 (3) 平板電腦 (4) 智能手機 (5) 其他 (請具體說明)			
6	Esitmated number of hours of online learning per week	估計每周上網學習時數約	☐ (1) ≤ 5 hours ☐ (2) 6-10 hours ☐ (3) 11-15 hours ☐ (4) 16 -20 hours ☐ (5) ≥ 21 hours	(1) 5小時以內 (2) 6-10 小時 (3) 11-15 小時 (4) 16-20小時 (5) 21小時以上			
THANK YOU FOR YOUR COOPERATION!!!! 謝謝您的合作!!!!							