Evaluating User Experience (UX) Factors and Emotions of Open Distance Learning (ODL) during the Pandemic Covid-19 among Secondary School Students

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***Abstract*—Throughout the covid-19 pandemic, technology in education has been important. This is a new norm in learning patterns. The study first investigates how user experience factors (useful, desire, accessible, usable) influence secondary school students' open distance learning (ODL). The second aim is to measure the emotion associated with their profiles. The method used is a questionnaire involving 161 respondents aged 13 to 17 years old. Findings show that user experience factors are significant to ODL, and the emotions associated with the likelihood ratio of gender and type of school are pleasant and unpleasant. Future work expands different target respondents, expands other user experience factors such as findable and credible, and expands different types of emotions.**

***Index Terms*—Covid-19, emotions, open distance learning (ODL), secondary school students, UX factors.**

I. Introduction

At the end of December 2019, a new coronavirus was identified in Wuhan, China. This COVID-19 virus became one of the largest outbreaks in the world. Since the virus will transfer through the air, social distance is important. According to [1], several studies have shown that this would help the world turn into a new norm. A new standard for the future would be operating or practicing from home with the use of information and communication technology. Based on [2], E-learning mainly contains three parts which are the content of multimedia teaching, the learning process in network environment, the interactive platform between learners and experts. According to [3], the collaborative classroom method was used to help students improve their social emotional skills which in turn influenced their academic performance. Peer tutoring, cooperative learning, and consulting experts were among the techniques employed in the study to increase social emotional skills. Therefore, students who prefer learning face-to-face with instructor in a classroom are more likely to face challenges in learning remotely [4]. As alternative, many participants, the synchronous mode of instruction using a video-conferencing application simulated the in-person meeting of a face-to-face class [5]. The important factor of learning by E-learning is the creation of a flexible and distributed learning environment. A good design is required to create a good and interactive E-learning system [6]. According to [7], a complex experience of awareness, physiological sensations, and behaviour that reflects the personal importance of an object, an event, or a circumstance is referred to as emotion.

Most schools are undoubtedly finding ways to keep their students on track in the face of the COVID-19 pandemic. Indeed, the required step is to use Information Communication Technology (ICT) to build an E-learning platform. However, based on [8], one of these rules would not allow more than 100 people in a room for a meeting or conference. As a result, most governments have declared schools closing since February 2020. According to [9], many closures impacted schools, affecting 70 percent of the world's students. As a result, Open Distance Learning (ODL) is adapted as an alternative for continuous learning, and students must adopt a new learning norm. This research aims to evaluate how User Experience (UX) factors influence Open Distance Learning (ODL) and the association of emotions among secondary school students.

II. Literature Review

A. User Experience (UX) and Usability

User experience (UX) applies in all aspects [10]. Therefore, a good user experience (UX) makes the platform more convenient and effective [11]. Some studies related are [12] on survey factors affecting the utilization of learning management, [13] on user experience evaluation at mobile spiritual and study on user experience XD theatre on normal and deaf children [14]. According to [11], usability and user experience (UX) are important factors in the success of the Learning Management System (LMS) and the learning process. Therefore, usability focuses on the pragmatic factors such as the achievement and activities of users, and UX enhances the emotional and concentrates on hedonic aspects. Furthermore, according to [15], the assessment of students is measured on how they utilize LMS.

B. E-Learning

E-learning, as referred to [16], is becoming popular as it offers flexibility for learners, accessible internet, customized

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guidance, and instant responses while studying. Based on [17], teachers may become more efficient educators by expanding their lesson plans which online lectures can be recorded, stored and shared. On the other hand, disadvantages of E-learning are internet connectivity and minimal physical interaction.

C. Open Distance Learning (ODL)

Open and Distance Learning (ODL) refers to providing flexible educational opportunities in terms of access and multiple modes of knowledge acquisition [18]. A student should have self-disciplined and determined to learn at their speed.

The advantages of ODL are more convenient learning and flexibility. Through a remote learning program, students can utilize a computer and an internet connection to seek and complete their preferred courses. Working people make up a higher share of individuals who enrol in distant education. Distance education allows these students to study when convenient for them, rather than interfering with their already hectic schedule. Studying after work, late at night, or on weekends is possible. Online learning resources and training are available at any time. As a result, working students may study while earning. Students will have the perfect opportunity to save money on their studies and the convenience of taking a course from home. In addition, a learner who is self-disciplined and determined may learn at his or her speed. To transmit information to students, online education includes using tutorials, E-learning resources, and video conference class sessions. As a result, students of all abilities will have the opportunity to comprehend the course fully [18].

Disadvantages of ODL are include a high chance of distraction, lack of social interaction and complicated technology. Distance learning restricts students to online-based programs and learning resources. Students can communicate via chat rooms, discussion boards, emails, and video conferencing software, but the experience is not comparable to that of a typical campus. Also, there is high chances of distraction. Those participating in an online program may find it difficult to keep track of their course work and assignments due to the lack of face-to-face connection with professors and other students because there are no frequent reminders about pending work and deadlines. As a result, remote learning is not a viable choice for students who are prone to procrastination or unable to meet deadlines. Furthermore, it is overly reliant on technology. In the event of a software or hardware failure, the class session will come to a halt, potentially disrupting the learning process. Due to the complexity of the technology utilized in distant learning, online education is only available to computer and tech-knowledgeable students [18].

D. Emotion and User Experience (UX)

According to [19], in terms of being connected to either accomplishment actions or accomplishment outcomes, a taxonomy characterizes emotions on three dimensions: level of activation, valence, and object focus. Therefore, positive activating emotions can generally increase educational action by encouraging flexible learning, task-related attention, and increasing motivation techniques. For example, enjoying a certain educational topic will concentrate on related tasks, resulting in improved student achievement.

Several studies have found a favourable relationship between pleasure and performance. Negative deactivating emotions such as discontent, on the other hand, have been proven to hinder motivation and self-regulation of learning, resulting in shallow informatics and poor student performance. On the other hand, negative activating emotions, such as worry, may reduce interest and intrinsic drive, but they will increase extraneous incentives to put out the effort and prevent failures [19]. Other studies related to emotion, such as [20], include evaluating students' emotional responses using Kansei Engineering. The word "experience" in User Experience refers to people's feelings when using a product [21]. Based on [22] evaluation, user experience e-participation on the service at e-government websites has been done. Also, [23], user perception on e-government portal, where users may feel pleased, content, frustrated, thrilled, or dissatisfied with their emotions. Therefore, users can experience two or more emotions while using an application.

E. UX Honeycomb

Fig. 1. UX Honeycomb Peter Morville's.
Source: Adapted from [24]

According to [24], the success or failure of a product in the market is determined by the User Experience (UX). Therefore, human-computer interaction (HCI) principles involve developing successful user-centred design products. Also, the UX honeycomb model factors that influence User Experience (UX) are Useful, Usable, Desirable, Findable, Accessible and Credible [25], as shown in Fig. 1. Therefore, the UX Honeycomb model is a tool that explains the various facets of user experience design.

Based on [25], usefulness is for practical purposes, which will compete for attention alongside a market full of purposeful and useful products. For example, it may be considered beneficial if a computer game or artwork does not allow a user to achieve a goal that others find important. The product or service offered by a company must be useful and meet demand.

Usability refers to a product's capacity to help consumers reach their goals quickly and easily. For example, a computer game that requires three sets of control pads is difficult to be practical because people only have two hands. Therefore, the product delivery must be simple and easy. In addition, systems should be built in a way that is intuitive and intuitive. The term "findable" relates to the concept that a product should be easy to locate, and in the case of digital and

information goods, the content within them should be as well as information must be easily findable and navigated. For example, when a user has a problem should find a solution, and the product design should be planned logically.

Credibility refers to the trust that the users put in the product, same with where trustworthiness is required of the company and its products or services. For example, when the user uses or buys the product, the information provided must be accurate and appropriate. The term desirable refers to branding, image, identity, aesthetics, and emotion design, all used to express desirability in design. Therefore, the product, service, and system's visual aesthetics should be attractive, minimal, and easy to use. For example, the more attractive a product is, the more probable it is that the user who owns it will boast about it, causing other users to want it.

Accessibility refers to delivering an experience accessible to people with a wide variety of abilities, including those who are disabled in some way, such as those with hearing loss, poor vision, mobility impairment, or learning disabilities. Accessible is when the product or service should be designed so that users with disabilities may have the same experience as everyone else. For instance, sometimes, some companies consider accessibility design as a waste of money because they believe persons with disabilities make up a small percentage of the population. The term "valuable " means the product must be valuable and beneficial. For example, it must be valuable to the company that makes it and the person who buys or uses it [25].

F. Circumplex Model

Russell's Circumplex model identifies emotional structure. The model's horizontal axis represents the duration between feelings that Russell considered pleasant and unpleasant, such as delight and disappointment. When looking into several emotional states, a circumplex model is perfect because they will all be indisputable along with their related relationships. The period between peak and low arousal is the vertical axis coordinate. Some people make a distinction between activation and deactivation because of this.

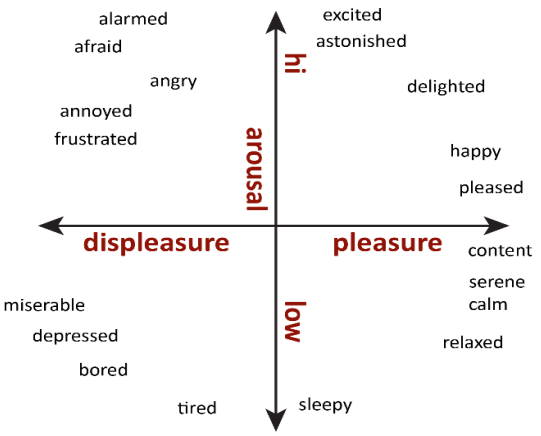

Fig. 2. Circumplex model.
Source: Adapted from [21]

As shown in Fig. 2, first, based on [21], demonstrated this approach's relationship or correlation between the various affectional states. Next, it will be determined whether emotions are linked and how strong the connection is. The researchers wanted to see how various emotions were linked. They needed a model type to display different relationships inside a visual framework. They had previously developed linear models that showed how entirely distinct sets of emotions were linked across time.

On the other hand, these models could not effectively demonstrate how a wide range of emotions is linked. Instead, they utilized a circular model with axes of crossed continua divided into quadrants. This model represents a range of information, creates a field on which the relationship between completely distinct variables can be observed, and ensures that the elements are evenly spaced to demonstrate uniformity and exactness.

III. Methodology

A. Research Model

This study consists of two models: the UX Honeycomb model in Fig. 1 and the Circumplex model in Fig. 2.

B. Research Framework

The User Experience (UX) factor is an independent variable (IV), and the dependent variable (DV) is ODL, as shown in Fig. 3.

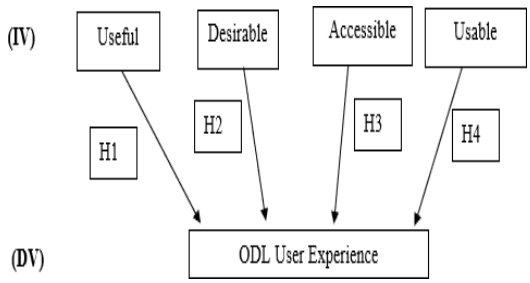

Fig. 3. Research framework.

C. Research Hypothesis

The research hypothesis is based on the User Experience (UX) factors towards online learning during (ODL) Covid-19. Below are the hypotheses:

H1: Useful: There is no relationship between Useful with ODL User Experience

H2: Desirable: There is no relationship between Desirable with ODL User Experience

H3: Accessible: There is no relationship between Accessible with ODL User Experience

H4: Usable: There is no relationship between Usable with ODL User Experience

D. Research Sampling

This research uses convenience and snowball sampling as the sampling strategy where the targeted respondents are selected due to accessibility. The population size of secondary school students in Selangor, Perak, Negeri Sembilan and Sabah is 8345. Therefore, the minimum recommended sample size for this research should be 200 respondents, with a confidence level desire of 95% and a margin error of 5%. Assuming that the researcher has more than 30 samples, the calculation is based on a normal distribution.

IV. Result and Discussion

Objective 1: To measure the user experience factors toward Open Distance Learning (ODL)

A. Correlation Matrix Using Factor Analysis

The KMO for the sample data was 0.922, suggesting that the correlation among items is suitable for conducting factor analysis. However, Bartlett's test of sphericity, x2 = 3541.286 with p-value < 0.001, indicates that the correlation matrix among the items was not an identity matrix. All the initial commonalities and the extracted commonalities were more significant than 0.75. Five factors were extracted. The rotation eigenvalue for all five factors were 14.429, 2.196, 1.386, 1.153 and 1.008, respectively. Thus, all five factors accounted for 60.97% of the total variance in all the items. The factor loadings were high for each factor, ranging from 0.30 to 0.98.

Reliability analysis was conducted on the 25 items instrument in the ODL User Experience scale. The reliability coefficient (Cronbach's alpha) was 0.920, indicating a high internal consistency among the instrument's items. Cronbach's Alpha coefficient for each aspect of the ODL.

B. Reliability Test

The acceptable value of Cronbach's Alpha Coefficient is in the range of 0.6 until 0.8. The Cronbach's Alpha value of less than 0.6 was considered poor, and a value greater than 0.8 was deemed suitable. A reliability test was conducted for the pilot study to measure the consistency of the UX factors and ODL User Experience. The Cronbach's Alpha of the reliability result on the User Experience factor elements and ODL User Experience has a good value of Cronbach's Alpha Coefficient with the value are Useful (0.885), Desirable (0.868), Accessible (0.847), Usable (0.881), and ODL User Experience (0.920).

C. Demographic

The survey collected demographic data, including gender, age, type of school, state of study and frequency of access to the internet. A total of 161 students contributed to this study, 31 were male, and 130 were female—the suitable measure of average for data classified on an ordinal scale.

Objective 2: To measure the association between emotions during ODL based on Demographic Profile.

A. Descriptive Analysis

Table I shows the association between emotions during ODL based on the demographic profile. There are four emotions associated with ODL: Excited, Happy, Content, and Angry. Here, 26.7% of students are excited when turning in their assignments on time. Therefore, three variables refer to the Happy emotion which is 41% of students were happy working and collaborating with others, 40.4% were happy when communicating with teachers online, and 42.9% were happy when communicating with friends online. Furthermore, five variables refer to the Content emotion which is 25.5% are not preparing assignments, 20.5% have been experienced a noisy study place, 28% have been experienced a chatty and emotional teacher, 21.1% was lack of understanding the way the teacher presented, and 22.4% was experienced workload and assessment, for example, needed to prepare more than one task. Lastly, only 26.7% of respondents had a weak internet signal or the bandwidth too narrow to connect.

TABLE I: ODL Activities and Emotion

LABEL	ODL	Pleasant				Unpleasant			
		Excited	Happy	Content	Sleepy	Tired	Depressed	Frustrated	Angry
G1.	Not preparing assignments	1.9	10.6	25.5	10.6	8.1	17.4	23.6	2.5
G2.	A noisy study place with distractions from things like television, family, or Roommates	3.7	8.1	20.5	1.9	3.7	15.5	34.2	12.4
G3.	Working and collaborating with others	23.0	41.0	19.9	2.5	3.1	4.3	4.3	1.9
G4.	Internet signals are weak or the bandwidth too narrow to connect	1.9	8.1	17.4	5.6	3.1	13.7	23.6	26.7
G5.	Chatty and emotional teacher	6.8	16.8	28.0	8.7	10.6	14.3	12.4	2.5
G6.	Lack of understanding in the way the teacher presents	1.9	9.3	21.1	12.4	8.7	21.7	20.5	4.3
G7.	Communicating with teachers online	18.6	40.4	19.3	9.3	3.1	3.1	5.6	0.6
G8.	Communicating with friends online	31.1	42.9	11.2	5.6	2.5	3.7	3.1	0.0
G9.	Workload and assessment, for example, need to prepare more than one task	8.7	14.9	22.4	5.0	21.7	14.9	8.1	4.3
G 10.	Turning in my assignments on time	26.7	24.8	16.8	5.0	9.9	10.6	3.7	2.5

Based on the pleasant percentage, students are happy to collaborate and communicate with a teacher online. However, less pleasant, such as when the students have to study in a noisy place with and weak internet connection.

B. Illustration of Circumplex Model

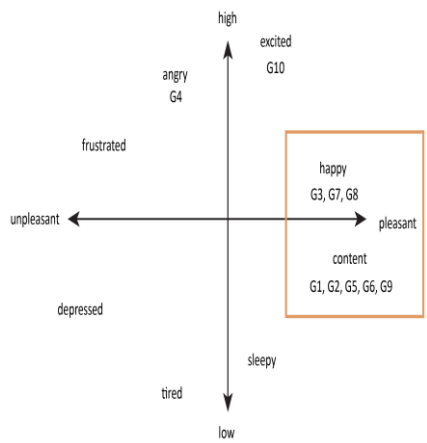

Fig. 4. Circumplex model.

Fig. 4 of the Circumplex Model shows the tabulation of ODL activities based on the emotions in the quadrant. For example, secondary school students feel angry at the label G4, whereby G4 represents weak internet signals or the bandwidth too narrow to connect. Students feel happy at ODL activities at labels G1, G7 and G8 but less pleasant in content emotion at labels G1, G2, G5, G6 and G9. At label G10, they feel excited.

Students express they are genuinely feeling according to ODL activities, such as they feel happy and excited when they can collaborate and communicate with friends and teachers, whereas they feel less content when they cannot prepare the assignment.

In summary, a circumplex model is as a circular representation of a body of information that demonstrates the relationship between knowledge points. A traditional horizontal and vertical axis with quadrants might be found within the circle. The horizontal axis in this example is between pleasant (happy) and unpleasant (sad) emotions, while the vertical axis is between high and low arousal. This model was developed to demonstrate that emotions are complicated and do not separate from one another.

C. Chi-Square Tests

TABLE II: LIKELIHOOD RATIO OF GENDER AND TYPE OF SCHOOL

No.	ODL	Likelihood Ratio	
		Gender	Type of school
1.	Not preparing assignments	0.628	4.217
2.	A noisy study place with distractions from things like television, family, or Roommates	0.030	10.522
3.	Working and collaborating with others	1.967	0.390
4.	Internet signals are weak, or the bandwidth too narrow to Connect	0.113	13.931
5.	Chatty and emotional teacher	0.464	0.853
6.	Lack of understanding in the way the teacher presents	4.252	6.823
7.	Communicating with teachers online	0.280	0.186
8.	Communicating with friends online	0.405	0.258
9.	Workload and assessment, for example, need to prepare more than one task	0.007	1.591
10	Turning in my assignment late	0.105	0.502

Based on Table II, the association related to gender and type of school is significant. For example, emotions, when the students lack understanding in the way the teacher presents between female students and male students, is 4.252 more likely. In contrast, only 1.967 is more likely when working and collaborating with others. Therefore, the type of school between regular school and learning has given challenges to secondary school students in the educational process. However, according to [18], because of the flexibility and accessibility of technology, ODL has grown the needs of students and teachers because the learning process must be continued during the pandemic Covid-19 for the future sustainability of knowledge. Teachers also play essential roles in ensuring that ODL could increase student learning engagement.

User experience factors such as desirable and usable do significantly influence ODL. For example, the desire to learn online. Students' emotions are imperative to analyse to understand their feelings. The way technology is used in teaching and boarding school is significant. For example, emotions, when the student was not preparing assignments, is 4.217 more likely between regular school and boarding school, emotions, when the student had a noisy study place with distractions from things like television, family, or roommates, is 10.522 more likely between regular school and boarding school, emotions when having a weak Internet signal or the bandwidth too narrow to connect is 13.931 more likely, emotions when experienced a lack of understanding in the way the teacher presents is 6.823 likely between regular school and boarding school and emotions when having a workload and assessment, for example, need to prepare more than one task is 1.591 more likely between regular school and boarding school. In summary, when students have ODL, emotions are positively associated with gender, and those with ODL are positively related to regular and boarding school.

V. CONCLUSION AND FUTURE WORK

As schools close and quarantine techniques are enforced to deal with the worldwide pandemic, students and educators throughout the world are feeling the remarkable ripple impact of the COVID-19 virus. As educators, the first step is to make sure that students are assessed in their online learning in the same way that they are in their face-to-face sessions including time management and workload. The impacts of ODL are in pleasant and unpleasant on user emotions. Based on user experience on learning activities, the use of information and communication technology can help students' study more effectively. For education, students can understand more through online learning [5]. However, in order to exploit accessible information in learning, students should have high degree of digital literacy, good environment, and internet connection. It is all about the learner's experience and how they feel about the course [26].

In the future, the study could expand on target respondents from several different university students, develop different categories of UX factors such as findable and credible, and choose other types of emotions.

CONFLICT OF INTEREST

"The authors declare no conflict of interest".

AUTHOR CONTRIBUTIONS

Aida and Norita contribute with data analysis, and Nor Hapiza and Roesnita contribute to manuscript preparation. Zan Azma and Fatin contribute with research design and data collection.

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