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A STUDY OF USER EXPERIENCE FOR E-LEARNING USING INTERACTIVE ONLINE TECHNOLOGIES

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ABSTRACT

User experience (UX) is a branch of human computer interaction (HCI) field. UX is a study that focuses on behaviours, attitudes, and perspectives towards services or technologies used within a specific context such as teaching and learning context. The teaching and learning process has evolved from traditional to elearning and recently interactive e-learning settings. The aim of this research is to study UX in online interactive e-learning. The study use observation, interview, and survey methods for data collection. Quantitative and qualitative analyses methods were applied. Findings of the study suggest that students and a teacher demonstrate positive attitudes and behaviours towards online interactive e-learning. Moreover, most of the advantages of face-to-face class interaction in a traditional classroom can be also achieved in online interactive e-learning. The interactive e-learning setting helps less confident and shy students to participate resulting in engagement between a teacher and students. Despite the power of new technologies in stimulating students to learn and retain knowledge in a more effective way, there is still room to improve the technologies to give a better UX to the teacher.

Keywords: User Experience, Human Computer Interaction, E-learning

1. INTRODUCTION

User experience (UX) has been one of the emerging research fields which attract interests of researchers not only from industry but also from academia. UX studies users' experience for a particular product [1], system or service [2] by taking an entire view of a person's emotions, attitudes, and expectations. In UX research, aspects of human computer interaction (HCI) setting such as practical, experiential, effective, meaningful and valuable are studied as a whole. Additionally, it also includes a person's perceptions of system aspects such as utility, ease of use, satisfaction, and efficiency. UX is subjective in nature to the degree that it is about individual perception and thought with respect to the system. However, it is dynamic and constantly changed and modified over time due to the changes of the individual system usage, circumstances and contexts of use. In general, factors such as ease of use, flexibility, robustness, information architecture, visual effects, content strategy, utility and performance, accessibility may give impact on UX.

The international standard on ergonomics of human system interaction, ISO 9241-210 [3] defines UX as "person's perceptions and responses that result from the use or anticipated use of a product, system or service /it". Based on the ISO definition, UX includes the users' emotions, beliefs, perceptions, physical preferences, and psychological responses, behaviours and accomplishments that occur before, during and after use. There are three factors which influence UX; systems, users, and the contexts of use [4]. UX has been perceived as a "soft" science, as this field relies mainly on qualitative research and observation [5]. UX is "not only a snapshot of the present usage" but it also presents the entire impression of a product [6]. As a matter of fact, sometimes users judge and create UX about any product before even touching them. Interests in UX has spread out all over domains, including an education field. With the growth of the Internet, teaching and learning field has transformed from a conventional classroom platform into an e-learning platform. There is a number of learning management systems (LMSs), such as Moodle or Blackboard have been utilized to support elearning. Normally, teachers post teaching materials

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such as quizzes, assignments, lecture notes, and so on, online. Students can retrieve these materials at anytime and anywhere. The e-learning industry has potential. It was reported in [7] that by 2022, the size of the e-learning industry amounts to 243 billion USD. It is also expected to grow at over 5% of compounded annual growth rate year on the year from 2017 to 2022. The numbers are convincing.

Educators have started to emphasize the importance of UX in teaching and learning in an elearning environment. Having an understanding about UX is an initial step for user-centered design (UCD) approach, for the development of any educational tools or apps which can be accessed by thousands of students regardless of borders and time. In previous years, great research efforts had been conducted on the usability of the user interface for educational tools/apps. However, UX goes beyond the usability matter. UX will give insight to designers, developers, and educators on how to enhance cognitive and affective processes of learning. Universities and educational institutes have taken advantages of e-learning by introducing online programs. However, most of the current elearning platforms do not facilitate student-teacher interactivity as in a brick-and-mortar classroom, a traditional classroom. It is no doubt that face to face interaction in a brick-and-mortar classroom has its own great advantages. Engagement between students and a teacher which occur in a face to face setting has its own impact on learning and teaching processes, and this cannot be offered through a regular e-learning platform.

With the advancement of Internet speed, online interactive e-learning is seen as a possible option to create a traditional classroom model in the digital world. Interactive e-learning in the digital world is the exchange of information that can occur either in real-time or later through technology in a synchronous method. Despite numerous studies had been conducted for UX in e-learning, to the best of our knowledge, none study was reported on UX for online interactive e-learning. Furthermore, none an integrated tool has been developed so far, to specifically dedicated to this purpose. The current efforts on having online interactive e-learning are made by utilizing existing online meeting tools and other additional tools which are chosen by a teacher who opts to give lessons on the online interactive elearning. The aim of this study is to explore the UX of teachers and students in online interactive elearning. not in the form of a database from which records and fields are easily manipulated and understood by computers, but in natural language

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texts which are intended for human reading. In spite of the promise of the semantic web, the use of the English language and other natural language texts will continue to be a

2. RELATED WORK

UX research community has conducted studies on various domains and in various contexts of use. These include interactive entertainment systems [8] industrial environment and system [9], interactive kiosks systems [10], social media [11], interactive products [12], interactive environments [13], mobile applications [14], augmented reality apps [15], e-commerce websites [16], healthcare systems [17] and so on. In the context of teaching and learning, UX has been a new and important aspect as the ubiquitous access to the internet has enabled remote educational services, where students are no longer required to be present at the same time and place as the teacher. This shift in a classroom structure has affected the development of modern elearning solutions. e-learning can be defined as the use of technology to enable learning outside the traditional classroom [18].

The e-learning system is the engine that enables remote interactions between the main entities in the learning experience: students, teachers, and content. The learning experience in e-learning systems can be classified into two groups asynchronous and synchronous (real-time) [19]. Synchronous learning is the process that occurs when the learning experience is delivered in real time. It allows students to directly interact and collaborate with their teachers, therefore increases the effectiveness of the learning process. On the other hand, asynchronous learning is a process that occurs when the learning experience is delivered offline. While it offers fewer interactions than synchronous learning, its main advantage stems from the increased personalized learning experience. Asynchronous learning increases students retention of information by tailoring the process to the students' preference of pace and time. The effectiveness of e-learning system can be analyzed based on the number of students dropping out of e-courses [20]. A model composed of 10 dimensions is used to analyze the effectiveness of e-learning solutions. The used model correlated the success of a system to how much it enables collaboration and social network integration [21]. Research on interactive e-learning space classrooms has reported an increase in the learning outcomes when students found the system to be more engaging [22]. Students engagement can



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be seen as contributions to the learning dialogue between students and teachers. Engagements enrich the learning process by allowing teachers to challenges students' answers and giving feedback to students.

Engagement can also be achieved by the use of gamification, systems that implement gamification has reported better students' retention of information [23]. Another aspect of system effectiveness can be attributed to the system user interface. Intuitive interface and ease of use are the main factors that directly impact user perception of any system [24] and a better UX is an inherent outcome of well-implemented user centricity models. In addition, allowing students to customize their accessibility preferences increased the effectiveness of the service for both disabled as well as non-disabled students [25]. The need to keep elearning solutions up to date with technology advancements is essential to meet students' needs in general and disabled students in specific [28]. One of the biggest technological advancements in impacting the e-learning experience is the use of mobile devices and smartphones. From one side the proliferation of those devices has helped students to connect from anywhere at any time [23]. From the other side, there are still a lot of enhancements that must be carried out in order to make e-learning content compatible with mobile devices. User familiarity with the learning experience affects overall system likeness, the quicker students are to accomplish tasks the better their satisfaction will be.

In recent years, a combination of both synchronous and asynchronous e-learning systems are emerging. The main idea from combining the two approaches is to offer students the preference of a more suitable learning experience: immediate or self-paced. The success of any software can be measured by its adaptability [27]. While this is straight forward for commercial software where a customer can choose between different competitors to select the most appropriate software. This is not true with LMS selection is entirely based on the organizational preference and it is forced on its students. This has, in fact, lead to many learning solutions to become outdated and fall short with students.

The current research work emphasizing UX in elearning platforms have been demonstrated in [18,28–31] for various purposes and aspects. For example, the work of [32] studied the motivational aspect in learning which is derived from the usability factors, [33] conducted UX research to identify design mistakes in an e-learning platform. The focus was given on usability aspects where they have identified clickmaps and scrollmaps are the most useful methods. The study of [31] shows there is a positive association between the satisfaction of e-learning platforms and students' performance in their grade. Nakamura et al. [30] characterized usability and UX evaluation techniques in the context of LMSs. Zaharias and Pappas [29] measured specific dimensions of UX in the context of LMS, which they listed four factors for UX in LMS. These include pragmatic quality, motivation and engagement, authentic learning, autonomy, and relatedness. Meanwhile, researchers also [18] claimed that LMSs such as Moodle, Sakai, ATutor, Blackboard, SuccessFactors, SumTotal, has shown similarity in terms of user experience. Our study, however, aims at exploring UX in online interactive e-learning.

3. MATERIAL AND METHOD

The UX research methodology ranges from qualitative research of experiences with in-depth interviews to quantitative data from questionnaires on the correlation among ratings of affect and technology perceptions [34]. Obtaining authentic qualitative data is a challenge in UX research [35]. Surveys and formal experiments are also used as quantitative research tools in UX studies. Quantitative user research methods seek to measure user behaviour in a way that can be quantified and used for statistical analysis. Interviews either conducted in structured, unstructured and semistructured manners are examples of qualitative research tools which are very useful to explore, seek, and get an in-depth understanding of the experience of an individual or a group of users. The scope of this study is investigating UX in online interactive e-learning where a teacher and students are connected to each other at the same time through the use of technologies; the Internet and teaching apps. Therefore, the above mentioned methods are the most significant ones. A visual programming class was taken as a case study. Data were collected through three methods namely observation, interview, and a survey on a focus group. Figure 1 illustrates the instruments used and expected outcomes of this exploratory study.

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Figure 1. Exploring UX in online interactive e-learning.

4. DATA ANALYSIS

4.1. Observation

The objective of using observation method in this study is to collect data about the behaviours of a teacher and students in the context of online interactive e-learning. The first author of this paper played a role as an observer by attending and participating in a class session. Only the class instructor was aware of the existence of the observer. The class was conducted on the GoToMeeting platform [36]. The tool enables users to meet with other users, via the Internet in real time. In this study, the instructor sent an invitation to visual programming students to join the interactive e-learning session. Like in any lectures in a brick-and-mortar classroom, the course instructor started the lecture by addressing the topic contents. The class instructor shared his screen with students and explained class materials by writing on his whiteboard using different colors as illustrated in Figure 2. The instructor also used additional apps such as Microsoft Paint to facilitate his teaching.



Figure 2. Instructor manually writes on his board while explaining the subject.

Other supporting materials from other sources were displayed as screenshots on the instructor's teaching screen as shown in Figure 3. Different colors were used. The interaction between students and the instructor occurred through chat and microphone features of the tool. If a student started to use a microphone feature, he/she would keep on asking a question using a microphone. Only a number of the students used a microphone feature in this observation. If anyone left the session, all members of the session will be notified. Most students used a chat feature to communicate with the instructor for asking questions or replying to the instructor's questions [37]. The instructor tried his best to answer all questions posted on the chat board. Using a chat message, a participant can send a message privately or publicly. They also expressed their emotions through texts such as "hehehe" for laughing. The chat feature was also used as a communication medium for a conversation among them.



Figure 3. Instructor manually writes on the screen for a further explanation using different colors.

Through the observation we discovered that students and a teacher can practically interact as if they are in a traditional classroom using provided technologies and facilities. Interaction in a physical world has been transformed or adapted into an artificial world. Socializing modes in a face to face interaction such as laughing and smiling has been digitized to fulfill the need. For example, by typing "hehehe" students have adopted the way how they express their emotions in the artificial world into the online interactive e-learning, and this displays the aspect of naturalness in the interaction.

A confidence level is normally can be assessed through the tone of voice, the presented idea, and how the idea is being presented. In a brick-andmortar classroom, a confident student often asks questions, demands for explanations, or gives opinion [38]. The findings presented in [39] showed that male students have a higher confidence level than female students. It was also observed in this study, that only male students used the microphone feature. This suggests that only students who are confident with their questions

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would use a microphone feature, and they are male students. However, quiet and shy students still have a chance to participate through a chat feature. The chatting feature allows female students to build their confidence level to actively involved in the learning process. Individual involvement in a class setting, as well as the quality of efforts, is a central role in a student's development [39,40].

4.2. Survey Results

A survey using online questionnaire was conducted on the focus group. Only one of the focus group participants never had any experience with online interactive e-learning. Participants were also asked if they are familiar with the technologies used in this study. Survey result shows that only 28.5% answered yes for that they are familiar with the technologies, while 71.5% answered somehow, and none had answered no. This illustrates the background of the focus group participants.

The focus group participants were asked about the type of devices they used to participate in the online interactive e-learning. They were given four multiple choice answers: laptop, smartphone, desktop computer and other. Survey result indicates that the majority of them were using laptops and smartphones. None of them had selected desktop computer and other as their answers. This indicates that mobile devices such as laptops and smartphones are more convenient for the online interactive e-learning. A UX questionnaire was also directed to explore UX scales 205 [6,41]. The scales being assessed in this study include perspicuity, attractiveness, efficiency, dependability, and stimulation. Table 1 presents a brief description of each UX scale which is tailored to online interactive e-learning. UX questions were prepared. The participants of the focus group were required to answer the questions using five Likert scales; strongly agree (SA), agree (A), neutral (N), disagree (D) and strongly agree (SD).

 Table 1. UX scales and its descriptions which are tailored to the online interactive e-learning.

UX scales	Description of each scale
Attractiveness	Users like or dislike with interactive
	e-learning.
Perspicuity	It is easy to get familiar and use
	technologies used in interactive e-
	learning.
Efficiency	Users can solve their tasks without
D 11'1'	Users feel in control of the
Dependability	interaction.
Stimulation	Interactive e-learning is exciting and
	fun.

Attractiveness is an important factor in UX. Don Norman, a pioneer of UX design, pointed out that products with a visually appealing design is rated more usable than they actually are by users, mainly because of the emotion influence [42]. The attractiveness elicits pleasant emotions. In the of online interactive context e-learning. attractiveness may excite students' emotions to learn and participate. The focus group was asked if the online interactive e-learning is more exciting and fun than a brick-and-mortar classroom. The result of the survey (see Table 2) shows that 57.2 % of the focus group participants responded with strongly agree and agree. This indicates that online interactive e-learning is attractive.

Table 2. UX on attractiveness factor.

Question	Frequency of Responses (%)				
	SA	А	Ν	D	SD
Having a class in online interactive e- learning is more exciting and fun than a face-to-face class setting	28.6	28.6	28.6	0	14.3

Perspicuity describes the pragmatic of a product [8]. Users may have positive emotions and attitude towards products, systems or contexts if they find they are easy to understand and use. In online interactive e-learning, students may have positive attitudes and positive emotions if they can use the technologies in the setting without details explanation on how to use it. Table 3 shows the frequency of the focus group for a question related to perspicuity.

Table 3. UX on perspicuity factor.

Question	Question Frequency of Response		onses	
	(%)			
	Yes Somehow No			
Do you need a detail	28.6	28.6	28.	
explanation about the			6	
technologies and apps used				
in online interactive e-				
learning?				

In HCI, efficiency is normally measured by the response time; how fast a user can complete a given task. Thus in measuring the efficiency in the context of online interactive e-learning, we ask students if they can retain what they learn in the online interactive e-learning with less effort. Table 4 shows that 85.8 percent of the focus group participants agreed that they can retain what they

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learn with less effort. None of the focus group participants strongly disagree or disagree with the statement.

Question	Frequency of Responses (%)				%)
	SA	Α	N	D	SD
I can retain what I learnt in online interactive e-learning with less effort	42.9	42.9	14.3	0	0

HCI has recognized the feeling of control as a key factor in how people experience interactions with technology [43]. It is known as dependability in UX research. Psychologically, being in control whether it be dealing with products, people or environments, it will definitely give positive emotions and generate positive attitudes of any human being. In this study, we explore the dependability in online interactive e-learning by asking questions related to the self-control in interaction. Results of the survey are presented in Table 5. The finding suggests that the online interactive e-learning allows students to feel that they have control in their interaction. This will increase their self-confident and desire to learn.

Table 5. UX on dependability factor.

Question	Freque	ency of I	Respons	ses (%)	
	SA	Α	N	D	SD
The private chat feature gives me a control on interaction in online interactive e-learning.	28.6	57.1	14.3	0	0
I have more freedom to ask any question compared to face- to face setting.	42.9	28.6	28.6	0	0
I feel I can express myself about the subject better in the online interactive e- learning more than face-to-face setting	28.6	28.6	28.6	14.3	0
I have confidence to ask a question in online interactive e- learning more than face-to- face setting.	14.3	57.1	14.3	14.3	14. 3

Stimulation is very important for any human being. Without stimulation, people feel bored, and cannot make any progress in their life. For students, stimulation is very essential to keep them focus on learning as well as retaining the knowledge that they gather. Studies have shown that colors can stimulate brain [44,45] for learning. Questions related to stimulation are presented in Table 6. Eighty-five percent of the focus group participants had strongly agreed that the different colors on the board stimulate their interest in learning. This indicates that the use of different colors give pleasure and stimulate interests in learning. This finding suggests that visualization which is can be easily presented or displayed in online interactive elearning rather than a brick-and-mortar classroom is a critical aspect in teaching and learning. As a proverb, "beauty is in the eye of the beholder," colors and patterns are parts of aesthetic pleasurable design, always appeals to a human visual sense [46,47]. Presented results also show that 85.7 percent of the focus group participants strongly agree and 14.3 percent of the participants agreed that the visuals of the apps increase their interests in the subject matter. The results also exhibit that conversation features such as chat in the online interactive e-learning stimulate interaction between students and a course instructor. Indirectly, this will create engagement between students and a teacher who is exercised in a face-to-face setting.

Table 6. UX on stimulation factor.

Question	Frequ	Frequency of Responses (%)				
	SA	А	Ν	D	SD	
The use of different	85.7	0	14.3	0	0	
colors stimulates my						
interest in learning.						
The visual of the	85.7	14.3	0	0	0	
apps appeal my						
interest in the						
subject more.						
Chat feature excites	71.4	14.3	14.3	0	0	
me to ask question/s						
to the class teacher.						

Furthermore, a concentration ability is always having a positive association with stimulation and positive emotions [48]. Participants were also asked if they can concentrate better on online interactive e-learning. The survey results (see Figure 4) show that the majority of the participants *strongly agree* and *agree* that they can concentrate better in this setting.

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Figure 4. Concentration in the online interactive elearning.

During the observation, it was recorded only certain students would use a microphone feature. The survey result which is shown in Table 7 exhibits that 51.7% of the participants strongly agreed that they would use a microphone feature whenever they feel confident with their questions. This result is in line with the observation result.

Table 7. The use of a microphone feature.

Question	Frequency of Responses (%)				
	SA	Α	N	D	SD
If I am confident with my questions, I would use a microphone rather than a chat message	51.7	14.3	28.6	0	0

On the other hand, when participants were asked to choose the best feature of the app for communicating with the class's instructor, 71.4% of the participant opted for a microphone, 14.3 % for chat, and 14.3% for web camera. This contradiction suggests, in spite of participants realized that a microphone feature is the best option for a medium of communication, shyness personality and lack of confident had hindered them. In order to explore whether a confidence level can be increased in online interactive elearning, a statement "I have confidence to ask a question in online interactive e-learning more than face-to-face" setting was given in a survey. More than 50% of the participants strongly agree with the statement (see Table 8). This indicates that the online interactive e-learning will be a shifting paradigm for boosting students' confidence level.

Table 8. Can the confident attitude can be achieved in online interactive e-learning?

offine interactive c-rearining.							
Question	Frequ	Frequency of Responses					
	SA	SA A N D SD					
I have the	51.7	14.3	14.3	14.3	0		
confidence to ask a							
question in online							
interactive e-							
learning more than							
face-to-face setting.							

The focus group was also asked if they have a choice to opt between an interactive online session and a face-to-face interaction, what type of the learning modes they would choose. Survey results show that 71.4% of the participants would opt for the interactive online session.

4.3. Interview Result

An interview session was conducted with the course instructor to get the insight of UX at the teacher's perspective. The instructor has over nine years of experience in teaching online courses and online sessions. Subjects taught with an interactive e-learning setup include courses in programming, computer networks, computer security, and advanced problem-solving courses such as data structures and algorithms. The instructor has a wide range of experience with the different online courses formats: complete online courses, blended courses, and Massive Open Online Courses (MOOCs). According to the instructor, the types of technologies involved in delivering the course are dependent on the nature of the course. Some courses require lecturing and topics explanation only, where students are not required to have any special tools or technologies to perform assignments other than their PC. In online interactive e-learning, the instructor ends up using four main tools. The first tool is any online meeting tool that allows conducting live sessions, such as GoToMeeting. The instructor favored GoToMeeting tool as it allows for several things:

- The instructor can conduct online session, ٠ where students can listen to instructor lectures.
- Students can watch the instructor's PC screen and see presented explanations such as class slides, or handwritten explanations.
- Students can ask questions via their • microphones and computer systems.
- Students and the instructor can use the chatting options to exchange text, questions and answers, in a dedicated text chatting area.
- Students can present to the entire class and presenter access mode can be given a student, so they can present their projects to the class and the rest of the class can listen and participate during the discussions.
- The presenter whether the instructor or the student can grant anyone in the online session access to his keyboard/mouse remotely to help explain some issue related to the class such how to navigate around some application menu and so on.
- The instructor can record the session, and make it available to the students that who could not

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they think it is them alone who do not understand a certain topic. Online meeting tools make the instructor and students aware of the entrance and leaving of attendees to the online session. The number of attendees is showing on the screen and changes based on the number of attending students. Also, the names of attendees are listed in a dedicated section. Table 9 shows the instructor evaluation for the UX in online interactive e-learning. The rating 5 means strongly agree and moving toward 1 strongly disagree. In general, the instructor showed a strong support and satisfaction for using online interactive e-learning setup.

Table 9. UX evaluation by the instructor.

No	Question	Rating
1	The current technologies for an	4
	interactive e-learning are attractive.	
2	The tools are easy to get familiar with	5
	and easy to be used.	
3	The tools eliminate many unnecessary	4
	efforts.	
4	Participants in online interactive e-	5
	learning have control of the interaction	
	mode.	
5	Teaching in online interactive e-	4
	learning is exciting and fun.	
6	There is creativity in technologies used	4
	in online interactive e-learning.	
7	Features needed in the interactive e-	5
	learning for better teaching experience	
8	The Instructor is able to extend the	5
	lesson coverage in an interactive e-	
	learning	

Students can just listen to the lecture, participate in the discussion, or watch the recording which avoids the instructor the need to repeat lectures. In addition, students can join from anywhere. The lecture time can easily be extended. Also with additional preparation, the creativity options provide better experience compared with face to face, the instructor can go over more examples, also in technology classes specifically, sharing screens, swapping the control over PCs allow another level of learning. The interview showed that the current tools lack the support of certain features that would provide better UX for the instructor and students. Examples of such features are customized whiteboard application for online interactive setup. A whiteboard application that allows typing text, not just handwriting, and allows saving boards and explanations, switching between them, linking them, adding images to them, would facilitate the teaching process and grant the instructor more abilities in delivering his course. This indicates that



attend, or to allow the students to view the session for more than one time and at their own pace.

The second tool that helps the instructor during his lecture is the Wacom Intuos pen & touch M graphics tablet. It allows him to explain things by handwriting and drawing, which speeds up the explanation process for certain cases according to the instructor. The third tool that goes along with the Wacom tablet; a drawing application that mimics the whiteboard. Examples of such applications are Microsoft Paint and Windows InkWorkspace. The fourth tool that comes naturally is some learning management system that helps in tracking the course material, posting the videos and assignments (ex. Moodle, Blackboard, etc). The instructor reported that some classes are more specialized and require additional tools or packages or subscriptions. For instance, in his applied ethical hacking course, he required the students to have a subscription to a cloud-based environment that allows the students to exercise ethical hacking labs, where remotely accessible virtual machines with loaded tools on them that cover the needs for that class. The same case applies to some of his programming courses, where the instructor and students ended up using software development packages to exercise programming. According to the instructor, the main features that impact the technology selection for online and interactive elearning include screen sharing, recording class lecture, allowing sharing anything including a writing board, writing tools on the screen using a stylus pen, marking with different colors, taking screenshots of any image or file and draw on it by hand, and swapping screen sharing between the instructor and a student to allow students to present if they want to, and chatting feature. Although chatting is optional it is a very useful feature for shy students. Despite it is not required to explain to the students how to use the technologies involved in delivering the class, exceptions exist when dealing with specialized courses like the applied ethical hacking, where there are special tools that require some domain knowledge and training.

Online meeting tools provide the instructor with capabilities to interact with the students' questions. Besides the ability to ask questions via voice, a student can send their questions using the chat area privately and publicly. Private communication between the instructor and the student during class session provides a higher chance for shy students to ask questions and avoids them the embarrassment if

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a better tool for online interactive e-learning is needed to have a better UX for a teacher.

5. FUTURE TRENDS IN ELEARNING

5.1 Video-Based Learning

eLearning gained momentum with the proliferation of eLearning tools and platforms. MOOC-based platforms such as eDX, Coursera, Udaciy, and Udemy in addition to traditional learning management systems such as Blackboard and Moodle have taken full advantage of video-based learning [49]. The support of video-based learning established the base for MOOCs and flipped learning model in general. The course material of video recording is prepared once. The trend is toward using short videos linked with the material context to keep the learning focused.

5.2 Adaptive learning

Adaptive learning is a new trend in eLearning [50]. Technologies facilitate adaptive learning by allowing customized learning according to the level of the learner. This includes adaptive assessments based on strong analytics of the material and the performance of learner [51]. With adaptive learning, learners are more encouraged as they see material more customized to their needs and in addition to being challenged by avoiding presenting material that is mastered by the learners.

5.3 Micro Learning

Micro Learning is a new trend [52]. Learners are no longer directed toward completing full programs, but rather a track, a path, a course, or a subspecialty. Micro-learning is a new trend in online learning. Learners take one or a few courses to master a skill or a specific competency. Udemy represents a perfect example of this model.

5.4 Gamification and Game-Based Learning

Game-based learning is a new trend to motivate learners to engage better in the learning process [53]. Gamification has improved the retention rates of learners.

6. CONCLUSION

HCI is a multidisciplinary field and it aims at assessing how computing technologies are used in all sort of domains including education. UX is one of the major aspects of HCI. As the education field is moving from a traditional into a digitized setting such a computer-based learning, e-learning, mlearning as well as interactive e-learning, there is a need to study UX within the new digitized setting. This research studied UX in online interactive elearning.

Findings of this study suggest that online interactive e-learning offers a joyful setting for teaching and learning, increase students selfconfidence, facilitates engagement between a teacher and students through its interactive features, and provides a mechanism to store and distribute tacit knowledge by recording the online session automatically. Furthermore, the study also revealed that students can learn and retain knowledge with less efforts, and teachers have a chance to elaborate on the subject matters using various supporting materials. It is no doubt that all benefits of a traditional classroom can be achieved in online interactive e-learning.

Despite the abilities of existing technologies in conducting online interactive e-learning, the current technology lacks of features such as e-whiteboard and the ability to embed multimedia sources dedicated for the interactive online setting.

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