User Experience Study on First Aid Training Using Virtual Reality

Narmeen Alhyari[1†] and Shaidah Jusoh [2††],
n.alhyari@psut.edu.jo shaidah.jusoh@xmu.edu.my
[†]School of Computing Science, Princess Sumaya University for Technology, Amman, Jordan,
[††]School of Electrical Engineering and Artificial Intelligence, Xiamen University Malaysia, Sepang, Selangor, Malaysia

Abstract
This study investigates the user experience (UX) of first aid training using virtual reality (VR) technology. As VR continues to be adopted for educational and training purposes, it is important to understand how learners perceive and engage with this medium for developing critical skills, such as first aid. In this study, we developed a VR application called "VR First Aid" that includes training modules on three emergency scenarios: heatstroke, shock, and seizure. The application has both tutorial and hands-on training components. We conducted a UX study by administering a questionnaire to participants. The UX of learning through the VR application was then compared to using a traditional e-book format. Results indicate that participants perceived stronger internal behavior control with the e-book but reported better confirmation, engagement, enjoyment, and intention to use when training with the VR system. Gender differences were also explored, revealing that female participants expressed greater interest in learning through the VR platform compared to male participants. These findings provide insights into the strengths and limitations of VR-based first aid training compared to traditional methods. Implications for the design and deployment of VR training systems are discussed, with a focus on optimizing the learner experience and learning outcomes.

Keywords:
Virtual Reality, User Experience, Training.

1. Introduction

The modern world has been revolutionized by the rapid change and development of technologies such as information and communication technologies (ICT) [11]. The use of ICT has significantly altered all aspects of human life, including learning environments. Digitising technology has had a significant impact on many aspects of our lives. Virtual reality (VR) technology has recently increased in popularity, making it much more accessible and affordable. Certain forecasts expect that by 2025, the VR market will reach $692 billion (USD), including hardware, networks, software, and content. The VR industry will reach $1 trillion (USD) by 2035, and VR technology will be the next wave of technology in the predefined time frames [20]. Recent developments in VR technology have made it easier and less expensive to create, use, test, and deliver interactive VR apps. The fastest-selling VR device is the is the standalone VR headset so called Oculus Quest 2, which was released in 2021 [24].

Medical education requires both theoretical instruction in a classroom setting and practical experience in a hospital setting. The hospital approach has drawn criticism for being both overly expensive and unworkable. Digital education is seen as an alternative. Digital education covers a variety of techniques, from straightforward ones like converting a book to a PDF file to more complicated ones like mobile learning or mobile digital education, virtual patients, virtual doctors, gamification, massive open online courses, and digital psychomotor skills trainers [12].

VR is a computer-generated digital environment that provides three-dimensional (3D) visual opportunities for users to display and communicate in a virtual environment [8]. VR technology is a new path in the creation and use of medical education training resources for the purpose of enhancing communication and skills among physicians and healthcare workers [21]. Froland, et al. [9] investigated the possibilities of employing VR as an approach to improve and interact in the healthcare industry. VR may modify healthcare standards by improving the adaptability of assessment and training methods [8].

It is not easy to set up real-life simulations in the medical field. VR is a great alternative because it can provide content in an immersive environment, outstanding retention of information, focusing on actual observations [9]. Furthermore, VR simulations are realistic and cost-effective. For example, by using a simulator for training, the number of supervised hours spent using necessary medical equipment in a medical operating room can be reduced [13]. In addition, it elaborates on a training method for learners and trainers. With VR technology, learners and instructors can practice unexpected circumstances and work without having to wait for appropriate materials. Both cognitive and non-cognitive performance can be constantly improved. If teachers are required to use traditional real-world training methods to create the same authentic experience, the cost may be significantly higher than employing a virtual learning simulation. In comparison to the traditional learning strategy, the findings from the research community in this area indicate there are significant outcomes for user interest and cognitive function with total simulation usage [15].

Manuscript received August 5, 2024
Manuscript revised August 20, 2024
https://doi.org/10.22937/IJCSNS.2024.24.8.3

VR has the potential to enable non-experts to learn and practice crucial first aid skills without constant supervision from medical professionals by constructing a controlled and immersive environment. Knowledge of first aid contributes to the creation of a safe, secure, and healthy workplace by creating confidence in people, their families, employees, and associates. A basic understanding of first aid is quite beneficial when dealing with stressful situations. They not only provide medical assistance but also radiate confidence, which is essential in times of tragedy. Knowledge of first aid benefits both the individual and society. Despite the evident potential of VR in medical education, there is a lack of comprehensive research in this specific domain, which underscores the need for this study.

The objective of this study is to explore the effectiveness and benefits of using VR technology for first aid training through a user experience (UX) study. By focusing on first aid training as a case study, this study aims to demonstrate the viability of VR technology as an innovative tool to enhance medical education and improve the overall quality of training for healthcare professionals and non-experts alike.

2. Technical Background

From a technological standpoint, VR is an immersive collection of numerous innovative technologies, as it is an integration of several forms of multimedia, including text, music, photos, and video, into a 3D world [2]. The difference between VR and conventional multimedia is its interactive function. VR is a 3D environment with a variety of technologies, real-time updates, and human interaction via various devices. With an internet connection, multiple users can now take part in the same VR environment at once or in various social activities and produce various kinds of virtual content. Users experience immersion through their interaction with the 3D environment that VR is projecting, not in a purely technological sense but rather through their interaction with the environment. It is a user's perception of cognitive immersion in the VR environment. Users act within the VR environment as if they are participating in actual events (real life), although they realize, they are not in the cognitive context [14].

2.1 Immersion and interaction

Two main characteristics of VR that are seen as the most significant and widely acknowledged are immersion and interaction. Immersion emphasizes realism and diverse environmental simulations. It focuses on the genuine interaction between various users in the VR world. With computer-generated 3D visuals, immersion describes the real sense of being present in the virtual environment. People often use words like "immersive virtual environment," "virtual worlds," and "meta-verse" to describe VR. This is because VR is a 3D computer simulation of the real world that includes model objects like buildings and landscapes.

Numerous depictions and visual simulations serve as the main sources of immersion. These include visual perception as well as audible, tactile, and motion perception. The 3D immersive worlds in VR demonstrate that they provide a better sense of presence [14]. For instance, in a scenario of being in a room, visitors function as avatars; such avatars can be in human or animal shapes. The body may have different facial and physical features, such as being fat, thin, tall, short, etc. Actions such as running, walking, riding, and teleporting to multiple places are considered commands in a virtual environment (VE). The audio in the background adds to the feeling of immersion in space. Furthermore, photographs and videos from websites such as YouTube can also be streamed into a virtual space. VR is about imagination. Everything that a user can imagine in their imagination can be planned out.

With VR, a user can manipulate his or her imagination within a generated or virtual environment. For instance, he or she can position himself or herself in the VE and have the experience of grabbing an object with his or her hand, putting the object in a place, throwing an object, or holding an object in the VE. In this scenario, the user feels that he or she has grabbed the object in the real world.

The interaction between a user and a system application in VE is different from a typical interaction between a human user and a computer system, such as steering, clicking, and typing. This implies the concept of the users' experience of being immersed in the VE [9]. In short, immersion, imagination, and interaction can summarise the main characteristics of VR technology [2]. A VE has five elements. These include purpose, place, platform, population, and profit. Purpose refers to the interaction content; more precisely, whether the information or data used in VR is used for a specific reason. Place is the place of communication, and the assessing environment may be temporarily or permanently virtual. Platform is the interaction design that focuses not just on contemporary, antiquated, or both, but also on different platforms. Population refers to the interaction system, which focuses on separating the type of target consumer market along with the number of users, and finally Profit refers to engagement and focuses on how users can gain economic benefits from VR. There is no doubt that VR is an intriguing and useful technology that makes it possible to learn new abilities in a safe environment. VR enables the simulation of events, allows medical students to practice various abilities and make mistakes without feeling guilty or responsible, and facilitates various conditions in healthcare training.

2.2 Challenges of Implementing VR Content

It is worth noting that implementing VR in education has its own challenges and issues. These include a lack of experts in the field, high implementation costs, and/or overhead costs. The expertise issue occurs when course instructors do not have technical expertise in using VR technology, which may not help them facilitate students using VR effectively. If students cannot manage VR technical challenges during the learning process, this may cause elevated levels of dissatisfaction in the learning process. As a result, it will reduce their learning interests and motivation. According to authors in [26], using VR solutions in the classroom also incurs significant expenses in terms of configuration time, system costs, and training for both learners and teachers. Sometimes learning institutions do not facilitate or support 3D virtual technology because the top management of the institutions has already considered that VR requires huge implementation costs. Producing 3D virtual course content consumes more time than producing regular online course content [23]. However, rapidly decreasing prices make HMD systems affordable for people, clinics, and care homes [3]. In the context of First Aid training, the cost of preparing the VR content is much cheaper compared to the cost of having physical training at the hospital.

3. Research Method

This study was conducted in two phases: developing our own VR First Aid Prototype and conducting UX study using the developed VR First Aid.

3.1 Developing VR First Aid Prototype

Despite the benefits of using VR in medical training is obvious, very few studies had addressed UX in using VR-based applications. For the purpose investigating user experience, we developed a VR first-aid training application. In this study, we used the Unity 3D engine and Oculus Quest Integration. The steps involved in designing and developing our own VR First Aid is illustrated Figure 1 There are five major steps: planning, designing, creating, implementing, and testing. Our developed VR First Aid simulates a virtual environment where a user has an opportunity to gain experience and practice first aid principles.

Fig. 1. Design and development phases of the prototype

During the planning phase, we defined the concept and specifications required to build the application, also known as an assignment. This procedure should be conducted with the utmost diligence, as it serves as the foundation for subsequent procedures. We laid the foundation for the entire application during the design phase, which was divided into three levels. The first step is to determine the materials required for the application, including the setting, characters, objects, and animation. The second step involves assigning the necessary materials for each of the afore-mentioned modules. The third level consists of defining the primary entities and required actions for each class. For the creation phase, we integrate the Unity project with Oculus Quest, designing models, shaded and textured models, texts, animation, audio, scripts, and lighting, as well as incorporating the Unity project with Oculus Quest. We deployed our Virtual Aid application on the Oculus Quest using Unity by connecting the device via USB and enabling USB debugging on the computer.

The final phase, that is the testing phase, was conducted in a continuous and exhaustive manner throughout the duration of the project. We conducted preliminary testing with three human participants. We observed the human subjects as they used the application and took notes on their reactions, responses, and remarks, which we recorded as subject feedback. The VR application was then equipped with functional and practical feedback (such as graphics, the flow of communications, etc.). Our VR First Aid application has only three modules: shock, heatstroke, and seizure (seizure is a sudden, uncontrolled burst of electrical activity in the brain [16]). Figure 2 shows the main page our VR First Aid application, and Figure 3 – Figure 5 illustrate the training procedure of the first aid.

Fig. 2. Main page of VR First Aid, presenting three modules to the VR user.

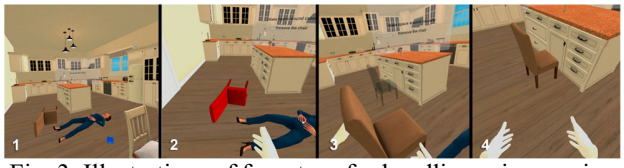


Fig. 3. Illustrations of few steps for handling seizure using VR First Aid.

Fig. 4. Illustrations of few steps for handling shock using VR First Aid.

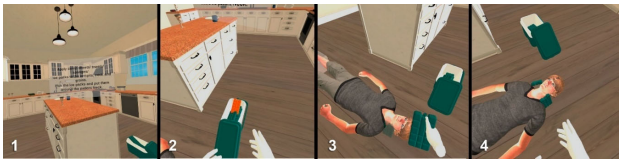


Fig. 5. Illustrations of few steps for handling sunstroke using VR First Aid.

Each module simulates an atmosphere or circumstances that users may experience if a casualty happens in front of them. In addition to the visual immersion environments, modules were designed to show users step-by-step how to apply first aid to the casualty. Users must accomplish the training by interacting with the system. In the future, we will enhance the application to provide a broader range of first aid models, such as choking, CPR, bleeding, burns, and so on.

3.2 Conducting User Experience Study

To explore the use and acceptance of Virtual aid, we also conducted a comparative study, in which we used electronic books (an E-book/EB) a well-known method for learning first aid as a second method. We compared both learning platforms and sought knowledge on user experiences of using Virtual Aid. The objective is to identify factors that affect users' intentions to use VR-based applications to learn in the future. Assessment was conducted using evaluation factors that were derived from information system theory/studies. These factors include perceived ease-of-use, perceived behavioral control, attitude [4], perceived usefulness [1], confirmation and satisfaction, and perceived enjoyment [25]. Furthermore, additional variables such as user engagement [6], users' experience of presence [4], and attention [5] were also formulated based on the literature on VR and AR. Consequently, we performed four analyses. The first analysis is an initial analysis to gain an overview of the VR application along with users' psychometric assessments of Virtual Aid. The second analysis aims to determine the willingness of learners to utilize the Virtual Aid application for first-aid training, and their inclination to use other VR training systems for learning and training purposes. The third analysis aims to identify practical evidence that can assist VR technology developers in broadening the application of VR in educational settings. Finally, we would like to compare two learning methods or platforms, Virtual Aid and E-book and recognize their motivation.

3.3 Human Subjects

A cohort of participants was selected from a variety of backgrounds, to use and engage with our VR First Aid. The variety of background is essential in this sampling because the prospective users this VR first aid training application could come from various background. Here, the question of the optimal number of participants required for usability testing is raised. The number of participants was deemed sufficient, as it was determined that testing between 5 to 8 users covers approximately 85% of the identified usability issues. A study conducted by Mitre, Muñoz, and Cardona [17] which investigated various literature reviews pertaining to user experience assessments also reported that the range of participants is 10 to 25. However, when it comes to statistically significant studies and evaluating performance measures like success rates, it is advised to have 20 or more participants. Taking this into consideration, we opted to include 22 individuals (12 females and 10 males) to conduct comprehensive testing and evaluation of our VR First Aid application. To better understand the expectations of potential users of Virtual Aid, we gathered data relevant to their subjective assessments of the system. To evaluate users' subjective perspectives, we employed a questionnaire survey, referencing studies on information systems or applications [18], [25], user experiences in virtual reality [18], [4], and the effectiveness of dynamic learning compared to E-books. This approach allowed us to enrich our understanding of users' perceptions and enhance the content of static learning materials.

3.4 Experimental Procedure

All participants were requested to peruse the first aid training E-book with the title *First Aid Manual: The Step-by-Step Guide for Everyone* [19]. Sufficient time was provided for them to comprehend the information presented in the E-book. Subsequently, upon finishing the reading, participants proceeded to fill out the initial section of the questionnaire. Following this, they engaged with the VR application, Virtual Aid, to learn first aid. We provided explanations and guidance to help them become familiar with VR devices. Once participants completed the assigned learning module using the VR devices, they were prompted to fill out a questionnaire to give their feedback. The questionnaire items cover attractiveness and ease of use of the application, easy and enjoyable learning, self-control in learning, increasing cognitive ability, automated assistance in learning, staying focused in learning, and an interest in learning in the future. On average, each session lasted approximately 4.17 minutes. It is worth noting that one participant experienced dizziness during the experiment and

was not able to complete the third module of the training. The measurements used in this study are psychometric structures developed and updated from related theories of acceptance technology for VR and AR applications [1]. The assessment elements used include perceived usefulness (PU), perceived ease-of-use (PEOU), perceived enjoyment (PE), perceived behavioural control (PBC), perceived internal control (PIC), attitude towards the system (ATT), satisfaction (SAT), confirmation (CON), engagement (ENG), attention (ATTEN), presence (PRE), behavioural intention to use the system (BIU for Virtual Aid), and behavioural intention to use other VR training systems (BIU for VR training technology) [4]. Basic demographic information, such as age, gender, education level, previous experience with VR technology, and level of personal innovativeness [4], were also measured. We used 1–5 Likert scales (e.g., 1: strongly disagree to 5: strongly agree) to measure the assessment elements.

4 Results and Discussion

4.1 Data Collection

The survey was conducted to gather quantifiable data pertaining to the participants' impressions, degrees of satisfaction, and preferences. The distribution of demographics of the participants was as follows: fifty-five percent (55%) were females, and forty-five percent (45%) were male. Sixty-eight percent (68%) of the participants were in the range of 18 to 24 years old. Sixty-four percent (64%) were students, and twenty-seven percent (27%) were employees. Only nine percent (9%) of the participants were self-employed. Regarding the educational level, eighty-two percent (82%) have a bachelor's degree, nine percent (9%) have a master's degree, and nine percent (9%) have a Ph.D. All participants had heard about VR, however, out of twenty-two participants, fifteen of them never had experience using VR applications for any sort of training.

4.2 Preliminary Examination and Descriptive of Data

We conducted normality checks, such as skewness and kurtosis diagnosis, prior to the data analyses to ensure the data distribution is normal. Cronbach's alpha was used to assess the reliability of the assessment elements. The Cronbach alpha coefficient does not have precise ranges; it is assumed to be acceptable if the value is equal to or above 0.70. Therefore, all our assessment elements in both learning methods, Virtual Aid and first aid E-book, are acceptable since they are greater than 0.70. Table 1 and 2 present the details.

Table 1: Cronbach's alpha of research assessment elements for Virtual Aid

		No. of Items	Cronbach's Alpha
1.	PU	3	0.728
2.	PEOU	4	0.713
3.	PE	3	0.847
4.	PBC	3	0.848
5.	PIC	9	0.751
6.	ATT	4	0.945
7.	SAT	4	0.826
8.	CON	3	0.752
9.	ENG	9	0.774
10.	ATTEN	10	0.750
11.	PRE	3	0.842
12.	BIU for Virtual Aid	3	0.825
13.	BIU for VR	3	0.747

Table 2: Cronbach's alpha of research assessment elements for first aid E-book

		No. of Items	Cronbach's Alpha
1.	PU	3	0.755
2.	PEOU	4	0.960
3.	PE	3	0.903
4.	PBC	3	0.849
5.	PIC	9	0.833
6.	ATT	4	0.893
7.	SAT	4	0.929
8.	CON	3	0.731
9.	ENG	9	0.939
10.	ATTEN	10	0.924
11.	BIU for first aid E-book	3	0.934

Obtained results indicate that participants rated Virtual Aid as positive. They considered our Virtual aid useful, easy, and enjoyable to use. The results also show participants had an optimistic attitude, satisfaction, and confirmation with the application. After having an experience with VR First Aid, they reported that they were willing to use the Virtual Aid application to learn first aid in the future. The results also revealed that if VR technology was available for them, they were also more likely to use similar VR-assisted training programs to learn other subjects (see Table 3). Nevertheless, participants did not pay much attention to the visual content of the Virtual Aid, with a mean value of 3.55, which is closer to the neutral perception based on the Likert scale.

Table 3: Descriptive stats of research assessment elements for Virtual Aid

		Item Average Means (SD)
1.	PU	4.36 (0.67)
2.	PEOU	4.49 (0.49)
3.	PE	4.44 (0.61)
4.	PBC	4.47 (0.57)
5.	PIC	4.38 (0.48)
6.	ATT	4.85 (0.45)
7.	SAT	4.90 (0.26)
8.	CON	4.67 (0.46)
9.	ENG	4.29 (0.50)
10.	ATTEN	3.55 (0.40)
11.	PRE	4.24 (0.80)
12.	BIU for Virtual Aid	4.26 (0.85)
13.	BIU for VR	4.45 (0.63)

Even though participants classified the first aid E-book as satisfactory, perceived ease of use, perceived behavior, and internal control, and they have no intention of using the first aid E-book to learn first aid, with a mean value equal to 1.88. This is closer to the "disagree" interpretation based on the Likert scale, as shown in Table 4.

Table 4: Descriptive stats of research assessment elements for first aid E-book

		Item Average Means (SD)
1.	PU	3.48 (0.53)
2.	PEOU	4.89 (0.31)
3.	PE	2.91 (0.62)
4.	PBC	4.91 (0.26)
5.	PIC	4.82 (0.33)
6.	ATT	3.73 (0.65)
7.	SAT	3.50 (0.70)
8.	CON	2.39 (0.95)
9.	ENG	2.52 (0.97)
10.	ATTEN	2.28 (0.91)
11.	BIU for first aid E-book	1.88 (1.09)

4.3 Comparative Analysis

To assess participants' UX and impressions of the two distinct methods of learning first aid, we used multiple separate sample t-tests, to see if there was any difference between the assessment elements. The results showed that there were statistically significant differences in perceived behaviour control (PBC: t (29) = -3:301, $p < 0.001$), satisfaction (SAT: t (27) = 1.398, $p < 0.001$), perceived ease of use (PEOU: t (35) = -3.225, $p < 0.005$), attitude (ATT: t (38) = 6.657, $p < 0.05$), and attention (PEOU: t (29) = 6.035, $p < 0.05$) between the two methods of learning first aid. Participants perceived better behaviour control (M = 4.91, SD = 0.26), and internal control (M = 4.82, SD = 0.33) in the first aid E-book than the Virtual Aid; (PBC:M = 4.47, SD = 0.57), (PIC:M = 4.38, SD = 0.48). Nevertheless, the results indicate that participants had better confirmation (CON: M = 4.67, SD = 0.46), intention to use Virtual Aid (BIU for Virtual Aid: M = 4.26, SD = 0.85), engagement (ENG: M = 4.29, SD = 0.50) and perceived enjoyment (PE: M = 4.44, SD = 0.61), in using VR First Aid compared to reading the first aid E-book; (CON: M = 2.39, SD = 0.95), (BIU for E-book: M = 1.88, SD = 1.09), (ENG: M = 2.52, SD = 0.97), and (PE: M = 2.91, SD = 0.62); see Table 5 for more details.

Table 5: User evaluation on first aid learning grouped by Virtual Aid and E-book

		Virtual Aid	first aid E-book	Mean diff.	*df*	*T*	*P*
1.	PU	4.36 (0.67)	3.48 (0.53)	0.879	40	4.802	.398
2.	PEOU	4.49 (0.49)	4.89 (0.31)	-0.398	35	-3.225	**.002****
3.	PE	4.44 (0.61)	2.91 (0.62)	1.530	42	8.248	.484
4.	PBC	4.47 (0.57)	4.91 (0.26)	-0.439	29	-3.301	**.000****
5.	PIC	4.38 (0.48)	4.82 (0.33)	-0.439	37	-3.516	.091
6.	ATT	4.85 (0.45)	3.73 (0.65)	1.125	38	6.657	**.017***
7.	SAT	4.90 (0.26)	3.50 (0.70)	1.398	27	8.780	**.000****
8.	CON	4.67 (0.46)	2.39 (0.95)	2.273	30	10.131	.139
9.	ENG	4.29 (0.50)	2.52 (0.97)	1.773	32	7.627	.080
10.	ATTEN	3.55 (0.40)	2.28 (0.91)	1.273	29	6.035	**.033***
11.	BIU for Virtual Aid/ E-book	4.26 (0.85)	1.88 (1.09)	2.379	40	8.051	.930

*** Difference was significant at the 0.001 level (2-tailed)
** Difference was significant at the 0.005 level (2-tailed)
* Difference was significant at the 0.05 level (2-tailed)

4.4 Gender Factor in Using Virtual Aid

Researchers such as Cimadevilla, José Manuel, and Laura Piccardi [7] and Geary and David suggested that males are better at spatial abilities than females. In addition, Tang et al. [22], reported that males have better mental abilities to manipulate two-and three-dimensional shapes

than females. Males and females are also distinct in their techniques of space navigation. Males depend more on spatial navigation vectors, while females use landmarks as spatial cues. Males are likely to outdo females in unfamiliar environments during space navigation. These may have an impact on various levels of first aid experience; their views on the use of VR could differ in both the actual and virtual worlds [10].

Taking the mentioned factors into consideration, the UX and perception of VR-assisted training systems could be affected differently. Therefore, we also examined the gender gap in using Virtual Aid training applications. To compare male and female participants, we used several independent sample t-tests. The results for Virtual Aid suggest that gender differences in performance were statistically important in PRE (t (11) = -4.671, $p < 0.01$)), and PE (t (11) = -6.012, $p < 0.05$)). Female participants perceived higher levels of enjoyment (M = 4.89, SD = 0.16), behavioural control (M = 4.86, SD = 0.30), and sense of presence (M = 4.78, SD = 0.30), compared to their male counterparts (PE: M = 3.9, SD = 0.50), (PBC: M = 4.00, SD = 0.44) and (PRE: M = 3.60, SD = 0.75); see Table 6.

Table 6: User Evaluation on Virtual Aid grouped by gender.

		Virtual Aid	first aid E-book	Mean diff.	*Df*	*T*	*P*
1.	PU	4.50 (0.50)	4.25 (0.79)	0.250	19	.897	.138
2.	PEOU	4.50 (0.53)	4.48 (0.48)	0.021	19	.096	.622
3.	PE	3.90 (0.50)	4.89 (0.16)	-0.989	11	-6.012	**.028+**
4.	PBC	4.00 (0.44)	4.86 (0.30)	-0.861	15	-5.216	.628
5.	PIC	4.41 (0.37)	4.35 (0.58)	0.059	19	.291	.370
6.	ATT	4.80 (0.63)	4.90 (0.25)	-0.096	11	-.451	.244
7.	SAT	4.88 (0.32)	4.92 (0.22)	-0.042	16	-.350	.488
8.	CON	4.67 (0.44)	4.67 (0.49)	0.000	20	.000	.577
9.	ENG	4.08 (0.55)	4.47 (0.40)	-0.394	16	-1.891	.468
10.	ATTEN	3.43 (0.24)	3.66 (0.48)	-0.228	17	-1.448	.114
11.	PRE	3.60 (0.75)	4.78 (0.30)	-1.178	11	-4.671	**.006***
12.	BIU for Virtual Aid	4.07 (0.89)	4.42 (0.83)	-0.350	19	-.949	.787
13.	BIU for VR	4.60 (0.38)	4.33 (0.78)	0.267	17	1.047	.053

* Gender difference was significant at the 0.01 level (2-tailed)
\+ Gender difference was significant at the 0.05 level (2-tailed)

4.5 Gender Factor in Using First Aid E-book

The same approach was also used to compare male and female participants for the first aid E-book method of learning. The results suggest that gender differences in performance were statistically important in PBC (t (14) = 0.106, $p < 0.05$)). Female participants perceived slightly higher levels of attitude (M = 3.88, SD = 0.67), compared to their male counterparts (ATT: M = 3.55, SD = 0.61); see Table 7.

Table 7: User Evaluation on first aid E-book grouped by gender.

		Virtual Aid	first aid E-book	Mean diff.	*Df*	*T*	*P*
1.	PU	3.47 (0.55)	3.50 (0.54)	-0.033	19	-.143	.956
2.	PEOU	4.90 (0.32)	4.88 (0.31)	0.025	19	.186	.782
3.	PE	2.83 (0.61)	2.97 (0.64)	-0.139	20	-.517	.952
4.	PBC	4.97 (0.11)	4.86 (0.33)	0.106	14	1.040	**.036***
5.	PIC	4.84 (0.27)	4.80 (0.38)	0.048	20	.344	.356
6.	ATT	3.55 (0.61)	3.88 (0.67)	-0.325	20	-1.190	.990
7.	SAT	3.60 (0.68)	3.42 (0.73)	0.183	20	.608	.578
8.	CON	2.53 (0.97)	2.28 (0.95)	0.256	19	.620	.708
9.	ENG	2.40 (0.96)	2.62 (1.01)	-0.220	20	-.525	.579
10.	ATTEN	2.15 (0.88)	2.39 (0.95)	-0.242	20	-.619	.739
BIU for Virtual Aid/ E-book		1.87 (1.14)	1.89 (1.10)	-0.022	19	-.046	.852

* Gender difference was significant at the 0.05 level (2-tailed)

4.6 Gender-based Comparative Analysis on Virtual Aid and E-Book

For a further analysis, several independent sample t-tests were performed on assessment elements to compare males' and females' perceptions towards learning through the Virtual Aid application and first aid E-book. The findings indicate that male participants perceived ease of use (t = 2.085, $p < 0.05$)) and satisfaction (t = 5.379, $p <$ 0.05)) differently in the two methods of learning. They had perceived higher degrees of usefulness (M = 4.90, SD = 0.32) in using the first aid E-book, compared to the virtual aid application (PEOU: M = 4.50, SD = 0.53). However, they had perceived higher degrees of satisfaction (M = 4.88, SD = 0.32) in using Virtual application compared to first aid E-book (SAT: M = 3.60, SD = 0.68), see Table 8.

Table 8: Research constructs grouped by Virtual Aid and E-book for Male

		VA (n=10)	E-book (n=10)	Mean diff.	*Df*	*T*	*P*
1.	PU	4.50 (0.50)	3.47 (0.55)	1.033	18	4.389	.747
2.	PEOU	4.50 (0.53)	4.90 (0.32)	-0.400	15	-2.058	**.022***
3.	PE	3.90 (0.50)	2.83 (0.61)	1.067	17	4.268	.521
4.	PBC	4.00 (0.44)	4.97 (0.11)	-0.967	10	-6.692	.082
5.	PIC	4.41 (0.37)	4.84 (0.27)	-0.433	17	-2.996	.122
6.	ATT	4.80 (0.63)	3.55 (0.61)	1.250	18	4.498	.316
7.	SAT	4.88 (0.32)	3.60 (0.68)	1.275	13	5.379	**.025***
8.	CON	4.67 (0.44)	2.53 (0.97)	2.133	13	6.316	.203
9.	ENG	4.08 (0.55)	2.40 (0.96)	1.678	14	4.811	.466
10.	ATTEN	3.43 (0.24)	2.15 (0.88)	1.280	10	4.456	.066
11.	PRE	4.07 (0.89)	1.87 (1.14)	2.200	17	4.831	.837

* Gender difference was significant at the 0.01 level (2-tailed)
+ Gender difference was significant at the 0.05 level (2-tailed)

On the other hand, female participants showed statistical significance in satisfaction ($t = 6.781, p < 0.001$)), attitude ($t = 4.947$, $p < 0.005$)), perceived enjoyment ($t = 10.007$, $p < 0.05$)) and engagement ($t = 5.923$, $p < 0.05$)). Furthermore, they perceived a higher degree of satisfaction (M = 4.92, SD = 0.22), attitude (M = 4.90, SD = 0.25), perceived enjoyment (M = 4.89, SD = 0.16), and engagement (M = 4.47, SD = 0.40) using Virtual Aid application, in contrary of the first aid E-book (SAT: M = 3.42, SD = 0.73), (ATT: M = 3.88, SD = 0.67), (PE: M = 2.97, SD = 0.64), and (ENG: M = 2.62, SD = 1.01), see Table 9.

Table 9: Research constructs grouped by Virtual Aid and E-book version for females.

		VA (n=12)	E-book (n=12)	Mean diff.	*Df*	T	P
1.	PU	4.25 (0.79)	3.50 (0.54)	0.750	19	2.706	.190
2.	PEOU	4.48 (0.48)	4.88 (0.31)	-0.396	19	-2.390	.056
3.	PE	4.89 (0.16)	2.97 (0.64)	1.917	12	10.007	**.011***
4.	PBC	4.86 (0.30)	4.86 (0.33)	0.000	22	0.000	.797
5.	PIC	4.35 (0.58)	4.80 (0.38)	-0.444	19	-2.218	.242
6.	ATT	4.90 (0.25)	3.88 (0.67)	1.021	14	4.947	**.004****
7.	SAT	4.92 (0.22)	3.42 (0.73)	1.500	13	6.781	**.000*****
8.	CON	4.67 (0.49)	2.28 (0.95)	2.389	16	7.723	.341
9.	ENG	4.47 (0.40)	2.62 (1.01)	1.852	14	5.923	**.031***
10.	ATTEN	3.66 (0.48)	2.39 (0.95)	1.267	16	4.113	.138
11.	BIU for Virtual Aid/E-book	4.42 (0.83)	1.89 (1.10)	2.528	20	6.339	.837

** Gender difference was significant at the 0.001 level (2-tailed)
** Gender difference was significant at the 0.005 level (2-tailed)
* Gender difference was significant at the 0.05 level (2-tailed

4.7 Experienced-based Comparative Analysis

The objective of experience-based comparative analysis is to explore whether the experience of using a VR application in the past affects the user's performance. Therefore, we use a t-test to compare the differences between experienced and non-experienced VR users. The results revealed that the performance of non-experienced users was statistically significant in perceived usefulness (t = 4.053, p < 0.05), attitude (t = -0.649, p < 0.05), and behaviour intention to use VR (t = -2.190, p < 0.05). While experienced users had a perceived higher degree of usefulness (M = 4.90, SD = 0.25) and behavioural intention to use Virtual Aid (M = 4.76, SD = 0.71), compared to participants that have no experience with VR (PU: M = 4.11, SD = 0.66), and (BIU for Virtual Aid: M = 4.52, SD = 0.60). This finding reveals that experience in using VR applications does affect performance; see Table 10 for more details.

Table 10: User Evaluation on Virtual Aid grouped by experienced and non-experienced users

		No (n=15)	Yes (n=7)	Mean diff.	*Df*	T	P
1.	PU	4.11 (0.66)	4.90 (0.25)	0.794	20	4.053	**.033***
2.	PEOU	4.38 (0.50)	4.71 (0.42)	0.331	14	1.621	.411
3.	PE	4.49 (0.60)	4.33 (0.67)	-0.156	11	-.525	.696
4.	PBC	4.44 (0.60)	4.52 (0.54)	0.079	13	.310	.310
5.	PIC	4.33 (050)	4.48 (0.47)	0.143	13	.650	.763
6.	ATT	4.92 (0.22)	4.71 (0.76)	-0.202	7	-.694	**.032***
7.	SAT	4.87 (0.31)	4.96 (0.09)	0.098	18	1.109	.092
8.	CON	4.67 (0.50)	4.67 (0.38)	0.000	15	.000	.369
9.	ENG	4.19 (0.51)	4.52 (0.43)	0.339	14	1.619	.397
10.	ATTEN	3.49 (0.42)	3.69 (0.33)	0.192	15	1.154	.611
11.	PRE	4.16 (0.84)	4.43 (0.74)	0.273	13	.771	.470
12.	BIU for Virtual Aid	4.13 (0.94)	4.52 (0.60)	0.390	18	1.171	.056
13.	BIU for VR	4.31 (0.71)	4.76 (0.25)	0.451	19	2.190	**.032***

* Experience difference was significant at the 0.05 level (2-tailed)

4.8 Intention Factors Analysis

Intention factors are also essential in using any sort of application. To identify intention factors for using Virtual Aid, we assessed factors that influence the behaviour intention to use Virtual Aid and other VR training systems. For this purpose, we used multiple regression to predict potential intentions to use Virtual Aid and other VR-assisted training systems for learning. The results show a strong relationship between behaviour intention to use Virtual Aid and perceived usefulness, ease of use, internal control, attitude, satisfaction, and attention. In addition, the results also indicate there is a strong relationship between behaviour intention to use other VR training systems and perceived usefulness, ease of use, internal control, satisfaction, and confirmation, which have the strongest relationship with behaviour intention to use other VR training systems; for more details see a table in Fig. 6.

The findings also suggest that perceived ease of use is a statistically significant predictor of BIU for Virtual Aid with a prediction model (F (4.760; 0.305) = 15.595, p < 001) where F represents an improvement in the prediction of the variable by fitting the model after considering the inaccuracy present in the model. If F is greater than one, then the model is efficient. The entire regression (R-square) model explained sixty-two-point one percent ($R^2 = 62.1\%$) of the variances of the dependent variable (BIU) where R-square indicates how much of the variance in the dependent

variable can be explained by the independent variables; see Table 11 for more details.

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. PU	1												
2. PEOU	.637**	1											
3. PE	-.252	-.035	1										
4. PBC	-.122	-.207	.776**	1									
5. PIC	.422	.247	-.160	-.004	1								
6. ATT	.028	.326	.259	.189	.302	1							
7. SAT	.264	.359	-.077	-.088	.432*	.092	1						
8. CON	.205	.492*	-.056	-.081	.649**	.285	.622**	1					
9. ENG	.259	.341	.198	.235	.324	.285	.207	.320	1				
10. ATTEN	.537**	.594**	.151	.078	-.022	.158	-.046	-.087	.383	1			
11. PRE	-.004	-.214	.526*	.790**	.020	-.169	-.121	-.200	.330	.204	1		
12. BIU for VA	.583**	.727**	.107	.098	.435*	.430*	.546**	.417	.366	.498*	.036	1	
13. BIU for VR	.726**	.659**	-.323	-.092	.484*	.246	.484*	.456*	.177	.415	-.102	.735**	1

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Fig. 6. Correlations between research assessment elements for Virtual Aid.

Table 11: Regression analyses for predicting BIU for Virtual Aid

Construct		*β*	*T*	*Sig.*	*R*
					0.621
1.	PU	0.184	1.001	.330	
2.	PEOU	1.060	4.029	.001***	
3.	PIC	0.178	1.139	.270	
4.	ATT	0.226	1.568	.134	
5.	SAT	1.061	2.165	.043	
6.	ATTEN	0.265	1.461	.161	

*** Significant at the 0.001 level (2-tailed)

A value greater than 0.5 indicates that the model can determine the relationship. As well as perceived usefulness statistically significant predictor of BIU for other VR-assisted training systems with a prediction model F (4.760; 0.305) = 15.595, p < 001) where F is greater than 1. The entire regression model (R^2) explains sixty-two-point six percent (R^2 = 62.6%) of the variances of the dependent variable; see Table 12 for more details.

Table 12: Summary of regression analyses for constructs predicting BIU for Virtual Reality

Construct		*β*	*T*	*Sig.*	*R*
					0.626
1.	PU	0.618	4.603	.000***	
2.	PEOU	0.176	.839	.412	
3.	PIC	-0.007	-.035	.973	
4.	SAT	0.186	1.022	.320	
5.	CON	0.440	2.238	.037	

*** Significant at the 0.001 level (2-tailed)

The results also show that there is a strong relationship between the intention to use first aid E-books and perceived usefulness, ease of use, internal control, attitude, satisfaction, and attention; for more details see a table in Fig. 7.

	1	2	3	4	5	6	7	8	9	10	11	12
1. PU	1											
2. PEOU	-.133	1										
3. PE	.044	.111	1									
4. PBC	.028	.774**	.112	1								
5. PIC	-.489*	.388	-.292	.296	1							
6. ATT	-.196	-.044	-.134	-.252	-.014	1						
7. SAT	-.267	.334	.037	.155	.344	.052	1					
8. CON	-.135	-.304	-.053	-.544**	-.048	.377	.396	1				
9. ENG	-.047	-.426*	-.035	-.605**	-.244	.338	-.010	.779**	1			
10. ATTEN	-.307	-.412	-.029	-.679**	-.102	.196	.188	.718**	.849**	1		
11. PRE	-.268	-.400	-.088	-.667**	-.167	.377	.265	.868**	.845**	.886**	1	
12.BIU for E-book	.583**	.727**	.107	.098	.435*	.430*	.546**	.417	.366	.498*	.036	1

**Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Fig. 7. Correlations between research assessment elements for first aid E-book.

The findings indicate that attention is a statistically significant predictor of BIU for first aid E-book with a prediction model F (10.355; 0.226) = 45.762, p < 001), where F is greater than one, then the model is efficient and the model explained eighty-two-point eight percent (R^2 = 82.8%) of the variance of BIU for E-book, see Table 13 for more details.

Table 13: Summary of regression analyses for constructs predicting BIU for E-book

Construct	*β*	*t*	*Sig.*	*R*
				0.828
1.PU	0.038	0.363	.721	
2.PEOU	-0.051	-0.483	.635	
3.PIC	-0.079	-0.816	.425	
4.ATT	0.355	8.710	.042	
5. SAT	0.099	1.022	.320	
6.ATTEN	1.018	2.178	.000***	

*** Significant at the 0.001 level (2-tailed)

5 Conclusion

In this study, we explored the possibilities of using VR for first aid training courses including heatstroke, shock, and seizure. Users' perception and experience these courses had been analysed. The results obtained suggest that VR is a great alternative and extremely useful for providing a training platform. The findings also suggest that, despite various implementations of learning methods that could serve participants' diverse needs and demands, participants are more satisfied and have a positive attitude when using VR to learn and train. The instrument used for collecting data in this study is self-reported. Therefore, the interpretation of findings based on questionnaire data can only tell part of the story. Future research may use a variety of research approaches to assess participants' UX, such as a cognitive approach, which could provide objective evidence other than self-reported results, which may result in a deeper understanding of the VR training system's UX. Furthermore, VR First Aid should provide a broader range of modules such as choking, CPR, bleeding, burns, and so on. In addition, we will expand the sample size of human subjects to include different segments of society, such as the NEETs (Not in Education, Employment, or Training) to obtain a clearer interpretation of the study. The outcome of this study can catalyse educational institutions to begin utilising VR as a learning aid because of the numerous benefits it can provide. These include expanding one's personal knowledge area, assisting students in comprehending complex concepts, subjects, or theories, and enhancing learners' creativity.

Acknowledgment

This work is partially supported by supported by Xiamen University Malaysia Research Fund: XMUMRF/2022-C9/IECE/0034

References

[1] Adams, Dennis A., R. Ryan Nelson, and Peter A. Todd. "Perceived Usefulness, Ease of Use, and Usage of Information Technology: A Replication." MIS Quarterly 16, no. 2 (1992): 227. https://doi.org/10.2307/249577.

[2] Al-Hiyari, Narmeen N., and Shaidah S. Jusoh. "Healthcare Training Application: 3d First Aid Virtual Reality." International Conference On Data Science, E-Learning And Information Systems 2021, 2021. https://doi.org/10.1145/3460620.3460741.

[3] Chang, Chen-Wei, Jun Heo, Shih-Ching Yeh, Hui-Ya Han, and Mengtong Li. "The Effects of Immersion and Interactivity on College Students' Acceptance of a Novel VR-Supported Educational Technology for Mental Rotation." IEEE Access 6 (2018): 66590–99. https://doi.org/10.1109/access.2018.2878270.

[4] Chang, Chen-Wei, Shih-Ching Yeh, Mengtong Li, and Eason Yao. "The Introduction of a Novel Virtual Reality Training System for Gynecology Learning and Its User Experience Research." IEEE Access 7 (2019): 43637–53. https://doi.org/10.1109/access.2019.2905143.

[5] Chang, Yuhmiin, and Esther Thorson. "Media Multitasking, Counterarguing, and Brand Attitude: Testing the Mediation Effects of Advertising Attention and Cognitive Load." Computers in Human Behavior 139 (2023): 107544. https://doi.org/10.1016/j.chb.2022.107544.

[6] Cheng, Kun-Hung. "Reading an Augmented Reality Book: An Exploration of Learners' Cognitive Load, Motivation, and Attitudes." Australasian Journal of Educational Technology, 2016. https://doi.org/10.14742/ajet.2820.

[7] Cimadevilla, José Manuel, and Laura Piccardi. "Spatial Skills." Handbook of Clinical Neurology, 2020, 65–79. https://doi.org/10.1016/b978-0-444-64123-6.00006-0.

[8] Dhar, Eshita, Umashankar Upadhyay, Yaoru Huang, Mohy Uddin, George Manias, Dimosthenis Kyriazis, Usman Wajid, Hamza AlShawaf, and Shabbir Syed Abdul. "A Scoping Review to Assess the Effects of Virtual Reality in Medical Education and Clinical Care." DIGITAL HEALTH 9 (2023): 205520762311580. https://doi.org/10.1177/20552076231158022.

[9] Froland, Tord Hettervik, Ilona Heldal, Elisabeth Ersvar, and Gry Sjoholt. "State-of-the-Art and Future Directions for Using Augmented Reality Head Mounted Displays for First Aid Live Training." 2020 International Conference on e-Health and Bioengineering (EHB), 2020. https://doi.org/10.1109/ehb50910.2020.9280182.

[10] Geary, David C. "Spatial Ability as a Distinct Domain of Human Cognition: An Evolutionary Perspective." Intelligence 90 (2022): 101616. https://doi.org/10.1016/j.intell.2021.101616.

[11] Guaña-Moya, Javier, Yamileth Andrea Arteaga-Alcívar, Marco Chiluisa-Chiluisa, and Lucía Fernanda Begnini-Domínguez. "Evolution of Information and Communication Technologies in Education." 2022 Third International Conference on Information Systems and Software Technologies (ICI2ST), 2022. https://doi.org/10.1109/ici2st57350.2022.00027.

[12] Haowen, Jiang, Sunitha Vimalesvaran, Bhone Myint Kyaw, and Lorainne Tudor Car. "Virtual Reality in Medical Students' Education: A Scoping Review Protocol." BMJ Open 11, no. 5 (2021). https://doi.org/10.1136/bmjopen-2020-046986.

[13] Jiang, Haowen, Sunitha Vimalesvaran, Jeremy King Wang, Kee Boon Lim, Sreenivasulu Reddy Mogali, and Lorainne Tudor Car. "Virtual Reality in Medical Students' Education: Scoping Review." JMIR Medical Education 8, no. 1 (2022). https://doi.org/10.2196/34860.

[14] Liu, Dejian, Kaushal Kumar Bhagat, Yuan Gao, Ting-Wen Chang, and Ronghuai Huang. "The Potentials and Trends of Virtual Reality in Education." Smart Computing and Intelligence, 2017, 105–30. https://doi.org/10.1007/978-981-10-5490-7_7.

[15] Makransky, Guido, and Gustav B. Petersen. "The Cognitive Affective Model of Immersive Learning (Camil): A Theoretical Research-Based Model of Learning in Immersive Virtual Reality." Educational Psychology Review 33, no. 3 (2021): 937–58. https://doi.org/10.1007/s10648-020-09586-2.

[16] "Seizures." Mayo Clinic, September 2, 2023. https://www.mayoclinic.org/diseases-conditions/seizure/symptoms-causes/syc-20365711.

[17] Mitre-Ortiz, Andres, Jaime Muñoz-Arteaga, and Héctor Cardona-Reyes. "Developing a Model to Evaluate and Improve User Experience with Hand Motions in Virtual Reality Environments." Universal Access in the Information Society 22, no. 3 (2022): 825–39. https://doi.org/10.1007/s10209-022-00882-y.

[18] Mutterlein, Joschka, and Thomas Hess. "Immersion, Presence, Interactivity: Towards a Joint Understanding of Factors Influencing Virtual Reality Acceptance and Use." Proceedings: Adoption and Diffusion of Information Technology (SIGADIT), 2017.

[19] Piazza, Gina M. First aid manual: The step-by-step guide for everyone. New York, NY: DK Publishing, 2014.

[20] Rojas-Sánchez, Mario A., Pedro R. Palos-Sánchez, and José A. Folgado-Fernández. "Systematic Literature Review and Bibliometric Analysis on Virtual Reality and Education." Education and Information Technologies 28, no. 1 (2022): 155–92. https://doi.org/10.1007/s10639-022-11167-5.

[21] Sattar, Mian Usman, Sellappan Palaniappan, Asiah Lokman, Nauman Shah, Usman Khalid, and Raza Hasan. "Motivating Medical Students Using Virtual Reality Based Education." International Journal of Emerging Technologies in Learning (iJET) 15, no. 02 (2020): 160. https://doi.org/10.3991/ijet.v15i02.11394.

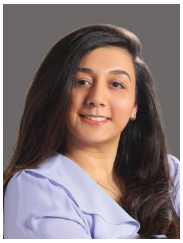
[22] Tang, Zhili, Xiaoyu Liu, Hongqiang Huo, Min Tang, Xiaofeng Qiao, Duo Chen, Ying Dong, et al. "Sex Differences in Eye Movements and Neural Oscillations during Mental Rotation in Virtual Reality." Medicine in Novel Technology and Devices 18 (2023): 100233. https://doi.org/10.1016/j.medntd.2023.100233.

[23] Tsivitanidou, Olia E., Yiannis Georgiou, and Andri Ioannou. "A Learning Experience in Inquiry-Based Physics with Immersive Virtual Reality: Student Perceptions and an Interaction Effect between Conceptual Gains and Attitudinal Profiles." Journal of Science Education and Technology 30, no. 6 (2021): 841–61. https://doi.org/10.1007/s10956-021-09924-1.

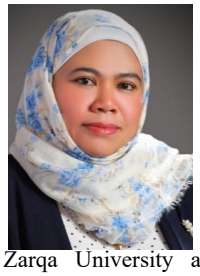
[24] Xie, Biao, Huimin Liu, Rawan Alghofaili, Yongqi Zhang, Yeling Jiang, Flavio Destri Lobo, Changyang Li, et al. "A Review on Virtual Reality Skill Training Applications." Frontiers in Virtual Reality 2 (2021). https://doi.org/10.3389/frvir.2021.645153.

[25] Yasen, Mais, and Shaidah Jusoh. "A Systematic Review on Hand Gesture Recognition Techniques, Challenges and Applications." PeerJ Computer Science 5 (2019). https://doi.org/10.7717/peerj-cs.218.

[26] Yılmaz, Oğuz, and Mustafa Tevfik Hebebci. "The Use of Virtual Environments and Simulation in Teacher Training." International Journal on Social and Education Sciences 4, no. 3 (2022): 446–57. https://doi.org/10.46328/ijonses.376.



Narmeen Alhyari is a lecturer in the Department of Computer Sciences at Princess Sumaya University for Technology. She received her a master's degree in enterprise system engineering, in 2020 and she holds a bachelor's degree in computer graphics and Animation. Narmeen's research interests lie at the intersection of animation and engineering, with a focus on interdisciplinary applications. She can be contacted at email: n.alhyari@psut.edu.jo



Shaidah Jusoh is currently an assistant professor of Artificial Intelligence at the School of Electrical Engineering and Artificial Intelligence at the Xiamen University Malaysia (XMUM). Prior joining XMUM she had been a sessional lecturer at the University of Guelph in Canada, Universiti Utara Malaysia in Malaysia, Zarqa University and Princess Sumaya University for Technology in Jordan, Najran University, Taibah University and Northern Border University in Saudi Arabia. She earned PhD in Engineering System and Computing (Intelligent System) from the University of Guelph, Canada. Her research interest includes Natural Language Processing, Human Computer Interaction, and Intelligent System. She can be contacted at email: shaidah.jusoh@xmu.edu.my