USABILITY EVALUATION OF A DESKTOP VIRTUAL REALITY PROTOTYPE (DVRP) COURSEWARE TO ENHANCE KNOWLEDGE ON DRUG ABUSE

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ABSTRACT

Evaluation is a way to measure the usability of a computer-based system. Usability is the ability to carry out tasks effectively, efficiently and with satisfaction. Usability is the extent to which users can use a computer system to achieve specified goals effectively and efficiently while promoting feelings of satisfaction in a given context of use. It can be broadly defined as "ease of use", and "usefulness". This study aims to evaluate the usability, of the Desktop Virtual Reality Prototype (DVRP) courseware in enhancing knowledge on drug abuse among student teachers in a Teacher Education Institution. A total of 35 student-teachers were identified through simple random method to evaluate the usability of DVRP. In order to assess the usability of the DVRP courseware, the USE Questionnaire (Lund, 2001) was employed. USE stands for Usefulness, Satisfaction, and Ease of use. The results of this study on the usability show that the uses are very positive using the DVRP courseware and very effective and efficient to be used to enhance knowledge on drug abuse.

Keywords: usability, usefulness, easy to use, easy to learn, desktop, virtual reality, courseware, evaluation, prototype, knowledge, drug abuse

1. INTRODUCTION

Over the last decade, developments in technology have brought about important progress across a wide range of our systems; social, cultural, physical and education. Swift changes in the world of technology have changed our lives in various aspects especially in information communication technology. The internet has certainly provide significant impact in various fields. These developments are clearly emphasised by the notable growth and advancements of computer technology applied to a diverse range of applications such as smart phones, cameras, medical devices and communication systems (Ozan Erenay &

Majid Hashemipour, 2003). Among the latest innovation is virtual reality (VR). Kommers and Zhiming (1997) wrote, "VR is a newly emerging tool for scientific visualization that makes possible multisensory, three-dimensional modelling of scientific data". The newest form of VR is called non-immersive or desktop VR which is steadily establishing itself as a popular medium to transfer knowledge in modern education and training facilities (Lee, Wong, and Chun, 2010). Currently, there has been an increasing eagerness of using desktop Virtual Reality (VR) for educational purposes because of its ability to provide real time visualization and interaction within a virtual world that closely resembles a real world. In desktop VR, which is also known as non-immersive VR, the interactive three-dimensional (3-D) computer generated program in a multimedia environment is presented on a conventional personal computer and is usually explored using keyboard, mouse, wand, joystick or touch screen (Chen, Toh & Wan, 2004; Strangman & Hall, 2003). However, according to Kaur et al. (1996), VR systems can suffer from severe usability problems such as conceptual disorientation and inability to manipulate objects. Standard evaluation methods (Nielsen, 2003) may be able to discover some usability problems. Therefore the usability testing has been widely used as an important technique to uncover the possible usability problems of a system. Poor usability of a system could prevent its effectiveness and efficiency of use.

2. BACKGROUND OF STUDY

Usability was first introduced by Shackel (1981) a decade ago in order to replace the term "user friendly" (Bevan, Kirakowski & Maissel, 1991). Shackel (1990) referred to four aspects of interest in usability testing: learnability (easy of learn), throughout, flexibility and attitude. Rubin (1994) accepted that usability includes one or more of the four factors outlined by Booth (1989): usefulness, effectiveness (ease of use), learnability, and attitude (likeability). For Smith and Mayes (1996) usability focused on three aspects: easy to learn, easy to use and user satisfaction in using the system. In international standards, usability refers to effectiveness and efficiency to achieve specified goals and users satisfaction. "Usability: the extent to which a product can be used by specified users to achieve a specified goals with effectiveness, efficiency and satisfaction in a specified context of use" (ISO/DIS 9241-11; European Usability Support Centres). Based on these opinions, usability can be broadly defined as "ease of use" plus "usefulness", including such quantifiable characteristics as learnability, speed and accuracy of user task performance, user error rate, and subjective user satisfaction. Usability dimensions reviewed in the literature for interactive multimedia software include: ease of learning (Guillemette, 1995; Lindgarrd, 1994; Nielsen, 1990; Reed, 1992; Shackel, 1991), ease of use (Guillemette, 1995; Nielsen, 1990), easy to remember (Nielsen, 1990), performance effectiveness (Lindgaard, 1994; Reed, 1992; Shackel, 1991), few errors and system integrity (Guillemette, 1995; Nielsen, 1990a; Reed, 1992), flexibility (Guillemette, 1995; Lindgaard, 1994; Shackel, 1991), and user satisfaction (Nielsen, 1993, Reed, 1992; Shackel, 1991). This study, therefore, attempted to evaluate the usability of the Desktop Virtual Reality Prototype (DVRP) courseware in enhancing knowledge on drug abuse among student-teachers in a Teacher Education Institution.

3. METHOD

These study employed descriptive method. Result will be presented using mean and standard deviation. Questionnaire was used to collect the data.

3.1 Sample

The usability of DVRP can be determined by two groups of people, namely the users (students) and the experts (teachers). In this study users were chosen as sample to evaluate the usability of DVRP. Therefore the samples of this study consisted of 35 (20 females and 15 males) student teachers from Teacher Education Institute (TEI) in northern Malaysia. They were selected using simple random sampling technique. According to Petrie and Bevan (2009), number ranging from 5 to 30 samples is suitable for the purpose of assessing the finished product. The main reason that most of the usability testing approaches involve only few participants is because recruiting more users requires more time, effort and higher cost (Chwen, Siew, Kee & Chee, 2013).

3.2 Instrumentation

To collect the data, a total of 35 students were given a brief demonstration on how to use the DVRP courseware. Students were then allowed to access the DVRP courseware as a downloadable executable file. Subsequently a questionnaire was distributed to the participants. The USE questionnaire (Lund, 2001) was chosen in this study. USE stands for Usefulness, Satisfaction, and Ease of use. Based on study by Tet and Noraidah Sahari (2015), they mentioned that the USE questionnaire has a fair choice of questions for measuring system usability based on performance without neglecting user experience compare to other questionnaire in their study. Besides that, the USE questionnaire was used in many studies such as on the effect of culture on usability (Wallace & Hsiao, 2009), evaluation of end-user satisfaction (Wan Norizan, Mohd Razali & Mohd Izzat, 2013), evaluation of utilitarian and experiential attribute in usability (Tet & Noraidah Sahari, 2015), a usability study of moodle (Ali Daneshmandnia, 2013), gender differences in the reading of e-books (Huang, Liang & Chiu, 2013), and the effectiveness of adopting e-readers (Hung & Young, 2015). There were 30 statements in the evaluation form which focused on four attributes namely; (i) usefulness, (ii) easy to use, (iii) easy to learn, and (iv) satisfaction. All the 30 statements required the assessors to indicate their response according to the rating based on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). An advantage of using Likert scale questionnaire is that they allow the 'participant to provide feedback that is slightly more expansive than a simple close-ended question, but that is much easier to quantify than a completely open-ended response' (Parnaby, 2007). The Likert questionnaire is also suitable for this study as they allow for information to be gathered quickly and in a standardised way and for the data produced being easily analysed using standard statistical techniques. The USE survey was found to be a highly reliable indicator of user perceptions as indicated by Cronbach's alpha. Similarly, Lund (2001) reported high levels of Cronbach's alpha when designing the survey. Ameer (2014) found that the alpha reliability was considered acceptable with values ranging between 0.7 and 0.86.

4. RESULT

In this section, the researcher analysed the findings of the research and examined the participants' responses to questionnaires. Table 1 shows the analysis for each domain.

Table 1: Mean and Standard Deviation for Usefulness, Easy to Use, Easy to Learn, Satisfaction and Usability Score Between Male and Female Subject

	Gender	N	Mean	SD
(a) Usefulness	Male	12	4.635	0.163
	Female	23	4.657	0.244
(b) Easy to Use	Male	12	4.704	0.134
	Female	23	4.660	0.160
(c) Easy to Learn	Male	12	4.708	0.257
	Female	23	4.684	0.202
(d) Satisfaction	Male	12	4.652	0.229
	Female	23	4.652	0.212
(e) Usability	Male	12	4.519	0.118
	Female	23	4.505	0.114

4.1 Usefulness

Landauer (1995) defined usefulness as "serving an intended purpose". Grudin (1992), however, considered that usefulness is the issue of whether the system can be used to achieve some desired goal. There were eight items under usefulness attributes. The mean score on satisfaction of the DVRP courseware among female subjects (X = 4.657) were higher compared with the male subjects (X = 4.635) as shown in Table 1(a) and Figure 1.

4.2 Easy To Use

Ease of use which referred to as *efficiency* or *productivity* is on how quickly highly trained, expert users can accomplish tasks once they have learned how on a given user interface, and with frequent use. There were 11 items under easy to use attributes. The mean score on satisfaction of the DVRP courseware among male subjects (X = 4.704) was higher compared with the female subjects (X = 4.660) as shown in Table 1(b) and Figure 1.
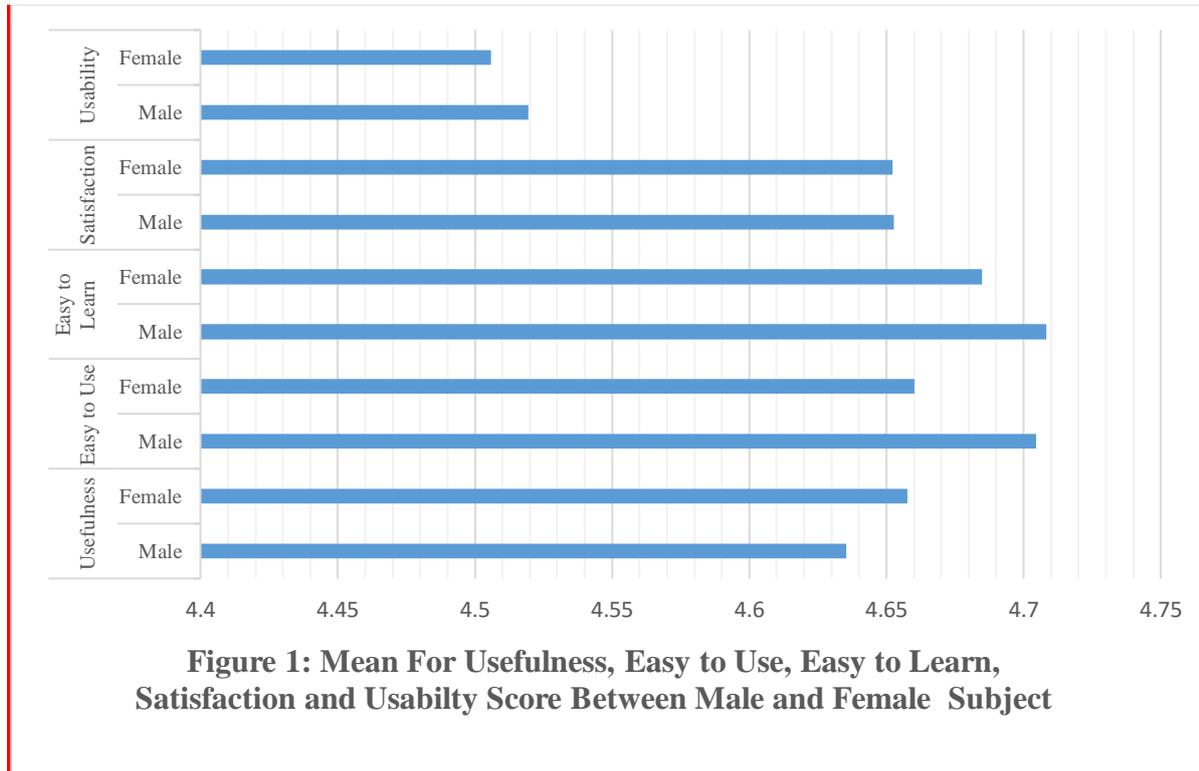
4.3 Easy to Learn

Ease to learn referred to how easy it is for first time, novice, and casual users to figure out how to accomplish tasks given and how easy it is to remember what they have learned between infrequent uses. There were four items under easy to learn attributes. Table 3 refers to the analysis of the usefulness attributes. In terms of user easy to learn, the mean score on easy to learn of the DVRP courseware among male subjects (X = 4.708) was higher compared with the female subjects (X = 4.684) as shown in Table 1(c) and Figure 1.

4.4 Satisfaction

Satisfaction referred to which the users' comfort with and positive attitudes towards the use of the system. There were seven items under satisfaction attributes. The mean score on satisfaction of the DVRP courseware among male subjects (X = 4.652) was higher compared with the female subjects (X = 4.652) as shown in Table 1(d) and Figure 1.

4.5 Usabillity

Landauer (1995) defined usability as "ease of operation". The International Standards Organization (1994) defined usability as "the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use". The mean score on usability of the DVRP courseware among male subjects (X = 4.519) was higher than female subjects (X= 4.505) as shown in Table 1(e) and Figure 1.

Figure 1: Mean For Usefulness, Easy to Use, Easy to Learn, Satisfaction and Usabilty Score Between Male and Female Subject

5. DISCUSSION AND CONCLUSION

Usability denotes the ease with which these products or services can be used to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use (Wegge & Zimmermann, 2007). The findings of this study clearly showed that DVRP courseware has a high usability. There is no great difference between male and female subject for four attributes. This study revealed that subjects of student-teachers from Teacher Education Institute (TEI) response positively to the usage of DVRP courseware. This clearly shows DVRP courseware achieved its objective in providing education against drug abuse. In addition, the virtual display with user friendly nature DVRP attracted subjects to get information about drug abuse. The findings of this research should also make a significant contribution to understanding the role of VR desktop can play in supporting learning and design in social science. It is therefore recommended that a further study is carried out using the theme on a larger sample size. A larger study and more appropriate questions should provide results with greater reliably and validity. Apart from more user tests, the cognitive walkthrough and heuristic evaluation methods should be carried out by more evaluators. Finally, including further methods apart from the four studied methods

would provide a better overview of which usability evaluation method can be more suitable for the evaluation DVRP courseware.

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