International Journal of Business, Human and Social Sciences
ISSN: 2517-9411
Vol:9, No:10, 2015

Students' Perception of Virtual Learning Environment (VLE) Skills in Setting up the Simulator Welding Technology

Mohd Afif Md Nasir, Faizal Amin NurYunus, Jamaluddin Hashim, Abd Samad Hassan Basari, A. Halim Sahelan

***Abstract*—**The aim of this study is to identify the suitability of Virtual Learning Environment (VLE) in welding simulator application towards Computer-Based Training (CBT) in developing skills upon new students at the Advanced Technology Training Center (ADTEC) Batu Pahat, Johor, Malaysia and GIATMARA, Batu Pahat, Johor, Malaysia. The significance of the study is to create a computer-based skills development approach in welding technology among new students in ADTEC and GIATMARA as well as to cultivate the elements of general skills among them. This study is also important in elevating the number of individual knowledge workers (K-workers) working in manufacturing industry in order to achieve a national vision which is to be an industrial nation in the year of 2020. The design of the study is a survey type of research which using questionnaires as the instruments and some 136 students from ADTEC and GIATMARA were interviewed. Descriptive analysis is used to identify the frequency and mean values. The findings of the study show that the welding technology has developed skills in the students because of the application of VLE simulated at a high level and the respondents agreed that the skills could be embedded through the application of the VLE simulator. In summary, the VLE simulator is suitable in welding skills development training in terms of exposing new students with the relevant characteristics of welding skills and at the same time spurring the students' interest towards learning more about the skills.

***Keywords*—**Computer-Based Training (CBT), knowledge workers (K-workers), virtual learning environment, welding simulator, welding technology.

I. Introduction

VISUAL technology usage for education and training in education has produced a dramatic expansion of conventional education, demonstration and skills training. It is starting from the introduction of video and graphics performance, and it animation. VLE emergent reality had heralded a new era for technical industry and learning. VLE technology is a simulation, which uses computer graphics to build or form such as actual situation. VLE technological progress has completely benefited the education field and training through simulated or developments that are grounded in VLE technology [1]. Developing some skills in the virtual environment allows for a reduction in material, time, and expert accessibility costs that are associated with traditional training methods. It also allows the novice to learn basic skills in a safer environment.

In a previous study, the results of a traditional welding training program, which involved only real-world training, with one that integrated virtual learning training using a simulator with realworld training. From the study found that in the area of welding, integrating virtual reality training into a real-world training program has a number of advantages over traditional training. These advantages include increased weld quality, higher certification rates, reduced training time, improved kinesthetic skill learning, and reduced costs for the simpler welds [1], [2].

The forging of the simulator and VLE technology has produced a new technology, which has become known as virtual simulator that has made virtual technology a reality. Amongst the successful examples of virtual simulation is simulator virtual training for driving a vehicle. Such practice has already been able to produce a 50% reduction in major energy resources. Apart from noise pollution reduction, reduced NO2 and pollutants there has also been a decrease in the number of vehicle accidents through the usage of driver simulators [8]. According to [8] with the existence of this Virtual Learning Environment simulator, US military can produce more than 90 percent skilled pilots with faster and safer compared to actual practice.

Nowadays research, which involves virtual environment more concentrated to skills enhancement such as sensor motor skill. This is supported by [3], which states that the virtual welding simulator can build motor skill such as detecting the movement of head and hand during welding and helping students to identify the optimum point of view during the welding process.

The existence of these simulators is parallel with the emphasis on computer-based training (CBT).Generally, Technical and Vocational Educational Training (TVET) has already converted to education and training in CBT. CBT is one way of training without supervision from instructors. With CBT, students can interact with the software and get hands on training. This training style also save time, energy and money and can be done according to needs and user ability [4]. The use of VLE Welding simulator aims to facilitate computer-based training to new students to seek early experience and exposure before committing real welding process. Yet, several problems also arise, such as the complexity in making virtual training simulator with real condition. Besides that, cost factor in developing the simulator and weaknesses in the VLE training method worsen the problem in getting the true skills like in actual situations. Moreover, the researcher has been attracted to study learning and training adapts ability with the

Mohd AfifMdNasir is with the Universiti Teknikal Malaysia Melaka (UTeM), Malaysia (e-mail: afif_83@hotmail.com).

aid of VLE Welding Simulator on students welding skills development [12]. Thus, the three main objectives of this research are to:

1) identify the level of welding skill among students in welding technology using the VLE Welding Simulator.
2) identify the level of welding skill among students in welding technology in the actual welding process.
3) identify the difference of student's skill level between using welding simulator and actual welding process.

All of three objectives were identified to find the students' perception of VLE learning. Besides that, this study also wants to find the suitability of computer-based training (CBT) with used the VLE welding simulator among students.

II. Related Works

A. Welding Skills

In producing a perfect welding result, the methods on how welding has been done is the most important element. Some of the aspects that need to be focused on welding or welding position, which encompasses working angle and movement angle, electrical current and voltage condition, length of arc with the work piece and hand movement speed. These features of skills are adapted from the guidelines prepared by NOSS. In order to become a competent welder, students should be familiar with the guidelines and every task and duty within the specified meeting hour determine by accreditation center [13]. This is supported by research that has been committed [9], which states that, in order to be a competent welder, training that quite needed to achieve is wanted and qualified welder is that they whom did training follow standards that prepared.

B. The Application of Virtual Learning Environment in Education and Training

The effectiveness of learning and training through VLE simulator depends on the capacity of the technology in giving exposure and developing student skills. According to [2], a VLE technology benefit of education and training in some ways, for example by allowing students to see abstract concept, monitor an incident, which the distance timing and safety factors need not to be worried. VLE technology can also offer an effective method in enhancing some skills [1]. For example, sensor motor skill, which can be classified a skill that is applied in real the world like skill on using equipment, enhancing awareness through simulation usage, and training design skills [7]. VLE technology also offers one good approach in learning and training. According to [10] positive transfer effects exist between virtual state and the actual situation during aircraft inspection training. Several studies were done, and found that VLE technology was the medium in aircraft inspection training [15]. Results showed that students gain much experience with the presence of VLE technologies.

III. Method

A. Research Design

The design of this research is the survey by using a questionnaire. Data were collected using questionnaires distributed to respondents in getting information related to this study. VLE simulator type in this study was VLE welding simulator was used in both institutions.

B. Population and Samples

This study was carried out at The Advanced Technology Training Center (ADTEC) Batu Pahat, Johor, Malaysia and GIAT MARA Batu Pahat, Johor, Malaysia. Since the VLE welding simulator can only be found in that institution, moreover, the suitability of the simulator could be examined as both institutes run the same programmed which is a Malaysian Skill Certificate module.

C. Data Analysis Method

The raw data were being gathered and quantitatively analyzed. The descriptive statistic method is being used to analyze the data. Data analyst for this study was carried out by using Statistical Package for the Social Sciences (Version 15). These descriptive analyzed data, then use to find mean score and percentage.

IV. Result and Discussion

A. The Level of Welding Skill Technology Created among Students by the Usage of the VLE Welding Simulator

10 questions item regarding the level of welding skill being asked to the respondents. Based on assessment of respondents, the mean score for item 1 to 10 are such as in shown in Table I.

Fig. 1 Images of weld types

The result of the respondent perception of the existence of welding simulator is in high level. This shows that there was an existence of welding skills in student through the usage of the VLE welding simulator, such as current adjustment, work piece preparation, 1G welding process, electrode gap, electrode movement speed, movement and welding electrode angle determination, way to do moldings weave in term of width and height aspect and also reading schematic diagram. There are four weld types, included the 2F (horizontal filet weld), 1G (flat groove weld), 3F (vertical filet weld) and 3G (vertical groove weld). Images of these weld types are shown in Fig. 1. In this test, only focus in 1G types. The 1G weld type was a medium difficulty weld. These retrieval results supported by [3], [5], which states that the VLE welding simulator can build motor skill, such as detecting the head and hand movement during welding and help students to identify

the optimum point of view during the welding process. Besides that, there was exist two items which contribute to moderate level, which are weaved molding at 6mm-9mm width and height does not exceed 4 mm (min = 3.51). This shows that the exits VLE welding simulator still cannot provide accuracy training in term of molding's width and height aspect compared to other welding skills and a feature only being presented in 2D picture format does not provide a holistic view.

TABLE I
WELDING SKILL THROUGH THE USAGE OF SIMULATOR MEAN

No	Item	Mean	Interpretation level
1	Welding simulator current adjustment	3.81	High
2	Doing horizontal position welding process (1G)	4.18	High
3	Preparing a 6mm-9mm thickness work piece	3.93	High
4	Fixing the distance between the arc and work piece (1.5mm-3mm)	4.06	High
5	Doing works at right angles for 1G	3.91	High
6	Doing various angles for 1G	3.92	High
7	Doing weave molding (6mm-9mm wide)	3.98	High
8	Doing high mouldings not exceeded 4mm	3.78	High
9	Controlling the speed of electrode movement	4.23	High
10	Read and understand schematic diagram	4.21	High
	Overall Interpretation	**4.02**	High

This will make student difficult to identify the thickness and width of moulding. It was supported by a study which was done by [11], [16] which states that simulator design of VLE and CS Wave only have the features such as movement angle, work angle, distance between electrode with the work piece, speed movement, voltage adjustment and speed of welding wire produced.

B. The Level of Welding Skill Technology Created among Students by Reality Welding Trainer

To identify actual welding skill among students, 10 question item, which related to welding skill being questioned to respondents, which are item 11 to 20 such as in shown in Table II. Based on Table II, welding skill exists in students with the usage of reality welding on a very high and founded mean for every item was higher than using the VLE welding simulator mean. This shows that students welding skill can be created efficiently and more competent and qualified by using this reality welding. This is supported by [11], [5] through his study that VLE welding simulator created will never replace reality welding because VLE welding simulator only help students to gain basic welding skill training. This also shows that student's welding skill is developed during succeeding reality welding and experience and early exposure gained through the usage of the VLE welding simulator assisted the students during the actual welding process. The result supports a study by [6], which stated that basic welding skills development exist with the assist of the VLE welding simulator.

TABLE II
WELDING SKILL THROUGH REALITY WELDING MEAN

No	Item	Mean	Interpretation level
11	Welding simulator current adjustment	4.2	High
12	Doing horizontal position welding process (1G)	4.32	High
13	Preparing a 6mm-9mm thickness work piece	4.25	High
14	Fixing the distance between the arc and work piece (1.5mm-3mm)	4.22	High
15	Doing works at right angles for 1G	3.87	High
16	Doing various angles for 1G	3.76	High
17	Doing weave molding (6mm-9mm size)	3.55	High
18	Doing high molding not exceeded 4mm	3.75	High
19	Controlling the speed of electrode movement	4.56	High
20	Read and understand schematic diagram	4.35	High
	Overall Interpretation	**4.07**	**High**

C. Data Analysis Method Different of Student's Welding Skill between the Usage of VLE Welding Simulator and Reality Welding

The comparison analysis was shown by percentage. Overall, there was the difference between the use of VLE simulator welding and reality welding, there are 78.01% respondents agree that welding skill can be developed by the usage of the VLE welding simulator, while by reality welding 82.52% respondents agree that welding skill can be developed. However, the difference that exists was small from the aspect of welding and not welding process. This was because the welding process was same between VLE welding simulator and reality welding [14] stated that in using virtual reality, users saw the existence of a virtual surroundings which consist of physical surroundings and they was a part of the simulation. Therefore, the difference was not huge due to this factor, because all the physical features which created by the simulator was similar to reality welding features. This also shows that VLE welding simulator successfully created the feelings of welding process similar to reality welding. The usage of the VLE welding simulator can indirectly be used to develop welding skills. This was supported by [15], stated that positive transfer effect exists in between virtual condition and actual surroundings when dealing with the task.

V. CONCLUSION

From the research, analysis, it shows that respondents agree with the usage of the VLE welding simulator, as a tool to develop basic welding skills to new students is necessary. Beside that with VLE, welding simulator student's understanding was much clearer when doing welding process, and welding skills also developed as well. The VLE welding simulator also provides experience and understanding about welding techniques. Moreover, the VLE welding simulator helps students to do more practice continuously the exercises without considering the wastage of work pieces and other equipment needed. Nevertheless, the usage of the VLE welding simulator can detect and improves faults that hard to be detected by reality welding.

As a conclusion VLE welding simulator used by the

students of the skill training institution can help the students to develop basic welding skills and achieve the objective based on perception and response given by the students.

REFERENCES

[1] Ausburn, L.J., &Ausburn, F. B. (2004). Desktop Virtual Reality: A Powerful New Technology for Teaching and Research in Industrial Teacher Education. Journal of Industrial Teacher Education, 4(4).
[2] Burdea, G. C., & Coiffet, P. (2003). Virtual Learning Environment Technology. 2nded. New Jersey: Wiley & Sons Inc.
[3] Choquet, C. (2008). ARC + ®: Today's Virtual Learning Environment Solution for Welders. Retrieved October 5, 2009 from www.123certification.com/en/article press /iiw2008_16v08.pdf
[4] Hashim, J. (2002). Welding Technology for Polytechnic Malaysia. Petaling Jaya: Delta Publisher Sdn Bhd.
[5] Heston, T. (2008). Virtually Welding, Training in a Virtual Environment Gives Welding Students a Leg up. Retrieved December 21, 2009 fromhttp://www.thefabricator.com/article /arcwelding/virtually-welding.
[6] Jamak, Z. (2003). Penggunaan Simulator Sebagai Penjana Kemahiran Asas Kimpalandi Kalangan Pelajar Kejuruteraan Mekanikal. Master Thesis, Universiti Tun Hussein Onn Malaysia.
[7] Javidi, G. (1999). Virtual Learning Environment and Education. Master Thesis, University of South Florida.
[8] Kappler, W. D. (2008). Smart Driver Training Simulation: Save Money. Prevent. Berlin Heidelberg: Springer-Verlag.
[9] Kennedy, G. A.(1982). Welding Technology. 2nd ed. Indianapolis, IN: Bobbs-Merrils Co.
[10] Nair, S. N., Medlin, E., Vora, J., Gramopadhye, A. K., Duchowski, A., Melloy B. & Kanki, B. (2001). Cognitive Feedback Training Using 3D Binocular Eye Tracker. Human Factors and Ergonomics Society Meeting. Minneapolis.
[11] Porter, N. C., Cote, A. J., Gifford T. D. & Lam, W. (2004). Virtual Learning Environment. Welder Training. Retrieved Jun 4, 2009, from http://www.simwelder.com/docs/summaryreportpdf.
[12] Rice, M. (2003). Mastering the art of welding—it's all about proper technique. Retrieved Jun 4, 2009 from http://www.thefabricator.com
[13] Thilakawardhana, C. H. (2002). Development of A Computer-Based Training (CBT) For Injection Moulding. MSc Thesis, School of Industrial Manufacturing.
[14] Thurman R. A. &Mattoon, J. S. (1994). Virtual Reality: Toward Fundamental Improvements in Simulation-Based Training. Educational Technology, 34(5), pp. 56-64.
[15] Vora, J., Nair, S., Gramopadhye, A. K., Melloy, B. J., Meldin, E., Duchowski A. T.& Kanki, B. G. (2001). Using Virtual Learning Environment Technology to Improve Aircraft Inspection Performance: Presence and Performance Measurement Studies. Proceedings of the Human Factors and Ergonomic Society 45th Annual Meeting, pp. 1867-1871Wave, C. S. (2005). The Virtual welding Trainer. Retrieved Jun 17, 2009 from http://wave.c-s.fr/index.php.
[16] Yusof, M. S. F. (2010). Pengajaran Pembelajaran Berbantukan Komputer. Master Thesis Universiti Tun Hussein Onn Malaysia.