

Association for Information Systems

AIS Electronic Library (AISeL)

ICEB 2016 Proceedings

International Conference on Electronic Business
(ICEB)

Winter 12-4-2016

Different Individual's Impact on Learning Performance in Virtual Reality

Hsin-Lu Chang

Department of MIS, National Chengchi University, hlchang@nccu.edu.tw

YungChi Shih

National Chengchi University, 104356008@nccu.edu.tw

Routing Sun

National Chengchi University, 102356004@nccu.edu.tw

Follow this and additional works at: <https://aisel.aisnet.org/iceb2016>

Recommended Citation

Chang, Hsin-Lu; Shih, YungChi; and Sun, Routing, "Different Individual's Impact on Learning Performance in Virtual Reality" (2016). *ICEB 2016 Proceedings*. 74.

<https://aisel.aisnet.org/iceb2016/74>

This material is brought to you by the International Conference on Electronic Business (ICEB) at AIS Electronic Library (AISeL). It has been accepted for inclusion in ICEB 2016 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

Different Individual's Impact on Learning Performance in Virtual Reality

HsinLu Chang, National Chengchi University, Taiwan, hlchang@nccu.edu.tw
 YungChi, Shih, National Chengchi University, Taiwan, 104356008@nccu.edu.tw
 Routing Sun, National Chengchi University, Taiwan, 102356004@nccu.edu.tw

ABSTRACT

Motivation

This study cooperated with National Palace Museum and the aim is to determinate the difference between various personal characteristics on learning performance in virtual reality (VR), to find out what kind of personality can have a better impact on performance and also want to raise people's interests in learning by using virtual reality. According to the current application on VR, it has been widely utilized in surgery simulation, aircraft simulation training and as we can see now, VR is getting more and more popular in gaming filed. Also, there already have many studies discussed about the VR, for example, many studies ([1]Witmer & Singer, 1998; [2]Steuer, 1992; [3]Rafaeli, 1988) discussed the factors which may influence user's experience in virtual environment and also there already have been lots of literatures ([4] Heeter, 1992; [5] Sanchez-Vives & Slater., 2005; [1] Witmer & Singer, 1998) talked over the indicator which can measure user's experience, the indicator we call it 'presence' and will talk about it later. In addition, there has another literatures proposed another indicator to measure user's experience, it's called 'engagement'. In this study we will talk about them and use them to measure how much subjects involve in the virtual environment.

But as we can see now, there are not so much application on educational field in VR. Otherwise, most of the literatures talked about what kind of usage in technology can have better presence to user or what kind of presence user would have when they experienced VR, also as we mentioned above, the application of VR in surgery simulation or aircraft stimulation training etc. With the chance if cooperating with the National Palace Museum, it's a good opportunity to do a research on it, National Palace Museum provide virtual reality equipment and the educational content to us, we dedicated to find out the different individual's impact on the usage of VR and also explore what kind of channels can have better presence or engagement to users and find the suitable content usage in different channel. After all, our aim is to let the application of VR can have more possibility in different field such as education and make people have more interests in learning the history of antiquities by using the virtual reality equipment which is supplied by National Palace Museum.

Research objective

In order to find the difference between various individuals, we can compare user's experience by measuring the presence and the engagement as the indicator we mentioned in the last paragraph. According to the past literatures, we can see that there are different methods can measure how much involvement user have in virtual environment, but the presence is the commonest one, in addition to this, we also take the engagement as one of our indicators, which can let us know how much enjoyment users have when they experience in the virtual environment, because if user have more enjoyment in VR, it will arouse their interests in learning things, this is one of our objective too. Also, because there were not so much essays discussed the usage of VR in the field of education. By the opportunity to cooperate with National Palace Museum, we will focus on the application on it and find out whether different personal characteristics can perform different learning performance when they are learning something in virtual environment.

In today, the VR is becoming more and more common and popular, there are many news talked about it and also many company are doing research and developing the equipment of VR, such as the famous virtual reality headset, HTC vive, which is developed by HTC and Valve Corporation, released on 5 April 2016. It is a first-of-its-kind virtual reality system. Aside from this, the Oculus Rift which is developed by Oculus VR, released on March 28 2016 is also one of the well-known virtual reality equipment. As to this world trend we hope to have a contribution to the application of VR in education, make the VR have more usage in different field.

Literature review

For evaluating user's experience, as mentioned before, we use presence and engagement as our indicators. Refer to the past literatures, there had many definition about presence, in this study we categorized it in three types, *environmental presence*, 'The extent to which the environment itself appears to know that you are there and to react to you' ([4]Heeter, C., 1992), *personal presence*, 'A measure of the extent to which and the reasons why you feel like you are in a virtual world' ([4]Heeter, C., 1992), *social presence*, "as individuals' perception of the medium to connect them to each other and create sociable, warm, and intimate interaction"([6]Lombard, M., & Ditton, T., 1997). In this study, because of restricting to the equipment and the content of VR which are provided by National Palace Museum, we will focus on discussing *environmental presence* and *personal presence*. And also as we mentioned, *engagement*, 'which reflects an individual's subjective enjoyment in a holistic experience with technology' ([7] Yi, Jiang, & Benbasat, 2015).

By using this indicators, we designed a questionnaire to measures them, after reviewing several literatures about presence questionnaire ([8]Witmer, Jerome, & Singer, 2005; [9]Slater, & Steed, 2000; [10]siter, Freeman, Keogh, & Davidoff, 2001). we

have picked some items from them to make it suitable to our experiment. As to appendix, there has several items, different items belongs to different indicators, and for the personality we used the big five personality trait to analysis, but the questionnaire is still on designing, so the items including in this abstract is the example from the recent finding, it's not the final vision of our questionnaire.

Research framework

For the purpose of measuring presence, we have reviewed many literatures and found out several factors that may impact the presence, in here, we summarize the elements into two parts, *individual differences* and *technology*. *Individual differences*, refer to [1] Witmer & Singer, (1998), they noted that the distraction factors and the realism factor may have impact on presence, these two factors are both related to personal difference. So according to these two factors, we expect personality, previous experience, attention and personal interests as the important elements of the presence. Also, according to [2] Steuer (1992), we knew that technology is one of the important factors may influence presence, for example, the resolution in virtual environment. Moreover, presence will impact user's learning performance. So by the means of measuring presence, we can find out the important factors which can have a better impact on performance.

For another indicator, engagement, we have found that we can measure it and know how much enjoyment user will have after they experience virtual environment. Because one of our objective is arousing people's interests in learning by using VR, it's important for us to know whether they engage in the virtual environment or not. If they have better performance in engagement it means that people really enjoy the experience in VR. If they enjoy it, it means that they may like the content which they experience and will let them have more interests in it. On the contrary, if they don't enjoy it, there are two main reason, one is that they may not really like the content and another is the equipment is not comfortable to them. According to this, people may not want to learn more about the things they see or listen in the virtual environment, because they don't have good experience. By measuring engagement, it will help us know whether the content is attractable to users. We hope to help National Palace Museum find the suitable content and arouse people's interest in learning more about the cultural relics.

Research plan and expected contribution

As to the framework we mentioned in the last paragraph, one of our purpose is finding out the important factor that may impact user's learning performance in VR, so we need to evaluate different user's presence. For example, users have experience in using VR may have better learning performance than those who never use it before, or the users who have interest in the virtual reality's content may have different presence to those who don't have, and whether user have experience in visiting museum or not will also have difference between them. Our another objective is attracting people's interests, we will design a questionnaire to measure engagement as we mentioned before, by measuring this we can know the content is attractable and also can help National Palace Museum to design their future content in VR.

Regarding to the experiment, because we want to find out the difference individual's impact, we will give them prerequisite questionnaire and separate the subjects into two groups by the result. The two groups are treatment group and control group, let the subjects have task in virtual environment which is supplied by National Palace Museum and we may give them some task, after the experiment, we will observe the task performance (in here it means learning performance) and give them questionnaire which is design by us, then we can measure the presence and engagement.

Our experiment's content and equipment is provided by National Palace Museum, the equipment is HTC Vive head-mounted display, with a camera near the bottom rim, two wireless handheld controllers and two 'lighthouse' base stations. Regarding to the content, there are some of the famous antiquities being stimulated in VR, such as the most famous one, jadeite cabbage with insects, one hundred stallions and some crafts, all of them are arrange in a place which looks like a room in the museum, user can walk around the room and watch the exhibits or interact with some of them. For the two controllers, one is a stimulated hand for people to interact with object, another one is a stimulated flashlight, by this we can turn on it in VR in order to let us observe the relics much more clearly. During the time experiencing the content which is provided by National Palace Museum, people can pick up some of the cultural relics, rotate it or take a look of it, but some of them people can only zoom them. For all of the antiquities, when people interact with them, the virtual environment will play the introducing track about the relic you interact with automatically.

By this experiment, we hope to prove that various individuals can have different impact on learning performance and find out which characteristics can have a better impact. Aside from this, by evaluating engagement, we can also know the content which is provided by National Palace Museum can make the user feel enjoyable or not and give some advice to them, we hope the advice can make them improve their content design in VR. And also let the educational application of VR can focus on the features we found, then use these features to design the content, make the VR can not only use in gaming or training field, but also be widely utilized in more fields.

Keywords: presence, virtual reality, education, personal characteristic, personal presence, environmental presence

REFERENCES

- [1] Witmer, B. G., & Singer, M. J. (1998). Measuring presence in virtual environments: A presence questionnaire. Presence:

- Teleoperators and virtual environments, 7(3), 225-240.
- [2] Steuer, J. (1992). Defining virtual reality: Dimensions determining telepresence. *Journal of communication*, 42(4), 73-93.
- [3] Rafaeli, S. (1988). From new media to communication. *Sage annual review of communication research: Advancing communication science*, 16, 110-134.
- [4] Heeter, C. (1992). Being there: The subjective experience of presence. *Presence: Teleoperators & Virtual Environments*, 1(2), 262-271.
- [5] Sanchez-Vives, M. V., & Slater, M. (2005). From presence to consciousness through virtual reality. *Nature Reviews Neuroscience*, 6(4), 332-339.
- [6] Lombard, M., & Ditton, T. (1997). At the heart of it all: The concept of presence. *Journal of Computer - Mediated Communication*, 3(2), 0-0.
- [7] Yi, C., Jiang, Z., & Benbasat, I. (2015). Enticing and Engaging Consumers via Online Product Presentations: The Effects of Restricted Interaction Design. *Journal of Management Information Systems*, 31(4), 213-242.
- [8] Witmer, B. G., Jerome, C. J., & Singer, M. J. (2005). The factor structure of the presence questionnaire. *Presence*, 14(3), 298-312.
- [9] Slater, M., & Steed, A. (2000). A virtual presence counter. *Presence*, 9(5), 413-434
- [10] siter, J., Freeman, J., Keogh, E., & Davidoff, J. (2001). A cross-media presence questionnaire: The ITC-Sense of Presence Inventory. *Presence*, 10(3), 282-297
- [11] Wiebe, E. N., Lamb, A., Hardy, M., & Sharek, D. (2014). Measuring engagement in video game-based environments: Investigation of the User Engagement Scale. *Computers in Human Behavior*, 32, 123-132.

APPENDIX

Measuring Items Sample (Using a Seven-Point Likert Scale)

Personal Presence

- (1) I was aware of the world.
 - (2) I felt I knew what was going to happen next
 - (3) How involved were you in the virtual environment experience?
 - (4) When you think back about your experience, do you think of the field more as images that you saw, or more as somewhere that you visited?
 - (5) During the time of the experience, did you often think to yourself that you were actually just standing in an office wearing a helmet or did the field overwhelm you?
-

Environmental Presence

- (1) How well could you move or manipulate objects in the virtual environment?
 - (2) How responsive was the environment to actions that you initiated (or performed)?
 - (3) The temperature of the real world distracted me.
 - (4) I wanted to see more of the space in the displayed environment than I was able to.
 - (5) I could not do some of the things I needed to do in the virtual environment.
-

Engagement

- (1) The content was attractive.
 - (2) Experiencing the museum in the virtual environment was worthwhile.
 - (3) I would recommend experiencing the virtual reality with this content to my friends and family.
 - (4) I was really drawn into my gaming task.
 - (5) This gaming experience did not work out the way I had planned.
-

Big Five Personality Trait

- (1) Do not have a good imagination
 - (2) Have a rich vocabulary
-

- (3) Make a mess of things
 - (4) Am quick to understand things
 - (5) Have difficulty understanding abstract ideas
 - (6) Feel little concern for others
 - (7) Seldom feel blue
-

The item is quote from [8]Witmer, Jerome, & Singer, 2005; [9]Slater, & Steed, 2000; [10]siter, Freeman, Keogh, & Davidoff, 2001; [11]Wiebe, Lamb, Hardy & Sharek, 2014) and the big five personality test. Note that this the sample item from the recent finding, still not the final vision of our questionnaire.