A review of research done on how to train presentation skills using Head Mounted Displays

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Abstract

Future labour markets demand employees that can carry out non-linear task which are still not possible for computers. This means that employees must have well developed soft-skills to perform at high levels in such a work environment. One of these soft-skills is presenting a message effectively. To be able to present a message effectively one needs to practice this. To practice effectively the trainee needs feedback on the current performance. Here VR environments can be used as a practice tool because it gives the trainee a sense of presence and reality. VR environments are becoming a cost-effective training method since it does not demand the presence of a expert to provide this feedback. The research article analysed in this study suggest that VR environment can be used and are able to provide the necessary feedback to the trainee which in turn will help the trainee become better at the task. The research analysed in this review do however show that there is a need for a study with a larger sample size and a study which runs over a longer period.

1.introduction

The future labour market environment demands employees that can carry out the non-linear task which artificial intelligence cannot. Employers and scientist recognize that to be successful in a work environment you need more than technical abilities (Hart Research Associates, 2013) & (Jensen & Konradsen, 2017). Laker and Powell show that transfer of soft-skills is low, and transfer is considerably lower than hard-skills. When learning soft-skills the trainee is more likely to be affected by prior experiences and own resistance (Laker & Powell, 2011). At the same time employers often fail to recognise the potential gains from training employees in soft-skills since these skills are less obvious and the consequences of having good soft-skills are harder to measure to employees (Laker & Powell, 2011).

Employees are generally emphasizing that communication skills are very important and that colleges should spend more time evolving these skills in college students. Communication is a vital skill when entering the modern workforce according to employers (Hart Research Associates, 2013).

Presenting is part of the communicative skill set which an employee should have when entering the modern workforce. It is key in a wide variety of task from presentation at conferences, service encounters at the workplace or in the field. Sales presentations in smaller groups etc. These different presentations are all critical to building value to a customer (Sundar, Dinsmore, Paik, & Kardes, 2016). Therefore, training and developing the skills associated to a good presentation are crucial (Hart Research Associates, 2013).

Presentation skills have been trained in classrooms throughout colleges around the world. The approach in training these skills and how much emphasise is put on the training of these skills differs from college to college, culture to culture. It would how ever be of interest, to all who must develop their presenting skills and the colleges which must facilitate this development, that this development can be done of site, when time is available to the student and still give qualitative feedback to the student on the presentation (Belboukhaddaoui & Ginkel, 2019). VR modules would be a cost-effective way to provide many students with a lifelike experience in presentations as in intercultural experiences and would be able to provide the criteria's mentioned above to make it both cost effective to the college and trainee effective to the student (Jensen & Konradsen, 2017).

The use of VR to create Educational virtual environments (EVE) have been developed through the last many decades (Mikropoulos & Natsis, 2011) however it is not until recent years that Head Mounted Displays (HMD's) have been affordable to a broader educational system an example is two comparable VR hardware from 204 and 2016 cost $ 45.000 and $ 1.300 respectively (Hickman & Akdere, Developing intercultural competencies through virtual reality: Internet of Things applications in education and learning, 2018).

Therefore, this review is focusing on research using HMD's and EVE for developing presentation skills focused on colleges students.

2. Methodology

The research axes of this review are the study of:

- The use of HMD's to develop presentation skills
- The features and characteristics used to develop presentation skills by exploiting VR
- The learning theory authors apply in their studies

This article reviews empirical research studies published as full-length articles written in English in scientific journals, proceedings of international conferences, symposia and workshops during the last 5 years because recent developments in HMD's as written above (Hickman & Akdere, Exploring Virtual Reality for Developing Soft-Skills in STEM Education, 2017). The Search in done with in the academic areas of educational research and computer and science.

2.1 Search strategy

The search strategy incorporates five research databases to ensure a comprehensive search. Of these three are interdisciplinary (SCOPUS, Web of Science, Science Direct) the other two are fields of computer and science (IEEE Xplore), educational research (ERIC).

Each database was searched in June 2020 with keywords based upon this below Boolean search string.

(Virtual reality OR head-mounted display) AND (presentation OR presentation skills OR learning to present in public).

Each search is as mentioned limited to a 5-year period and sources must be in English. The Search on SCOPUS gave 1107 documents, at Web of Science this search gave 1417 documents, at Science direct this gave 9563 articles. The at IEEE Xplore gave 2350 articles and conference papers and the search on ERIC gave 1 article.

2.2 The selection process

The high number of references in the gross list reflects that the search terms are very general and can be found in a large variety of academic documents. Due to the extensive gross list the search was narrowed down only to consist the academic years 2019 and 2020. This should not affect the conclusion of the review since this only narrowed the search to 2330 academic reports. Here after the search war narrowed down to only include higher educations which gave 145 academic documents.

The search could how-ever due to the interdisciplinary nature have been narrowed with a focus on vocabulary studies without risk of missing essential documents. All studies focusing on training of hard skills (Laker & Powell, 2011) where exclude as where documents focused on hardware or software. Next the articles where sorted after a systematic approach in four steps.

1. Full text is available.
2. Full text is in English.
3. Describes the use of HMD's.
4. Describes a use of HMD's in learning public speaking or presentation skills.

This narrowed the search down to 6 articles which were deemed appropriate to include in the analysis.

The 6 studies which are analysed in this review all examine the application of VR in teaching presentation skills in some form:

- Alyssa Davis, Darren L. Linvill, Larry F. Hodges, Albert Florencio DaCosta & Alexzander Lee (2020) "Virtual reality versus face-to-face practice: a study into situational apprehension and performance", Communication Education, 69:1, 70-84, DOI: 10.1080/03634523.2019.1684535.
- Hugh, McFaul, Elizabeth Fitzgerald, "A realist evaluation of student use of a virtual reality smartphone application in undergraduate legal education", British Journal of Educational Technology, vol. 52, No 2, 2019 p. 572-589, DOI: 10.1111/bjet.12850.
- Ilham Belboukhaddaoui, Stan Van Ginkel, "Fostering oral presentation skills by the timing of feedback: an exploratory study in virtual reality", REM – Research on Education and Media, Vol. 11, N. 1, Year 2019, DOI: 10.2478/rem-2019-0005.
- SchneiderJan, Romano Gianluca, Drachsler Hendrik, "Beyond reality: Extending a presentation trainer with an immersive VR module", Sensors, 2019, Vol.19(16), DOI: pp.urn:issn:1424-8220.
- Siti Maftuhah Damio, Qistina Ibrahim, "Virtual Reality speaking application utilisation in combating presentation apprehension" Asian Journal of university Education, December 2019, vol.15(3), p 235, DOI: 10.24191/ajue.v15i3.7802.
- Stan Van Ginkel, Dominic Ruiz, Asko Mononen, Gendel Karaman, Ander de Keijzer, Jirarat Sitthiworachart, "The impact of computer-mediated immediate feedback on developing oral presentation skills: An exploratory study in virtual reality", Journal of computer assisted Learning, June 2020, vol. 36(3), pp. 412-422, DOI: 10.1111/jcal.12424.

3. Findings

3.1 Quality of the studies analysed

The research done by Hugh McFaul and Elizabeth Fitzgerald has a very limited scope with only 28 respondents to their questionnaire and from this only 11 students used the smart phone VR application (McFaul & FitzGerald, 2019). This very limited number of users on their smart phone VR application makes the findings of the study questionable. They randomly selected 10 of the 11 participants who had answered that they had used the smart phone VR application and conducted interviews to get a better insight in to the experience of the users. By conducting interviews, the research team will get an in-depth insight in to the 10 students experiences in using the smart phone VR application. The findings are however not necessarily general, and the research team should be wary of drawing general conclusions on the behalf of such a small sample size.

The exploratory study on “The impact of computer-mediated immediate feedback on developing oral presentation skills: An exploratory study in virtual reality” by Stan Van Ginkel et al. builds upon a test of 22 pre-university students all enrolled in a presentation course in Holland. The authors point out them self’s that because of the limited scope of the sample size creates a problem regarding the conclusions of the exploratory study. The students were divided in to two groups of equal size which was then given feedback in different methods. During the course the students were given feedback either as computer-mediated immediate feedback or as feedback from a professional on behalf of a computer-generated report. The students then had a week of before the next session took place. This time lack presents a problem to the study since all students had the opportunity to practice their presentation skills within the passing week. Therefore, it will be hard to conclude which of the feedback methods are best at maintaining knowledge since the development in student performance could be due to practice done outside the VR application and not necessarily draw upon the feedback given. The feedback given by professionals also hold an aspect of personal mediation which might also have an impact on the maintenance of learning (Ginkel, et al., 2020).

Ilham Belboukhaddaoui et. al. are basing their study on a sample size of 30 undergraduate students who had signed up for a two-hour presentation session at a Dutch university from varies study domains and selected on their willingness to improve their presentation skills. The students where in this study divided randomly in to two equal size groups of 15 and where then getting either immediate feedback or delayed feedback from the virtual reality environment. Having a sample size of 30 makes the findings in the study questionable and there is no statistical certainty that the findings will be general. The study only used computer mediated feedback which rules out the possibility of an inter-personal bias. The study focused on the participants ability to improve eye contact with avatars in the VR environment and the participants use of voice. Here it should be mentioned that presentation skills incorporate a large variety of complex skills hence improving on eye contact and use of voice does not necessarily create a good presentation (Belboukhaddaoui & Ginkel, 2019).

The study made by Siti Maftuhah Damio et. Al. had a sample size of 24 post graduate TESL students from UiTM, Selangor, Faculty of education. This sample size deems a problem to the conclusions made in the study. The research team used questionnaires to collect the quantitative data and interviews to collect the qualitative data. This collection method is useful to collect the insights and can provide deeper understandings of the participants thoughts on their participation. The collection is how-ever not done anonymously, and this could create a bias in the data collection process (Damio & Ibrahim, 2019).

The study made by A. Davis et al. had a sample size of 243 students of these 127 took part in a control group and 69 took part in the test the remaining students did not want to participate in the study. The sample size of this study is deemed adequate to generalize the findings. The problem however is that the study only lets the test group practice ones in the VR environment. When only doing one practice session in the VR environment it is likely that the students have practiced their presentation skills on their own as well and this

creates an unknown variable which is not dealt with in the study. Furthermore, some participants in the VR environment were to practice their presentation before they had to prepare their presentations. This is a known bias in the study which the analysis of the result should have considered (Davis, Linvil, Hodges, Costa, & Lee, 2020).

The exploratory research done by Jan Schneider et al. builds upon a user test of 24 participants who all signed up voluntarily to take part in the research on using a VR environment for enhancing presentation skills. Since the research team only had 24 participants it is unlikely that the findings of this study can be generalised. The participants had on training session with 3 presentation of a duration of 30 to 120 second. Since the duration of the study is very short the findings in the study might are unable to tell if the participants will maintain their learnings over time. At the same time all participants were volunteers' which is a bias concerning involvement and enthusiasm and should be considered in the conclusions of the study (Schneider, Romano, & Drachsler, 2019).

3.2 Factors influencing user experience

Hugh McFaul and Elizabeth Fitzgerald finds that the user experience in their smart phone VR application is altered by 3 distinctive factors, time available to the user, user self-efficacy towards technology and technological short comings of the application. These 3 factors created a hindrance for the users' engagement with the smart phone VR application and the 10 out of 11 users newer felt immersed in the application (McFaul & FitzGerald, 2019).

Stan Van Ginkel et al. found that students which were given computer-mediated immediate feedback stated "*that they appreciated the direct nature of the feedback and that it supported immediate behavioural change*" (Ginkel, et al., 2020, s. 8). The students who were given delayed feedback however were better at effecting change within the specific aspects of their performance. The study shows that students did have some questions to the use of VR, one student answer in the questionnaire that scenario was not realistic while only 6 out of 22 students answer that the VR experience encourages their reflection skills. The study does however suggest that in general the students held a "*positive perception of the platform*" (Ginkel, et al., 2020, s. 9).

Ilham Belboukhaddaoui et. Al. choose their participants in the study based upon their willingness to improve their presentation skills. This might bias the participants opinion on the use of VR in improving these skills. The participants in this study did not provide feedback to the research team on the VR environment or if the VR environment provided the participants with a realistic training field (Belboukhaddaoui & Ginkel, 2019).

Siti Maftuhah Damio et al. found that the participants where very enthusiastic about the use of a VR environment to improve their oral presentation skills. The participants found the VR environment engaging and realistic, hence the participants had a good sense of immersiveness and this resulted I a feeling of presence. The research team found that respondents in general were enthusiastic about the VR environment as a tool to practice their oral presentation skills (Damio & Ibrahim, 2019).

The study made by A. Davis et. Al. found that their VR environment may have caused the test users to feel a sense of presence and that test users: "*found their sessions to be realistic*

and immersive" (Davis, Linvil, Hodges, Costa, & Lee, 2020, s. 78). The sense of realism and immersiveness which led to the feeling of presence caused the VR users to feel presentation/communication apprehension in the VR environment. The users in the VR environment where found to feel more communication apprehension then the test group practising in peer-to-peer groups (Davis, Linvil, Hodges, Costa, & Lee, 2020).

The exploratory research done by Jan Schneider et al. found the participants in the study did not feel immersed because the VR environment was not perceived realistic by the users. The exploratory study suggests that because of lacking capabilities in the hardware it would be a possibility to use 2D audience in the VR environment. The users also experienced that all applications running on the hardware would go to the background with certain gestures and thereby interrupting the practice session (Schneider, Romano, & Drachsler, 2019).

3.3 Skills obtained by users

Hugh McFaul and Elizabeth Fitzgerald's research finding towards obtained skills are limited. Only one recipient of the 11 users deemed the smart phone VR application a use full tool to obtain better presentation skills when studying remotely.

The other recipients found the smart phone VR application either too incomplete technologically, they perceived their own technological skills to be inferior and therefore did not engage or perceived using the smart phone VR application to time consuming. The one user who did engage and felt immersed in the technology did not report any increase in presentation skills (McFaul & FitzGerald, 2019).

Stan Van Ginkel et al. found that the expert mediated feedback gave the students a better retainment of learning. The students given expert delivered feedback specifically scored better at adjusting talk pace then the group given computer-mediated immediate feedback. However, both groups improved their presentation skills overall and there are no statistically significant differences between the two groups gain in overall performance, eye-tracking and talking pace (Ginkel, et al., 2020).

Ilham Belboukhaddaoui et. Al. focused solely on eye contact with the avatars in the VR environment and the use of voice in the VR environment. The research team found that there was no difference between giving delayed or immediate computer-moderated feedback. Both groups where able to improve on their eye contact and their use of voice. They did how-ever find that there was a difference between students' ability to present based on their study fields (Belboukhaddaoui & Ginkel, 2019).

The study conducted by Siti Maftuhah Damio et. Al. did not focus on the respondents gain in skills or knowledge, they solely focused of respondents' appreciation of the VR environment as a training tool. Therefore, this study does not provide any insights on a VR environments ability to provide users with a training field that also helps the user to retain the obtained skills (Damio & Ibrahim, 2019).

The research done by A. Davis et.al. did not focus on any general attainment of knowledge. The focus of the exploratory study was to see if a VR environment can help on combating communication/presentation apprehension. The study suggest that one way of combating

communication apprehension is to practice in a life like environment as done with other phobias. The study suggest that the VR environment was to realistic causing an undesirable high communication apprehension in the test group (Davis, Linvil, Hodges, Costa, & Lee, 2020).

The exploratory research done by Jan Scheider et al. found that learners training in their semi-immersive VR environment improved their use of pauses by 33.7% and improved their use of gestures by 32.7%. Overall the study was able to improve the percentage of time in mistake by 28.6%. This leads the research to conclude that the participants use of the semi-immersive VR environment had a positive impact on their performance (Schneider, Romano, & Drachsler, 2019).

4. Conclusion of the studies

Conclusion on the Hugh McFaul et al is that there is need for further development of the smart phone VR application used in the study and that students did not perceive the software to be of value to them (McFaul & FitzGerald, 2019).

The exploratory study made by Stan Van Ginkel et al. conclude that students given computer mediated immediate feedback found the direct nature and impact of the feedback as a positive driver for their performance. The students given expert mediated delayed feedback found that the analytical depth of the feedback as a positive driver. In general, the study suggest that expert delivered delayed feedback is better because it demands deeper cognitive processing (Ginkel, et al., 2020).

The study conducted by Ilham Belboukhaddaoui et. Al. found that students for specific studies where able to improve on eye contact and use voice as sub criterions to improve overall presentation skills. They did how-ever also find that participants from technical studies perform worse on face-to-face presentations after rehearsing in a VR environment. The study suggests that a VR environment can be used to improve on eye contact and use of voice if students do not study a technical program (Belboukhaddaoui & Ginkel, 2019).

Siti Maftuhah Damio et al. conclude that students who engaged with the VR environment found it enjoyable and the students also responded that is could ease their oral presentation apprehension. The immersive and engaging nature of the VR environment was deemed as beneficial in easing oral presentation apprehension (Damio & Ibrahim, 2019).

The research team with A. Davis et.al. found that the end grades in the course were not influenced by the use of VR. They were not able to identify if users of the VR environment felt less communication apprehension then the control group. The research team suggest that more research should be done in the field to find out if a VR environment can be used to cope with communication apprehension and thereby making students better at presenting (Davis, Linvil, Hodges, Costa, & Lee, 2020).

The exploratory research done by Jan Scheider et al. conclude that there are three main findings concerning learning and user experience. Practicing with a VR environment also linked to a Kinect sensor which makes I possible to both give immediate and delayed feedback helps learners improve their performance. The feedback given as immediate

computer moderated feedback was appreciated by the learners in the semi-immersive VR environment. The use of post-practice histograms and video-analysis features where found insightful by the learners to be aware of their behaviour during their presentation (Schneider, Romano, & Drachsler, 2019).

5. Conclusion of the review

This review has analysed 6 different studies using VR environment to improve presentation skills. The studies reviewed in this article have all been done on small sample sizes and all lack a longer time frame.

It does however seem to be indications that using a VR environment can help learners improve their presentations skills. Both by combating communication apprehension and because of immediate computer mediated feedback. Specific studies also suggest that by integrating a possibility to provide computer mediated feedback to learners after their performance creates a more in-depth understanding of the learner's own performance and their behaviour during their training sessions in the VR environment.

The research area is at this point mostly exploratory and to create proof that a VR environment is a feasible solution to practicing presentations there is need of a study that has a most larger sample size and which will run for a longer duration of time.

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