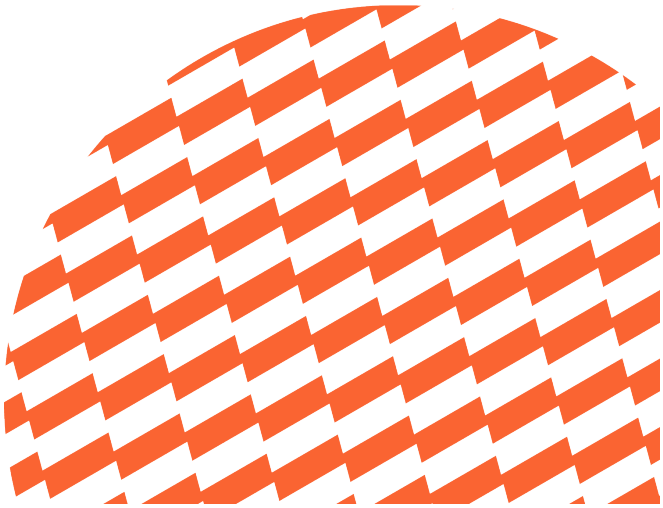

FINAL REPORT

Immersive virtual reality for soft skills training: higher education student and instructor perceptions

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THOMAS MORE UNIVERSITY OF APPLIED SCIENCES

Study commissioned by Bodyswaps.co

Research carried out by Thomas More University of Applied Sciences.
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1 Context of study

Meta, formerly known as Facebook, is investing billions of dollars in the development of XR devices, such as the most recent Meta Quest3. To promote XR technology in education and enterprise learning, Meta has also launched an Immersive Learning program. Meta has granted several companies, including Unity, Inspirit and Bodyswaps, to investigate the potential of XR for educational purposes.

Bodyswaps is a London based XR development agency, focusing on soft skills training, both for education and enterprise. In 2022 Bodyswaps has been granted 200 Meta Quest2 headsets in a Soft Skills Education Grant by Meta. In this grant, Bodyswaps aims to investigate the potential uptake of immersive learning supporting soft skills training in higher education institutions (HEIs). They have provided 106 HEIs throughout the US and Europe, with 2 Meta Quest2 headsets and full access to their library of modules. These 106 HEIs were recruited and selected by Bodyswaps via an open call.

To carry out the research, Bodyswaps engaged with Thomas More University of Applied Sciences in Belgium. Thomas More has a proven track record in research on immersive learning, both on an academic and practice-oriented level. Thomas More has designed, carried out and analyzed the study. This was done in close collaboration between Thomas More and Bodyswaps, while maintaining research ethics, such as data regulation and independence of research.

2 Executive summary

Immersive virtual reality is gaining popularity. Educators worldwide start to experiment with this new technology. Several review studies have pointed to the affordances, such as safety, unlimited possibilities, doing the impossible, increased motivation and so on. These outcomes have been reinstated by multiple meta-analyses, especially pointing to the benefits of the iVR affordances over other instructional approaches. Despite these benefits, it is however of interest to investigate which factors contribute and inhibit the acceptance by both students and instructors, before implementing this new technology. This study investigates the perceptions of higher education (HEI) students and instructors on immersive virtual reality as an instructional medium to train students' soft skills. This study was carried out by Thomas More, commissioned by Bodyswaps, in a context a the Meta grant for Immersive Learning. Participating HEIs were recruited by Bodyswaps and 106 were selected, which received two Meta Quest2 headsets and full access to the library of Bodyswaps training modules. During a period of three months the HEIs could experiment with this new instructional medium. Afterwards they were asked about their perceptions. Due to the voluntary and remote nature of this research, only 48 out of 106 HEIs engaged in the study, however resulting in a sample of 103 instructors and 480 students from 8 different countries. Results were analyzed using the IBM SPSS statical package. Exploratory analyses were carried out, pointing to some interesting differences between countries, between universities and colleges, and between gender. However, when adding these variables in subsequent general linear modelling analyses, none of these seemed to significantly affect the outcome results. Both students and instructors are highly acceptable to use iVR as an instructional medium for soft skills training. When studying the results in more detail, students should be shown the benefits of iVR, they should be supported in handling the hardware and software, preferably in a context of social (peer) learning. Similarly, instructors stress the importance of the added value to their teaching practice, they ask for technical support and expect a clear incentive from their senior leadership on how iVR fits within their current educational policies. Based on the results, iVR for soft skills should be promoted in higher education.

3 Problem statement and hypotheses

3.1 iVR in education[1]

Immersive virtual reality (iVR) has become popular, with millions of virtual reality headsets (head-mounted displays, HMDs) sold and over 16 million users (Alsop, 2022). This iVR rise is often attributed to improved usability and affordability (Bower et al., 2020). Following the technological advancements of iVR headsets, iVR has also caught the attention of the educational sector. This is also reflected in the European Horizon program on Extended Reality (XR) Learning (European Commission, 2021), and the recent report on XR in education and healthcare (European Commission, 2023). Educational institutions worldwide have started experimenting with iVR in their curricula.

Immersive virtual reality is now being used in a wide variety of educational domains, including medicine, STEM, social sciences, computer science and architecture (Hamilton, 2021). Due to its technological features, immersive virtual reality is able to create highly immersive experiences with unprecedented learning opportunities. These opportunities or benefits are generally called 'learning affordances' (Bower, 2008; Dalgarno & Lee, 2010; Shin, 2017). When applied to e-learning, educational affordances refer to how an educational resource can foster certain learning behavior (Bower, 2008). Several review studies have pointed to iVR learning affordances, such as encompassing limits of time and place (Freina & Ott, 2015) and of resources available (Kavanagh, 2017), procedural training and practicing transfer of skills (Kavanagh, 2017; Jensen & Konradsen, 2018), offering opportunities for distance learning (Kavanagh, 2017) and collaboration (Maas & Hughes, 2020), and finally simulating dangerous or even impossible situations (Freina & Ott, 2015; Kavanagh, 2017).

[1] This part was taken from Boel, C., Rotsaert, T., Valcke, M., Rosseel, Y., Struyf, D., & Schellens, T. (2023) Are teachers ready to immerse? Acceptance of mobile immersive virtual reality in secondary education teachers. *Research in Learning Technology, 31,* https://doi.org/10.25304/rlt.v31.2855; and from Boel, C., Rotsaert, T., Valcke, M., Rosseel, Y., & Schellens, T. (2023). The teacher matters! A cross-over experimental study on the instructional method of immersive virtual reality to teach middle school students how to ride a bicycle safely in traffic. *Journal of Computer-Assisted Learning*, submitted for review.

As there is an increased interest in iVR by the educational research field (Marougkas, 2023), several experimental studies have been administered, of which the results have been collated in recent meta-analyses. Kaplan et al. (2020) concluded that XR is equally effective in training procedures than traditional instruction methods, however "the other benefits of XR training make it a superior option" (Kaplan et al., 2022 p. 9), pointing to the pedagogical affordances as discussed above. Howard et al. (2021) noted significantly better learning results than the comparison groups with an overall medium effect size of respectively g = 0.54, which was endorsed later on by Cao & Hsu (2022) indicating a similar overall medium effect size of g = 0.52. Coban et al., 2022 found a significant improvement of learning outcomes with a medium to large effect (g = 0.61) for K-12 education, confirming Wu et al. (2020), who found a large effect size (g = 0.80) in K-12. Yu et al. (2022) found iVR significantly outperforming the control conditions on intellectual skills, motor skills, cognitive strategies, attitudes and overall skills. These results were found on all educational levels (K-12 and university), but not in elementary education.

Apart from the effect of immersive virtual reality on cognitive outcomes, affective outcomes have been of interest too. Several studies have indicated iVR positively affecting motivation (Chavez & Bayona, 2018; di Natale et al., 2020; Kavanagh, 2017; Makransky & Petersen, 2021; Mayer et al., 2022;), interest (Chavez & Bayona, 2018; di Natale et al., 2020; Makransky & Petersen, 2021; Mayer et al., 2022) and enjoyment (Suh & Prophet,2018; Kavanagh, 2018; Makranksy & Petersen, 2021; Meyer et al., 2019; Mayer et al., 2022)

The affordance of training soft skills and communication strategies using iVR has also been documented (di Natale et al., 2020; Hamilton et al., 2021; Radianti et al., 2020, however mainly in medical education (Turso-Finnich et al., 2023). As soft skills have been identified as one of the most important skills for applicants (El-Jarn & Southern, 2020; Forbes, 2022), it of interest to investigate how immersive virtual reality can support teachers and trainers worldwide, across all disciplines in training their students' soft skills.

We were interested in whether the identified affordances of iVR would also apply on soft skills training. As such, our first research question is:

RQ1: How do HEI students and instructors perceive of the commonly cited educational affordances of iVR, when applied to soft skills training?

3.2 Acceptance of iVR in education[2]

However, before implementing this new, immersive technology, it is of great importance to study which factors contribute to and inhibit the acceptance and use of iVR in higher education institutions, as it might inform design guidelines for implementation (Alfalah, 2018; Han, 2020; Wu et al., 2020). Several studies have investigated students' and instructors' perspectives on iVR before (Bower et al., 2020; Boel et al., 2023), however not focused on soft skills training, nor at such a large scale (100 HEIs involved across Europe and North-America). As such, this presents us with the second research question:

> *RQ2 – Which factors contribute to and inhibit the acceptance by HEI students and instructors of immersive virtual reality to train soft skills?*

As stated by Venkatesh, Thong, and Xu (2012, p. 157) research on 'individual acceptance and use of information technology is one of the most mature streams of information systems research'.

Over the years, several acceptance models have been drafted, ranging from TAM (Davis 1989) over Unified Theory of Acceptance and Use of Technology (UTAUT) (e.g. Hussin, Jaafar, and Downe 2011) to self-generated models (e.g. Alfalah 2018; Khukalenko et al. 2022). However, nearly all identified factors predicting iVR acceptance by teachers can be synthetised into the factors of the UTAUT acceptance model (Venkatesh et al. 2003) related to behavioural intention to use, namely performance expectancy, effort expectancy, social influence, facilitating conditions adding hedonic motivation from UTAUT2 (Venkatesh, Thong, and Xu 2012). This is also in line with our prior qualitative, exploratory study using UTAUT2 to investigate which factors contribute to the acceptance of mobile iVR by secondary education teachers (Boel et al. 2021b). We will now discuss the factors of UTAUT2 in greater detail (Fig 1.). For a comprehensive review of UTAUT2 refer to Venkatesh, Thong, and Xu (2016).

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[2] This part was taken from Boel, C., Rotsaert, T., Valcke, M., Rosseel, Y., Struyf, D., & Schellens, T. (2023) Are teachers ready to immerse? Acceptance of mobile immersive virtual reality in secondary education teachers. *Research in Learning Technology, 31,* https://doi.org/10.25304/rlt.v31.2855

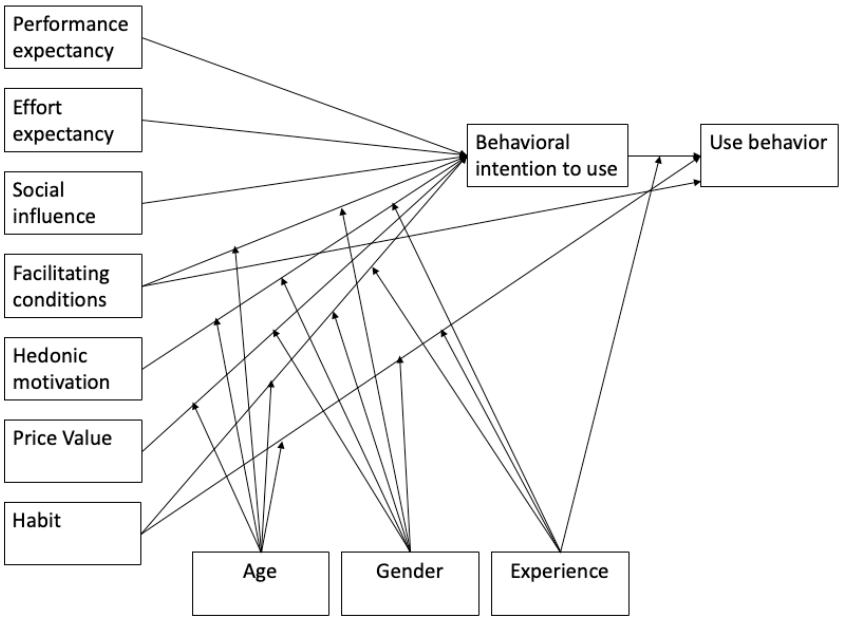

Fig. 1 - UTAUT2 model (taken from Venkatesh et al., 2012)

Performance expectancy refers to the extent to which a person believes the technology improves working conditions. This factor seems significantly associated with behavioural intention to use iVR (Boel et al. 2021b; Bower, De Witt, and Lai 2020; Khukalenko et al. 2022; Sagnier et al. 2020; Shen et al. 2019). Effort expectancy is the extent to which a person thinks efforts are needed to use a technology. Teachers must learn to operate iVR, to integrate this into their curriculum and so on. Previous exploratory research (Boel et al. 2021b; Pletz 2021) proved this to be of major concern in teachers and instructors. Social influence refers to the extent someone feels influenced by others. 'Others' can be colleagues or persons valued by teachers, such as teacher-experts, trainers, IT-staff and principals. Available iVR research points to the significant association with behavioural intention to use (Bower, De Witt, and Lai 2020; Jang et al. 2021; Shen et al. 2019). Facilitating conditions comprise a person's feeling of being supported in his or her technology use. It refers to organisational, instrumental and infrastructural support. Facilitating conditions has proven to be a key factor predicting behavioural intention to use of teachers in general (Pynoo et al. 2011) and for iVR more specifically (Boel et al. 2021b; Bower, De Witt, and Lai 2020; Bracq et al. 2019; Khukalenko et al. 2022; Pletz 2021; Shen et al. 2019). Resulting from these findings, we hypothesised:

H1. Performance expectancy is significantly associated with behavioural intention to use.
H2. Effort expectancy is significantly associated with behavioural intention to use.
H3. Social influence is significantly associated with behavioural intention to use.
H4. Facilitating conditions is significantly associated with behavioural intention to use.

Whereas UTAUT focuses on technology acceptance and use from the perspective of an organisation, UTAUT2 rather aims at individual level variables (see e.g. Tamilmani, Rana, and Dwivedi 2021). This fits the present study because iVR is yet not adopted as a general educational tool in schools. Therefore, we considered the three factors of habit, price value and hedonic motivation. Habit reflects prior experiences and refers to the extent to which teachers already adopt technology in their courses (Venkatesh, Thong, and Xu 2012). As we expected teachers do not yet integrate iVR technology in their courses at a level which would fit the construct of habit, we chose not to add this factor to our research model. Although price value is another significant factor in predicting behavioural intention to use (Venkatesh, Thong, and Xu 2012), our prior research (Boel et al. 2021b) proved price value not to come into play as in general teachers are less concerned with expenses, compared to principals and IT-staff. Therefore, price value was not included in this study. Hedonic motivation is defined as the enjoyment of the information system by the user (Van der Heijden 2004). The pleasure arising from an iVR experience is one of the main attraction elements to iVR (Bracq et al. 2019; Bower, De Witt, and Lai 2020; Chen, Shih, and Yu 2012; Makransky, Terkildsen,
and Mayer 2019; Yang and Han 2020). These findings led to this hypothesis:

H5. Hedonic motivation is significantly associated with behavioural intention to use.

Our prior exploratory study (Boel et al. 2021b) proved the UTAUT2 framework to be useful, but also pointed at shortcomings. Interview data from nearly all interviewees revealed the need to consider personal innovativeness in the domain of information technology (personal innovativeness [PI]). This was underpinned by other qualitative research on iVR in professional training settings by Pletz (2021). Agarwal and Prasad (1998) defined personal innovativeness as 'the willingness of an individual to try out new information technology' (p. 206). Personal innovativeness has proven to have a significant effect on intention to use (Amid and Din 2021; Blut et al. 2021; Cao et al. 2019; Fagan, Kilmon, and Pandey 2012; Sagnier et al. 2020; Zhao et al. 2021). Based on these findings, we therefore enrich the model with the factor of personal innovativeness, adding this hypothesis:

H6. Personal innovativeness is significantly associated with behavioural intention to use.

Although there is evidence to suggest the beneficial impact of iVR on learning outcomes, both on the cognitive and affective domain, several factors seem to affect the potential positive outcomes, such as the educational level (Cao, 2022; Wu et al., 2020; Yu et al., 2022), the subject taught (Cao & Hsu, 2022) the iVR equipment used (Cao & Hsu, 2022; Coban et al., 2022) and individual traits such as gender (Suh & Prophet, 2018; Zeuwts et al., 2022), age (Suh & Prophet, 2018), prior knowledge (Yu, 2022). As such, we were interested in whether moderating variables, such as gender, prior knowledge, prior gaming experience, prior VR experience, age, country, educational level were moderating the associations between the predicting factors and the acceptance levels. This led to this hypothesis:

H7. Age, gender, prior knowledge, prior gaming experience, prior VR experience are significantly moderating the association between the predicting factors and behavioral intention to use.

As stated before, we expected mobile iVR technology is not yet integrated in most teachers' educational practice. Therefore, we limited the construct of acceptance to the factor of behavioral intention to use leaving out Use as a dependent variable in this study.

Pulling together available iVR research resulted in a further development of the model in view of the present study as depicted in Figure 2.

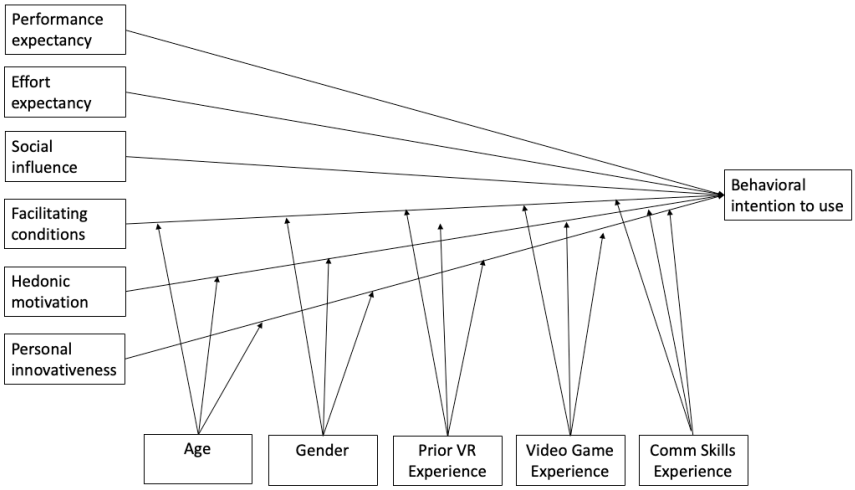

Fig. 2 - Research model investigating perceptions of HEI students and instructors on iVR for soft skills training

4 Methodology

4.1 Participants

Participants were recruited via an open call, launched by Bodyswaps, during October-December, 2022. Interested HEIs could apply to engage in the Soft Skills grant via an online form. They were asked about their geographical location, their educational institution and their position therein, how they would organize the accelerator program during the grant period, and which profile of students would take part in the program. In total, 231 HEIs applied for the grant, of which 106 were selected. Selection of HEIs was based on the criteria of feasibility of organization (will the accelerator program probably succeed during the grant period?) and representation across academic levels (university, higher education), countries, and academic programs (e.g. engineering, language studies, psychology). Part of the grant was to take part in academic research, but on a voluntary basis; no charges or penalties were induced when HEIs would not take part in the study.

Of the 106 selected HEIs, 45 made up the sample for the current study. The voluntary nature of the study will have contributed to this major drop-out. Across the 45 HEIs in our sample, 583 participants completed the online survey, of which 480 students and 103 students. The university and college level were equally represented: 289 and 294 participants respectively. 305 participants defined themselves as male, 265 as female, and 13 as another gender. Our sample reflects a whole range of study domains, ranging from engineering, psychology, language studies, social care, business management and so on. A similar range was noted for the academic year: ranging from 1st year college over 2nd master university, to doctoral students or postgraduate trainings. Demographic variables are collated in Table 1 and 2 in the appendices.

Prior to the study, the participating students and instructors were provided with an information letter, including an informed consent. The participants were required to give active informed consent via the online survey; otherwise the survey was immediately ended. This study was conducted in accordance with the ethical guidelines as defined in the Declaration of Helsinki. The study was given approval by the Social and Societal Ethics Committee of KU Leuven (number G-2023 05 2148).

4.2 Procedure

The selected HEIs were provided with a detailed research protocol by the responsible researcher (see appendices) to ensure consistency in collecting the data. Participants were invited to take the iVR soft skills training, as organized by the HEI itself, in terms of time and location between May 15 and June 4, 2023.

Participants put on the Meta Quest2 iVR headset and take the iVR soft skills training from the Bodyswaps library, offering several modules to train soft skills. The topics address several skills and situations (e.g. public speaking, inclusive leadership, job interview, active listening), but all have the same design. Each module lasts about 20 minutes, depending on the training module selected and the pace of the participant.

The trainee is set in a virtual environment with one or more virtual conversation partners. Based on a scenario, the trainee is asked to engage with the virtual conversation partner, e.g. in a job interview. The trainee talks and listens to the virtual conversation partner, as if it was a real job interview. The virtual conversation partner is life-like, both in design and in behavior. The trainee is supported by help features in terms of prompts.

After the training, the trainee gets feedback on his performance, according to some metrics such as fluency, eye contact, and appropriateness. Finally, the trainee 'swaps bodies', takes the perspective of the conversation partner and watches how he performed earlier. This can be considered as a stimulated recall protocol, which can be defined as "a subject may be enabled to relive an original situation with vividness and accuracy if he is presented with a large number of the cues of stimuli which occurred during the original situation." (Bloom, 1953, p. 161). Stimulated recall has been used to assess students' self-regulated learning and provides the learner with opportunities for reflection (Meier & Vogt, 2015). In the Bodyswaps modules, the trainee is taken back to the training, 'relives' the training and metacognition and reflection is fostered through this 'body swapping'.

Participants are always observed by an instructor or staff member of the respective HEI, in order to ensure mental and physical safety and comfort of the participant, but also to maintain the research procedure as described in the protocol. Immediately after the iVR experience, the participants fill in an online survey (administered via QuestionPro), using a computer, or mobile device in the same room of the experiment, provided by the HEI itself. Participants are asked for their wellbeing and if recommended are asked to stay in an adjacent room, until they feel well. Collection of data was limited to the period of May, 15 to June, 4.

4.3 iVR equipment

The HEIs were provided with two Meta Quest2 iVR headsets by Bodyswaps, with the Bodyswaps software pre-installed, accompanied with some technical information on how to set-up and use the iVR headset properly and safely. The HEIs were also invited to join a webinar, hosted by Bodyswaps, to provide the participating instructors and management staff with technical information. As such, we tried to ensure a frictionless usage of the Meta Quest2 iVR headsets during the experiment.

4.4 Measures

All participants were asked to answer an online survey via QuestionPro. The link to the survey was distributed via the Bodyswaps team to the HEI representatives. First, we asked for some demographic elements, such as gender, the name, level and geographic location of their HEI institution, and their academic domain and main year they study or work in. Next, we measured their prior VR experience, video gaming experience and familiarity with soft skills training on a 7-point Likert scale, ranging from 1 (no experience), over 4 (moderate experience) to 7 (very much experience).

To tap into their perceptions (RQ1) both students and instructors were presented with an adapted version of the UTAUT2-questionnaire. To prevent drop-out of the experiment as much as possible, due to the voluntary nature of the study and the remote format of the study, we opted for a reduced version of the survey, bringing the original 37 items to 14 for the students, and to 22 items for the instructors. An overview of all survey items is presented in the appendices.

Similarly, we investigated self-efficacy (Bandura, 1977) via four items, and interest on another two items (Ryan & Deci, 2000). Another 14 items measured whether the commonly cited affordances of iVR for education also apply to soft skills in HEI. All items tested separate affordances, such as a psychologically safe place for learning, a high-focus learning environment, a realistic learning experience, an accessible learning instrument and so on. 13 instructors' items were targeted towards their perceptions on performance on the student level, e.g. 'Virtual reality increases students' engagement' and 'Virtual reality makes students more focused'. The remaining 7 items addressed the role of organizer as an instructor, e.g. 'Virtual reality makes it less complicated to train students' communication skills' and 'Virtual reality would serve as a selling point to attract students to our institution over others'.

5 Results

5.1 Descriptive analysis

Analysis of the data was performed using SPSS28 (IBM). First, unidimensionality of the instrument was tested using correlation indices (students) and factor analyses (instructors). Results are presented in Table 3 (students) and Table 4 (instructors). For the students, all items correlated good to very good, and to a significant level (<.001). Only for facilitating conditions (FC) we noticed a low correlation, although significant (<.001). This is typical for FC, as this construct measures both available knowledge and resources, which might differ.

Reliability was tested calculating Cronbach's alpha. Similar results were noted for the instructors. However, we found within the construct of Social Influence, two subconstructs: Social Influence on a personal level (e.g. 'people who are important to me, think I should use virtual reality to learn soft skills') and on an organizational level (e.g. 'the senior leadership of my institution is facilitating the use of virtual reality'). As factor analyses indicated dispersed factor loadings and subsequent reliability analyses proved very good, we decided to keep these two factors. This is in line with previous research (Boel et al., 2023). All other reliability analyses turned out to be very good, which allowed us to proceed with subsequent analyses.

As we were interested in individual's characteristics potentially moderating the associations between the predicting factors and behavioral intention to use, we measured also prior knowledge, prior VR experience and prior gaming experience (see Table 5). As we had expected, only few participants had prior VR experience, validating our dropping of Use Behavior and Habit. Most students had moderate to a lot of gaming experience, and prior knowledge depicted a normal distribution with most students indicating moderate experience. When analysing instructors' data we saw a different picture with moderate to a lot of experience in soft skills and an equal distribution over all levels for prior gaming experience. Measuring their prior VR experience showed even lower results for the instructors than the students.

5.2 Research questions and hypotheses testing

RQ1: How do HEI students and instructors perceive of the commonly cited educational affordances of iVR, when applied to soft skills training?

Our first research question was how HEI instructors and students perceived of the affordances of iVR for education when applied to soft skills training. Both students' and instructors' results showed positive results for all previously identified affordances (see Table 6 and 7), although with a slightly lower outcome (4.92) for one item: 'Virtual reality helps me to empathize more with others' however only for the students.
We can therefore conclude that the educational affordances of immersive virtual reality identified in prior research, are reaffirmed when applied to soft skills training in HEI, thus positively answering research question 1 (RQ1).

RQ2 – Which factors contribute to and inhibit the acceptance by HEI students and instructors of immersive virtual reality to train soft skills?

In our second research question, we wanted to investigate which factors contribute to or inhibit the acceptance of immersive virtual reality for soft skills training by HEI students and instructors.

First, we explored the data, calculating several ANOVA-analyses in search of significant between-groups results. To investigate the effect of country (see Table 8), we first reduced the eight countries to four categories: United States of America (USA), United Kingdom (UK), European Union (EU), Other. There were no significant differences between the countries for the students, nor for the instructors, although close to significance for effort expectancy ($p = .069$), in favor of the USA students and social influence on an organizational level for the instructors ($p = .040$) with high results for the USA and the EU. No significant difference could be noted for the level of the institution (see Table 9), although close to significance for performance expectancy ($p = .021$) by the students, in favor of universities over colleges. Similarly for the instructors we noted a near-significance difference for social influence on the organizational level ($p = .022$), in favor of colleges, and facilitating conditions ($p = .061$) again in favor for colleges. We noticed significant differences ($p < .001$) between genders (see Table 10) on effort expectancy and personal innovativeness, both in favor of female students, and near-significant differences for facilitating conditions, again in favor of female students ($p = .014$). No significant effect of gender was found for the instructors. As there was no normal distribution over the other demographic variables (academic year, academic domain), we did not carry out other between-groups analyses.

Next, we applied general linear modeling to analyze the associations. We will first discuss students' results (see Fig 3). First, we built our model with main effects only (see Table 11). Performance expectancy, Social influence, Facilitating Conditions, and Hedonic Motivation proved to significantly ($p < .001$) predicting behavioral intention to use. Effort expectancy and surprisingly personal innovativeness were not of significance, with respective p-values of .957 and .512. We also noted a significant effect of prior VR experience ($p < .001$) and a nearly significant effect of gaming experience ($p = .017$). Other moderating variables proved not to be of significance: gender ($p = .092$), academic year ($p = .603$) and prior knowledge ($p = .169$). As such, we added video gaming experience and prior VR experience to our subsequent analyses, investigating significantly moderating effects. This turned out not to be the case (see Table 12). Results accounted for nearly 58% of variance ($R^2 = .577$), which is good.

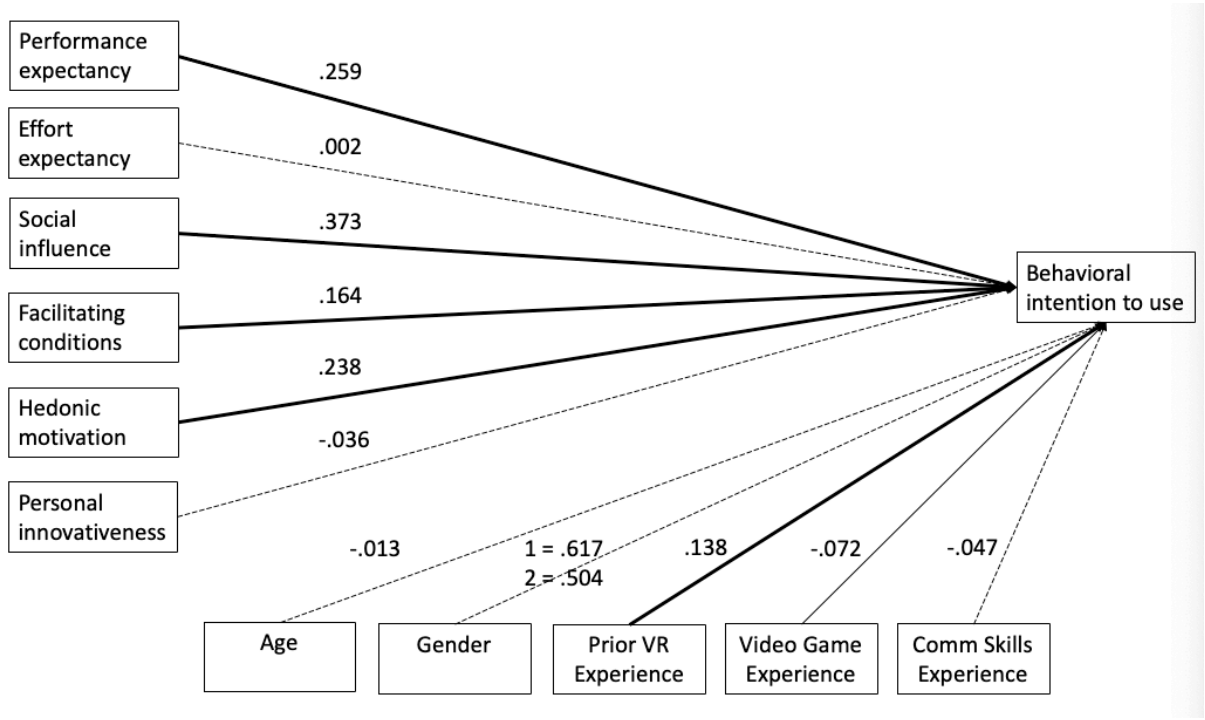

Fig. 3 - Results of general linear modeling of students' perceptions on iVR as an instructional medium (bold lines = significant to <.001, straight lines = significant to .05; dotted lines = not significant)

Next, we analyzed the results for the instructors, in a similar way. Main effects analysis (see Table 13) showed only performance expectancy to be of significance (p = .001). Three other factors were near significance (at a .05 level), namely social influence on an personal level, facilitating conditions and personal innovativeness (respectively p = .027, p = .054 and p = .016). No significantly moderating effects could be retrieved (see Table 14), apart from prior experience with educational technology affecting the association between personal innovativeness and behavioral intention. As these are correlated constructs, this moderating effect can be neglected, as it is embedded within personal innovativeness itself. Our results could account for 65% (R^2 = .651) of the variance of the results, which is very good.

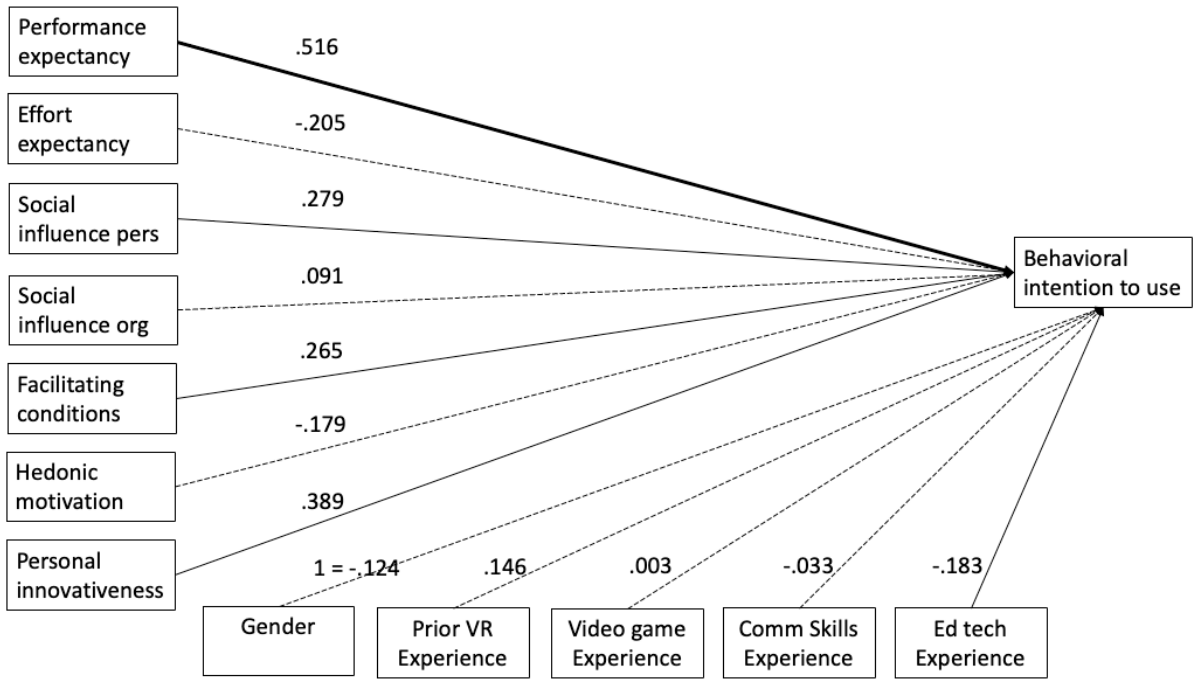

Fig. 4 - Results of general linear modeling of instructors' perceptions on iVR as an instructional medium (bold lines = significant to <.001, straight lines = significant to .05; dotted lines = not significant)

6 Discussion

This study was set up to investigate the perceptions by HEI students and instructors on immersive virtual reality as an instructional medium to train soft skills. Two main research questions were targeted: what are the perceptions of the participants on the frequently cited educational affordances of iVR, and which factors thrive and inhibit the acceptance of iVR by the participants. We will now discuss the results into more detail and provide recommendations to design implementation strategies for the HEIs.

> *RQ1: How do HEI students and instructors perceive of the commonly cited educational affordances of iVR, when applied to soft skills training?*

First, we investigated the participants' perceptions on the frequently cited educational affordances of immersive virtual reality, such as increased interest, increased self-efficacy, more learning opportunities, a more personalized learning experience and so on. All items, but one ("iVR helps me to empathize more with others", M = 4.92) had mean values between 5.16 and 5.51 for the students. Even higher results were noted for the instructors, with mean scores for all items between 5.36 to 5.84, except for one item ("iVR would involve less trainers for the same amount of students", M = 4.71). These results indicate both students and instructors think of immersive virtual reality as a very promising tool for educational purposes, on different levels. They perceive this medium as enhancing their learning or teaching process, in a way that other instructional media do not or less.

Moreover, both students and instructors think the use of iVR helps to support more students, both in terms of accessibility and distance learning. This adds to their perception of iVR as a selling point to attract students to their institution.

RQ2 – Which factors contribute to and inhibit the acceptance by HEI students and instructors of immersive virtual reality to train soft skills?

Students' results indicate four factors are of interest when aiming to implement iVR for soft skills in HEIs: performance expectancy, social influence, facilitating conditions, and hedonic motivation. The variable of prior VR experience proved also to be directly associated with acceptance, adding another factors to take into account. When adding the moderating variables into our model, we found some associations, but they were not of. As such, we suggest to ignore these minor differences and focus on the five important factors. When designing implementation strategies for students, we advise to:

1. Show the added value to the students, by providing them with an exploratory experience, prior to the actual use within the main course. This could be organized by the instructor, or by another department (e.g IT, library, innovation department…). When the students have this prior experience, they will see the benefit of this new instructional medium and will more be inclined to engage with it afterwards.
2. Addresses the factor of hedonic motivation: when students have a first, exploratory experience, which is enjoyable to them, they will be more inclined to engage with the learning experience later on, again adding to their learning process. This first experience should be an experience which is enjoyable to them, so playing a game could be of value here too. The focus should be on the entertainment factor, stressing the importance of an easy-to-use experience too. An example could be Beat Saber or First Steps. These applications are designed to provide the users with a highly entertaining experience, while keeping the learning curve as low as possible.
3. Make it a social experience, qs social influence is of importance to students. Invite groups of students to explore the iVR experience, instead of making it an individual experience. When students see their peers being enthusiastic about this new instructional medium, they will be more inclined to engage with it themselves.

4. Support students in manipulating the new technology in a proficient way. We suggest to combine this with the prior exploratory phase: in this way, students will have the opportunity to learn how to engage with the hardware and software prior to the actual learning experience. This will too enhance the learning process itself, as students are more familiar with how to engage and navigate within the iVR learning process, reducing extraneous cognitive load, i.e. cognitive capacity which is lost due to processes irrelevant to the learning itself, e.g. thinking about which button to press instead of thinking which answer is the proper one. This too addresses the importance of prior VR experience.

When looking at the instructors' results, suggestions for implementation strategy are somewhat different. Only performance expectancy proved to be of significance, although three other factors could be of interest too, as they were nearly significantly affecting acceptance, namely social influence on an organizational level, facilitating conditions, and personal innovativeness. We advise to take them into account, and suggest the following recommendations:

1. Instructors in HEI are mainly interested in how it can help them in attaining their goals. As such, it is of importance to provide them with an understanding of what the benefits of the new instructional medium could be. The best way to do this, is to provide them with one or more demo moments. When they can experience the iVR learning materials themselves, instructors think of how they can use it in their own courses, and they perceive this as an added value on several levels, both on students' learning process and instructors learning organization.
2. In complement, instructors ask for a clear incentive from the senior leadership that they too perceive of iVR as a valuable instructional method to enhance students and instructors in their learning and teaching practice. As such, we suggest the senior leadership to indicate explicitly in their educational policies how iVR fits within faculty board's current view on learning, teaching, and pedagogical paradigms. This helps in showing instructors the senior leadership does not perceive of iVR as the next hype, or a gimmick, but instead as a valuable new instructional medium enhancing students' learning and instructors teaching.
3. When taking this into practice, the senior leadership should provide the instructors with support, both on a technical and educational level. Instructors want to integrate this new instructional medium in their courses, but they shouldn't be bothered with setting up accounts, charging the devices, or pushing updates. This can be tackled by another department, such as faculty's IT department, innovation department, library or the audiovisual services, to name a few. These departments are familiar with technical setup, and in most cases with providing the instructors with technical support. This is a sustainable and low-entry strategy to implement this new technology.
4. Fitting all innovation strategies, we recommend the senior leadership to work first with the coalition of the willing, the instructors which are keen to experiment with new technologies in their teaching practice. When addressing these early adopters, the senior leadership can test and learn, gathering valuable data on do's and don'ts, before implementing this

on a large scale. We suggest to launch a call for participation on a voluntary basis to experiment with this new instructional medium. To mitigate novelty effect as much as possible and to get a good understanding of how, and when the iVR technology does add value, we suggest to opt for a longer period of experimentation, preferably from the beginning to the end of a course. Depending on the organization of courses within each HEI this might range from three to six months, or even longer.

Following other research, this period of experimentation should results in design guidelines on how to implement iVR effectively, depending on the specific context of the HEI, the instructors' teaching habits and the students' characteristics. Secondly, the design of the course into which the iVR medium needs to fit, should lead to a better understanding of how it is complementary to the current teaching practices. The new technology should not be considered as a replacement of the existing learning approach, instead as an addition. Research shows that iVR does not lead to better learning results in its own, but however when supported by generative learning strategies it does. Some of these strategies are pretraining, summarizing, reflecting, peer teaching of enacting.

7 Conclusion

In this study, we investigated both higher education students' and instructors' perceptions on immersive virtual reality as an instructional medium to train soft skills. 45 HEI from the USA, UK, Europe and some other countries enrolled in this study, with a total of 480 students and 103 instructors. To tap into their perceptions, participants were provided with both hardware and software to experiment with during a period of three months. To tap into their perceptions, participants were asked to fill in an online survey afterwards. Results indicate both students and instructors are highly acceptable to this new instructional method, suggesting iVR to be beneficial to implement within the HEIs. Instructors were mainly focused on the perceived level of added value for their courses, as students also valued their peers' perceptions and the enjoyment highly. Several recommendations were provided to design implementation strategies. Apart from prior VR experience for the students, no individualistic characteristics are of note, which suggests a general approach for implementation is proficient.

Our results for both research questions indicate that there are several opportunities for iVR in the HEIs. We suggest the implementation of iVR for soft skills training should be promoted.

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9 Appendices

Appendix 1 – full survey of students

I took the following VR learning experience:

1. Public speaking and presentation – Essential skills
2. Workplace Communication – Clear communication
3. Workplace Communication – Active listening
4. Job interview simulator
5. Employability skills – Career mindset development
6. Diversity, equity and inclusion – gender inclusion
7. Inclusive leadership
8. Let's talk about race
9. International Labour Organisation
10. Health and Social Welfare Training
11. Other, please specify

Please rate the following statements on a scale to 7. 1 = Completely disagree, 7 = Completely agree

1. I believe this VR learning experience helps me learn communication skills more quickly
2. I believe this VR learning experience helps me to improve my communication skills 3. Learning how to use virtual reality is easy for me
4. I find virtual reality easy to use
5. People who are important to me, think I should use virtual reality to learn communication skills
6. People who influence my behavior, think I should use virtual reality to learn communication skills
7. I have the knowledge necessary to use virtual reality
8. I have the resources necessary to use virtual reality
9. Learning communication skills using virtual reality is fun
10. Learning communication skills using virtual reality in enjoyable
11. I predict to use virtual reality for learning communication skills within 6 months
12. I expect to use virtual reality for learning communication skills within 6 months
13. When I hear about a new technology, I look for ways to experiment with it
14. I like to experiment with new technologies
15. I believe using virtual reality will help me to achieve my goals in terms of communication skills
16. I am confident that using virtual reality will help me to perform effectively on tasks requiring communication skills

Please rate the following statements on a scale to 7. 1 = Completely disagree, 7 = Completely agree

Compared to other teaching methods, learning communication skills using VR

1. helps me to be more confident when interacting with other people
2. helps me to become more skilled interacting with other people
3. increases how engaged I am with learning communication skills
4. increases my interest in communication skills training
5. helps me to become more aware of my current skills
6. provides a more psychologically safe place to learn communication skills 7. provides me with more opportunities to train my communication skills
8. makes me more focused while practicing my communication skills
9. helps me to better remember what I've learned
10. helps me to practice my communication skills on a more personal level 11. helps me to empathize more with others
12. provides a more realistic learning experience while practicing my communication skills
13. provides me with more detailed personal feedback on my communication skills
14. will make communication skills training accessible to more students
15. makes it less complicated to practice my communication skills
16. would serve as a selling point to choose this institution over others

Identification

1. Which country do you live in? [dropdown list]
2. What is the name of your institution? [dropdown list < Bodyswaps alphabetically ordered list]
3. What is the level of your institution?
    1) University
    2) University of Applied Sciences or College
    3) Other, please specify
4. What is the main academic year you study or work in? [only shown when university or university of applied sciences in shown]
    1) Bachelor 1st year
    2) Bachelor 2nd year
    3) Bachelor 3rd year
    4) Bachelor 4rd year
    5) Master 1st year

6) Master 2nd year
7) Master 3rd year
8) Doctoral students
9) Graduate students
10) Postgraduate students
11) Other

5. What is the domain of study? [dropdown list]
    1) Mathematics, physics, astronomy, chemistry, biology, geology, geography
    2) History
    3) Psychology
    4) Educational sciences
    5) Language, linguistics, literature, translation, communication, audiology, logopedia
    6) Cultural studies
    7) ICT and computer studies
    8) Media, journalism and entertainment
    9) Tourism
    10) Economics, marketing, business and management
    11) Engineering
    12) Construction
    13) Architecture and design
    14) Health care
    15) Social care
    16) Medicine
    17) Veterinary medicine
    18) Biosciences
    19) Pharmaceutical sciences
    20) Arts, archaeology, theatre, musicology
    21) Transport and supply chain management
    22) Political studies
    23) Philosophy and moral sciences
    24) Law studies and criminology
    25) Real estate
    26) Sports
    27) Artistic development
    28) Other, please specify
6. What is your gender?
    1) Male
    2) Female
    3) Undefined or prefer not to say

7. Please rate your experience on a scale to 7. 1 = no experience, 7 = very experienced
    - Video gaming
    - Virtual reality (in general)
    - Virtual reality (in education)
    - Communication skills training

Appendix 2 – full survey of instructors

I took the following VR learning experience:

1. Public speaking and presentation – Essential skills
2. Workplace Communication – Clear communication
3. Workplace Communication – Active listening
4. Job interview simulator
5. Employability skills – Career mindset development
6. Diversity, equity and inclusion – gender inclusion
7. Inclusive leadership
8. Let's talk about race
9. International Labour Organisation
10. Health and Social Welfare Training
11. Other, please specify

Please rate the following statements on a scale to 7. 1 = Completely disagree, 7 = Completely agree [factors for adoption: usefulness, ease of use…]

1. Using virtual reality would be useful for the programmes I deliver
2. Using virtual reality would enable me to help my students to achieve their goals more quickly

3. Using virtual reality would increase the productivity of the programmes I deliver

4. It would be easy for me to become skillful at using virtual reality

5. I would find virtual reality easy to use

7. People who are important to me, think I should use virtual reality in my courses

8. People who influence my behavior, think I should use virtual reality in my courses 9. The senior leadership of the institution is facilitating the use of virtual reality

10. In general, the senior leadership of the institution supports the use of virtual reality

11. People whose opinions I value prefer that I use virtual reality in my courses

12. I have the knowledge necessary to use virtual reality in my courses

13. I have the resources necessary to use virtual reality in my courses

14. A specific person or service is available for assistance with virtual reality difficulties

15. Using virtual reality is fun

16. Using virtual reality is enjoyable

17. Using virtual reality is entertaining

18. I intend to use virtual reality in my courses within 6 months

19. I expect to use virtual reality in my courses within 6 months

20. I plan to use virtual reality in my courses within 6 months
21. When I hear about a new information technology, I look for ways to experiment with it
22. I like to experiment with new information technologies
23. I believe using virtual reality will enable me to help my students to achieve their goals more quickly
24. I am confident that using virtual reality will help me to teach how to perform effectively on tasks requiring communication skills

Please rate the following statements on a scale to 7. 1 = Completely disagree, 7 = Completely agree [self-efficacy, interest, usefulness...]

Compared to other teaching methods, learning communication skills using VR

1. helps students to be more confident interacting with other people
2. helps students to become more skilled interacting with other people
3. increases students' engagement during practicing communication skills 4. increases students' interest in communication skills training
5. helps students to become more aware of their current skills
6. provides a more psychologically safe place to learn communication skills
7. provides students with more opportunities to train their communication skills 8. makes students more focused while practicing their communication skills
9. helps students to better remember what they've learned
10. helps students to practice communication skills on a more personal level
11. helps students to empathize more with others
12. provides a more realistic learning experience while practicing communication skills
13. provides students with more detailed personal feedback on their communication skills
14. will make communication skills training accessible to more students
15. provides easier opportunities for asynchronous learning
16. provides more proficient opportunities to distance learning students
17. makes it less complicated to practice my communication skills
18. would serve as a selling point to attract students to our institution over others
19. would provide me with more detailed information on the individual students' performance
20. would involve less trainers for the same amount of students

Identification

1. Which country do you live in? [dropdown list]
2. What is the name of your institution? [dropdown list < Bodyswaps alphabetically ordered list]
3. What is the level of your institution?
    4) University
    5) University of Applied Sciences or College
    6) Other, please specify
4. What is the main academic year you study or work in? [only shown when university or university of applied sciences in shown]
    12) Bachelor 1st year
    13) Bachelor 2nd year
    14) Bachelor 3rd year
    15) Bachelor 4rd year
    16) Master 1st year
    17) Master 2nd year
    18) Master 3rd year
    19) Doctoral students
    20) Graduate students
    21) Postgraduate students
    22) Other
5. What is the domain of study? [dropdown list]
    29) Mathematics, physics, astronomy, chemistry, biology, geology, geography
    30) History
    31) Psychology
    32) Educational sciences
    33) Language, linguistics, literature, translation, communication, audiology, logopedia
    34) Cultural studies
    35) ICT and computer studies
    36) Media, journalism and entertainment
    37) Tourism
    38) Economics, marketing, business and management
    39) Engineering
    40) Construction
    41) Architecture and design
    42) Health care
    43) Social care
    44) Medicine
    45) Veterinary medicine

46) Biosciences
47) Pharmaceutical sciences
48) Arts, archaeology, theatre, musicology
49) Transport and supply chain management
50) Political studies
51) Philosophy and moral sciences
52) Law studies and criminology
53) Real estate
54) Sports
55) Artistic development
56) Other, please specify

6. What is your gender?
    4) Male
    5) Female
    6) Undefined or prefer not to say
7. Please rate your experience on a scale to 7. 1 = no experience, 7 = very experienced
    - Video gaming
    - Virtual reality (in general)
    - Virtual reality (in education)
    - Communication skills training
8. Please rate your experience on a scale to 7. 1 = no experience, 7 = very experienced
    - Experience with using technology in education

Appendix 3 – Table 1 – demographic variables of student sample

What is your gender?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	244	50.8	50.8	50.8
	2	223	46.5	46.5	97.3
	3	13	2.7	2.7	100.0
	Total	480	100.0	100.0	

video gaming

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	42	8.8	8.8	8.8
	2	41	8.5	8.5	17.3
	3	39	8.1	8.1	25.4
	4	68	14.2	14.2	39.6
	5	87	18.1	18.1	57.7
	6	78	16.3	16.3	74.0
	7	125	26.0	26.0	100.0
	Total	480	100.0	100.0	

virtual reality in education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	138	28.7	28.7	28.7
	2	68	14.2	14.2	42.9
	3	91	19.0	19.0	61.9
	4	70	14.6	14.6	76.5
	5	43	9.0	9.0	85.4
	6	43	9.0	9.0	94.4
	7	27	5.6	5.6	100.0
	Total	480	100.0	100.0	

communication skills training

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	36	7.5	7.5	7.5
	2	41	8.5	8.5	16.0
	3	68	14.2	14.2	30.2
	4	103	21.5	21.5	51.7
	5	115	24.0	24.0	75.6
	6	74	15.4	15.4	91.0
	7	43	9.0	9.0	100.0
	Total	480	100.0	100.0	

What is the level of your institution?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	240	50.0	50.0	50.0
	2	237	49.4	49.4	99.4
	3	2	.4	.4	99.8
	4	1	.2	.2	100.0
	Total	480	100.0	100.0	

AcadYear

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	71	14.8	15.3	15.3
	2	81	16.9	17.5	32.8
	3	27	5.6	5.8	38.6
	4	7	1.5	1.5	40.1
	5	46	9.6	9.9	50.0
	6	22	4.6	4.7	54.7
	7	7	1.5	1.5	56.3
	8	17	3.5	3.7	59.9
	9	179	37.3	38.6	98.5
	10	7	1.5	1.5	100.0
	Total	464	96.7	100.0	
Missing	System	16	3.3		
Total		480	100.0		

Country_rec

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	113	23.5	23.5	23.5
	2	252	52.5	52.5	76.0
	3	108	22.5	22.5	98.5
	4	7	1.5	1.5	100.0
	Total	480	100.0	100.0	

1 = USA, 2 = UK, 3 = Europe, 4 = other

What is the domain of your study?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	19	4.0	4.0	4.0
	2	1	.2	.2	4.2
	3	17	3.5	3.5	7.7
	4	22	4.6	4.6	12.3
	5	5	1.0	1.0	13.3
	6	1	.2	.2	13.5
	7	26	5.4	5.4	19.0
	8	38	7.9	7.9	26.9
	9	3	.6	.6	27.5
	10	122	25.4	25.4	52.9
	11	52	10.8	10.8	63.7
	13	4	.8	.8	64.6
	14	71	14.8	14.8	79.4
	15	12	2.5	2.5	81.9
	16	9	1.9	1.9	83.8
	17	6	1.3	1.3	85.0
	18	10	2.1	2.1	87.1
	19	1	.2	.2	87.3
	20	11	2.3	2.3	89.6
	21	3	.6	.6	90.2
	22	2	.4	.4	90.6
	24	14	2.9	2.9	93.5
	25	1	.2	.2	93.8
	26	4	.8	.8	94.6
	27	6	1.3	1.3	95.8
	28	20	4.2	4.2	100.0
	Total	480	100.0	100.0	

Appendix 4 – Table 2 – demographic variables of instructor sample

What is your gender?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	61	59.2	59.2	59.2
	2	42	40.8	40.8	100.0
	Total	103	100.0	100.0	

video gaming

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	15	14.6	14.6	14.6
	2	17	16.5	16.5	31.1
	3	14	13.6	13.6	44.7
	4	17	16.5	16.5	61.2
	5	17	16.5	16.5	77.7
	6	11	10.7	10.7	88.3
	7	12	11.7	11.7	100.0
	Total	103	100.0	100.0	

virtual reality in education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	25	24.3	24.3	24.3
	2	27	26.2	26.2	50.5
	3	21	20.4	20.4	70.9
	4	12	11.7	11.7	82.5
	5	8	7.8	7.8	90.3
	6	6	5.8	5.8	96.1
	7	4	3.9	3.9	100.0
	Total	103	100.0	100.0	

communication skills training

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	1.9	1.9	1.9
	2	7	6.8	6.8	8.7
	3	11	10.7	10.7	19.4
	4	10	9.7	9.7	29.1
	5	26	25.2	25.2	54.4
	6	32	31.1	31.1	85.4
	7	15	14.6	14.6	100.0
	Total	103	100.0	100.0	

Experience with using technology in education

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	6	5.8	6.6	6.6
	3	8	7.8	8.8	15.4
	4	13	12.6	14.3	29.7
	5	28	27.2	30.8	60.4
	6	24	23.3	26.4	86.8
	7	12	11.7	13.2	100.0
	Total	91	88.3	100.0	
Missing	System	12	11.7		
Total		103	100.0		

What is the level of your institution?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	49	47.6	47.6	47.6
	2	54	52.4	52.4	100.0
	Total	103	100.0	100.0	

What is the main academic year you study or work in?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	5.8	7.7	7.7
	2	6	5.8	7.7	15.4
	3	3	2.9	3.8	19.2
	4	4	3.9	5.1	24.4
	5	1	1.0	1.3	25.6
	6	58	56.3	74.4	100.0
	Total	78	75.7	100.0	
Missing	System	25	24.3		
Total		103	100.0		

Country_rec

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	2	1.9	2.3	2.3
	2	64	62.1	72.7	75.0
	3	8	7.8	9.1	84.1
	4	14	13.6	15.9	100.0
	Total	88	85.4	100.0	
Missing	System	15	14.6		
Total		103	100.0		

2 = USA, 2 = UK, 3 = Europe, 4 = other

What is the domain of your study?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	3.9	3.9	3.9
	3	6	5.8	5.8	9.7
	4	18	17.5	17.5	27.2
	5	5	4.9	4.9	32.0
	7	6	5.8	5.8	37.9
	8	3	2.9	2.9	40.8
	9	1	1.0	1.0	41.7
	10	5	4.9	4.9	46.6
	11	6	5.8	5.8	52.4
	12	1	1.0	1.0	53.4
	14	13	12.6	12.6	66.0
	15	9	8.7	8.7	74.8
	17	1	1.0	1.0	75.7
	18	2	1.9	1.9	77.7
	20	3	2.9	2.9	80.6
	24	6	5.8	5.8	86.4
	26	1	1.0	1.0	87.4
	28	13	12.6	12.6	100.0
	Total	103	100.0	100.0	

Appendix 5 – Table 3 – results of reliability test for student items

Correlations

		I believe this VR learning experience helps me learn communicati on skills more quickly	I believe this VR learning experience helps me to improve my communicati on skills
I believe this VR learning experience helps me learn communication skills more quickly	Pearson Correlation	1	.733**
	Sig. (2-tailed)		<.001
	N	480	480
I believe this VR learning experience helps me to improve my communication skills	Pearson Correlation	.733**	1
	Sig. (2-tailed)	<.001	
	N	480	480

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

Reliability Statistics

Cronbach's Alpha	N of Items
.846	2

Correlations

		Learning how to use virtual reality is easy for me	I find virtual reality easy to use
Learning how to use virtual reality is easy for me	Pearson Correlation	1	.753**
	Sig. (2-tailed)		<.001
	N	480	480
I find virtual reality easy to use	Pearson Correlation	.753**	1
	Sig. (2-tailed)	<.001	
	N	480	480

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

Reliability Statistics

Cronbach's Alpha	N of Items
.859	2

Correlations

		People who are important to me, think I should use virtual reality to learn communication skills	People who influence my behavior, think I should use virtual reality to learn communication skills
People who are important to me, think I should use virtual reality to learn communication skills	Pearson Correlation	1	.751**
	Sig. (2-tailed)		<.001
	N	480	480
People who influence my behavior, think I should use virtual reality to learn communication skills	Pearson Correlation	.751**	1
	Sig. (2-tailed)	<.001	
	N	480	480

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

Reliability Statistics

Cronbach's Alpha	N of Items
.858	2

Correlations

		People who are important to me, think I should use virtual reality to learn communicati on skills	People who influence my behavior, think I should use virtual reality to learn communicati on skills
People who are important to me, think I should use virtual reality to learn communication skills	Pearson Correlation	1	.751**
	Sig. (2-tailed)		<.001
	N	480	480
People who influence my behavior, think I should use virtual reality to learn communication skills	Pearson Correlation	.751**	1
	Sig. (2-tailed)	<.001	
	N	480	480

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

Reliability Statistics

Cronbach's Alpha	N of Items
.480	2

Correlations

		Learning communicati on skills using virtual reality is fun	Learning communicati on skills using virtual reality is enjoyable
Learning communication skills using virtual reality is fun	Pearson Correlation	1	.768**
	Sig. (2-tailed)		<.001
	N	480	480
Learning communication skills using virtual reality is enjoyable	Pearson Correlation	.768**	1
	Sig. (2-tailed)	<.001	
	N	480	480

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

Reliability Statistics

Cronbach's Alpha	N of Items
.869	2

Correlations

		When I hear about a new technology, I look for ways to experiment with it	I like to experiment with new technologies
When I hear about a new technology, I look for ways to experiment with it	Pearson Correlation	1	.664**
	Sig. (2-tailed)		<.001
	N	480	480
I like to experiment with new technologies	Pearson Correlation	.664**	1
	Sig. (2-tailed)	<.001	
	N	480	480

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

Reliability Statistics

Cronbach's Alpha	N of Items
.869	2

Correlations

		I predict to use virtual reality for learning communicati on skills within 6 months	I expect to use virtual reality for learning communicati on skills within 6 months
I predict to use virtual reality for learning communication skills within 6 months	Pearson Correlation	1	.769**
	Sig. (2-tailed)		<.001
	N	480	480
I expect to use virtual reality for learning communication skills within 6 months	Pearson Correlation	.769**	1
	Sig. (2-tailed)	<.001	
	N	480	480

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

Reliability Statistics

Cronbach's Alpha	N of Items
.798	2

Appendix 6 – Table 4 – results of reliability test for instructor items

Factor Matrix[a]

	Factor 1
Using virtual reality would be useful for the programmes I deliver	.845
Using virtual reality would enable me to help my students to achieve their goals more quickly	.837
Using virtual reality would increase the productivity of the programmes I deliver	.891

Extraction Method: Maximum Likelihood.

a. 1 factors extracted. 4 iterations required.

Correlations

		It would be easy for me to become skillful at using virtual reality	I would find virtual reality easy to use
It would be easy for me to become skillful at using virtual reality	Pearson Correlation	1	.531**
	Sig. (2-tailed)		<.001
	N	103	103
I would find virtual reality easy to use	Pearson Correlation	.531**	1
	Sig. (2-tailed)	<.001	
	N	103	103

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

Structure Matrix

	Factor	
	1	2
People who are important to me, think I should use virtual reality in my courses	.813	.448
People who influence my behavior, think I should use virtual reality in my courses	.901	.388
The senior leadership of the institution is facilitating the use of virtual reality	.454	.999
In general, the senior leadership of the institution supports the use of virtual reality	.403	.676
People whose opinions I value prefer that I use virtual reality in my courses	.864	.468

Extraction Method: Maximum Likelihood.
Rotation Method: Promax with Kaiser Normalization.

Factor Correlation Matrix

Factor	1	2
1	1.000	.489
2	.489	1.000

Extraction Method: Maximum Likelihood.
Rotation Method: Promax with Kaiser Normalization.

Factor Matrix[a]

	Factor 1
I have the knowledge necessary to use virtual reality in my courses	.649
I have the resources necessary to use virtual reality in my courses	.661
A specific person or service is available for assistance with virtual reality difficulties	.610

Extraction Method: Maximum Likelihood.

a. 1 factors extracted. 3 iterations required.

Factor Matrix[a]

	Factor 1
Using virtual reality is fun	.868
Using virtual reality is enjoyable	.889
Using virtual reality is entertaining	.748

Extraction Method: Maximum Likelihood.

a. 1 factors extracted. 4 iterations required.

Correlations

		When I hear about a new information technology, I look for ways to experiment with it	I like to experiment with new information technologies
When I hear about a new information technology, I look for ways to experiment with it	Pearson Correlation	1	.667**
	Sig. (2-tailed)		<.001
	N	103	103
I like to experiment with new information technologies	Pearson Correlation	.667**	1
	Sig. (2-tailed)	<.001	
	N	103	103

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

Factor Matrix[a]

	Factor 1
I intend to use virtual reality in my courses within 6 months	.945
I expect to use virtual reality in my courses within 6 months	.883
I plan to use virtual reality in my courses within 6 months	.929

Extraction Method: Maximum Likelihood.

a. 1 factors extracted. 4 iterations required.

Appendix 7 – Table 5 – results of moderating variables

See Appendix 3 (students) and 4 (teacher) for a detailed overview

Appendix 8 – Table 6 – results of student perceptions on educational affordances of iVR

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
I believe using virtual reality will help me to achieve my goals in terms of communication skills	480	1	7	5.09	1.380
I am confident that using virtual reality will help me to perform effectively on tasks requiring communication skills	480	1	7	5.22	1.338
helps me to be more confident when interacting with other people	480	1	7	5.21	1.422
helps me to become more skilled interacting with other people	480	1	7	5.16	1.376
increases how engaged I am with learning communication skills	480	1	7	5.29	1.354
increases my interest in communication skills training	480	1	7	5.39	1.305
helps me to become more aware of my current skills	480	1	7	5.37	1.322
provides a more psychologically safe place to learn communication skills	480	1	7	5.58	1.255
provides me with more opportunities to train my communication skills	480	1	7	5.48	1.266
makes me more focused while practicing my communication skills	480	1	7	5.27	1.371
helps me to better remember what I've learned	480	1	7	5.23	1.355
helps me to practice my communication skills on a more personal level	480	1	7	5.25	1.408
helps me to empathize more with others	480	1	7	4.92	1.498
provides a more realistic learning experience while practicing my communication skills	480	1	7	5.21	1.419
provides me with more detailed personal feedback on my communication skills	480	1	7	5.29	1.391
will make communication skills training accessible to more students	480	1	7	5.51	1.278
makes it less complicated to practice my communication skills	480	1	7	5.25	1.415
would serve as a selling point to choose this institution over others	480	1	7	5.16	1.404
Valid N (listwise)	480				

I believe using virtual reality will help me to achieve my goals in terms of communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	1.5	1.5	1.5
	2	23	4.8	4.8	6.3
	3	29	6.0	6.0	12.3
	4	80	16.7	16.7	29.0
	5	122	25.4	25.4	54.4
	6	158	32.9	32.9	87.3
	7	61	12.7	12.7	100.0
	Total	480	100.0	100.0	

I am confident that using virtual reality will help me to perform effectively on tasks requiring communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	1.5	1.5	1.5
	2	16	3.3	3.3	4.8
	3	29	6.0	6.0	10.8
	4	62	12.9	12.9	23.8
	5	135	28.1	28.1	51.9
	6	159	33.1	33.1	85.0
	7	72	15.0	15.0	100.0
	Total	480	100.0	100.0	

helps me to be more confident when interacting with other people

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	11	2.3	2.3	2.3
	2	16	3.3	3.3	5.6
	3	29	6.0	6.0	11.7
	4	76	15.8	15.8	27.5
	5	98	20.4	20.4	47.9
	6	174	36.3	36.3	84.2
	7	76	15.8	15.8	100.0
	Total	480	100.0	100.0	

helps me to become more skilled interacting with other people

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	2.1	2.1	2.1
	2	17	3.5	3.5	5.6
	3	25	5.2	5.2	10.8
	4	81	16.9	16.9	27.7
	5	110	22.9	22.9	50.6
	6	174	36.3	36.3	86.9
	7	63	13.1	13.1	100.0
	Total	480	100.0	100.0	

increases how engaged I am with learning communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	1.3	1.3	1.3
	2	14	2.9	2.9	4.2
	3	33	6.9	6.9	11.0
	4	65	13.5	13.5	24.6
	5	108	22.5	22.5	47.1
	6	172	35.8	35.8	82.9
	7	82	17.1	17.1	100.0
	Total	480	100.0	100.0	

increases my interest in communication skills training

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	1.5	1.5	1.5
	2	12	2.5	2.5	4.0
	3	14	2.9	2.9	6.9
	4	77	16.0	16.0	22.9
	5	106	22.1	22.1	45.0
	6	174	36.3	36.3	81.3
	7	90	18.8	18.8	100.0
	Total	480	100.0	100.0	

helps me to become more aware of my current skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	1.5	1.5	1.5
	2	14	2.9	2.9	4.4
	3	12	2.5	2.5	6.9
	4	84	17.5	17.5	24.4
	5	97	20.2	20.2	44.6
	6	177	36.9	36.9	81.5
	7	89	18.5	18.5	100.0
	Total	480	100.0	100.0	

provides a more psychologically safe place to learn communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	1.5	1.5	1.5
	2	6	1.3	1.3	2.7
	3	16	3.3	3.3	6.0
	4	52	10.8	10.8	16.9
	5	104	21.7	21.7	38.5
	6	182	37.9	37.9	76.5
	7	113	23.5	23.5	100.0
	Total	480	100.0	100.0	

provides me with more opportunities to train my communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	1.3	1.3	1.3
	2	11	2.3	2.3	3.5
	3	11	2.3	2.3	5.8
	4	71	14.8	14.8	20.6
	5	94	19.6	19.6	40.2
	6	193	40.2	40.2	80.4
	7	94	19.6	19.6	100.0
	Total	480	100.0	100.0	

makes me more focused while practicing my communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	6	1.3	1.3	1.3
	2	15	3.1	3.1	4.4
	3	36	7.5	7.5	11.9
	4	64	13.3	13.3	25.2
	5	102	21.3	21.3	46.5
	6	177	36.9	36.9	83.3
	7	80	16.7	16.7	100.0
	Total	480	100.0	100.0	

helps me to better remember what I've learned

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	1.5	1.5	1.5
	2	20	4.2	4.2	5.6
	3	16	3.3	3.3	9.0
	4	86	17.9	17.9	26.9
	5	107	22.3	22.3	49.2
	6	171	35.6	35.6	84.8
	7	73	15.2	15.2	100.0
	Total	480	100.0	100.0	

helps me to practice my communication skills on a more personal level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	10	2.1	2.1	2.1
	2	19	4.0	4.0	6.0
	3	24	5.0	5.0	11.0
	4	69	14.4	14.4	25.4
	5	101	21.0	21.0	46.5
	6	182	37.9	37.9	84.4
	7	75	15.6	15.6	100.0
	Total	480	100.0	100.0	

helps me to empathize more with others

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	14	2.9	2.9	2.9
	2	29	6.0	6.0	9.0
	3	30	6.3	6.3	15.2
	4	96	20.0	20.0	35.2
	5	111	23.1	23.1	58.3
	6	141	29.4	29.4	87.7
	7	59	12.3	12.3	100.0
	Total	480	100.0	100.0	

provides a more realistic learning experience while practicing my communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	1.9	1.9	1.9
	2	19	4.0	4.0	5.8
	3	24	5.0	5.0	10.8
	4	82	17.1	17.1	27.9
	5	104	21.7	21.7	49.6
	6	158	32.9	32.9	82.5
	7	84	17.5	17.5	100.0
	Total	480	100.0	100.0	

provides me with more detailed personal feedback on my communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	1.5	1.5	1.5
	2	20	4.2	4.2	5.6
	3	26	5.4	5.4	11.0
	4	64	13.3	13.3	24.4
	5	102	21.3	21.3	45.6
	6	179	37.3	37.3	82.9
	7	82	17.1	17.1	100.0
	Total	480	100.0	100.0	

will make communication skills training accessible to more students

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	1.5	1.5	1.5
	2	11	2.3	2.3	3.8
	3	10	2.1	2.1	5.8
	4	59	12.3	12.3	18.1
	5	113	23.5	23.5	41.7
	6	174	36.3	36.3	77.9
	7	106	22.1	22.1	100.0
	Total	480	100.0	100.0	

makes it less complicated to practice my communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	9	1.9	1.9	1.9
	2	19	4.0	4.0	5.8
	3	30	6.3	6.3	12.1
	4	65	13.5	13.5	25.6
	5	93	19.4	19.4	45.0
	6	189	39.4	39.4	84.4
	7	75	15.6	15.6	100.0
	Total	480	100.0	100.0	

would serve as a selling point to choose this institution over others

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	1.5	1.5	1.5
	2	18	3.8	3.8	5.2
	3	24	5.0	5.0	10.2
	4	108	22.5	22.5	32.7
	5	91	19.0	19.0	51.7
	6	150	31.3	31.3	82.9
	7	82	17.1	17.1	100.0
	Total	480	100.0	100.0	

Appendix 9 – Table 7 - results of instructor perceptions on educational affordances of iVR

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
I believe using virtual reality will enable me to help my students to achieve their goals more quickly	103	2	7	5.43	1.117
I am confident that using virtual reality will help me to teach how to perform effectively on tasks requiring communication skills	103	2	7	5.43	1.134
helps students to be more confident interacting with other people	103	1	7	5.60	1.123
helps students to become more skilled interacting with other people	103	1	7	5.55	1.227
increases students' engagement during practicing communication skills	103	2	7	5.83	1.049
increases students' interest in communication skills training	103	2	7	5.82	1.055
helps students to become more aware of their current skills	103	2	7	5.83	.930
provides a more psychologically safe place to learn communication skills	103	2	7	5.76	1.107
provides students with more opportunities to train their communication skills	103	2	7	5.84	.968
makes students more focused while practicing their communication skills	103	2	7	5.66	1.005
helps students to better remember what they've learned	103	2	7	5.50	1.154
helps students to practice communication skills on a more personal level	103	2	7	5.71	1.185
helps students to empathize more with others	103	2	7	5.36	1.236
provides a more realistic learning experience while practicing communication skills	103	2	7	5.50	1.236
provides students with more detailed personal feedback on their communication skills	103	2	7	5.58	1.233
will make communication skills training accessible to more students	103	1	7	5.62	1.206
provides easier opportunities for asynchronous learning	103	3	7	5.52	1.162
provides more proficient opportunities to distance learning students	103	2	7	5.47	1.235
makes it less complicated to practice my communication skills	103	2	7	5.44	1.288
would serve as a selling point to attract students to our institution over others	103	2	7	5.64	1.162
would provide me with more detailed information on the individual students' performance	103	2	7	5.48	1.153
would involve less trainers for the same amount of students	103	1	7	4.71	1.570
Valid N (listwise)	103				

I believe using virtual reality will enable me to help my students to achieve their goals more quickly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	2	1.9	1.9	1.9
	3	3	2.9	2.9	4.9
	4	11	10.7	10.7	15.5
	5	39	37.9	37.9	53.4
	6	29	28.2	28.2	81.6
	7	19	18.4	18.4	100.0
	Total	103	100.0	100.0	

I am confident that using virtual reality will help me to teach how to perform effectively on tasks requiring communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	3	2.9	2.9	2.9
	3	3	2.9	2.9	5.8
	4	10	9.7	9.7	15.5
	5	34	33.0	33.0	48.5
	6	37	35.9	35.9	84.5
	7	16	15.5	15.5	100.0
	Total	103	100.0	100.0	

helps students to be more confident interacting with other people

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	1.0	1.0	1.0
	2	1	1.0	1.0	1.9
	3	4	3.9	3.9	5.8
	4	4	3.9	3.9	9.7
	5	32	31.1	31.1	40.8
	6	41	39.8	39.8	80.6
	7	20	19.4	19.4	100.0
	Total	103	100.0	100.0	

helps students to become more skilled interacting with other people

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	1.0	1.0	1.0
	2	3	2.9	2.9	3.9
	3	3	2.9	2.9	6.8
	4	7	6.8	6.8	13.6
	5	26	25.2	25.2	38.8
	6	43	41.7	41.7	80.6
	7	20	19.4	19.4	100.0
	Total	103	100.0	100.0	

increases students' engagement during practicing communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	2	1.9	1.9	1.9
	3	2	1.9	1.9	3.9
	4	5	4.9	4.9	8.7
	5	19	18.4	18.4	27.2
	6	49	47.6	47.6	74.8
	7	26	25.2	25.2	100.0
	Total	103	100.0	100.0	

increases students' interest in communication skills training

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	1.0	1.0	1.0
	3	2	1.9	1.9	2.9
	4	8	7.8	7.8	10.7
	5	22	21.4	21.4	32.0
	6	41	39.8	39.8	71.8
	7	29	28.2	28.2	100.0
	Total	103	100.0	100.0	

helps students to become more aware of their current skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	1.0	1.0	1.0
	3	2	1.9	1.9	2.9
	4	5	4.9	4.9	7.8
	5	17	16.5	16.5	24.3
	6	58	56.3	56.3	80.6
	7	20	19.4	19.4	100.0
	Total	103	100.0	100.0	

provides a more psychologically safe place to learn communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	2	1.9	1.9	1.9
	3	2	1.9	1.9	3.9
	4	8	7.8	7.8	11.7
	5	22	21.4	21.4	33.0
	6	42	40.8	40.8	73.8
	7	27	26.2	26.2	100.0
	Total	103	100.0	100.0	

provides students with more opportunities to train their communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	1.0	1.0	1.0
	3	3	2.9	2.9	3.9
	4	3	2.9	2.9	6.8
	5	20	19.4	19.4	26.2
	6	53	51.5	51.5	77.7
	7	23	22.3	22.3	100.0
	Total	103	100.0	100.0	

makes students more focused while practicing their communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	1.0	1.0	1.0
	3	2	1.9	1.9	2.9
	4	10	9.7	9.7	12.6
	5	23	22.3	22.3	35.0
	6	49	47.6	47.6	82.5
	7	18	17.5	17.5	100.0
	Total	103	100.0	100.0	

helps students to better remember what they've learned

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	2	1.9	1.9	1.9
	3	3	2.9	2.9	4.9
	4	15	14.6	14.6	19.4
	5	23	22.3	22.3	41.7
	6	41	39.8	39.8	81.6
	7	19	18.4	18.4	100.0
	Total	103	100.0	100.0	

helps students to practice communication skills on a more personal level

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	3	2.9	2.9	2.9
	3	3	2.9	2.9	5.8
	4	8	7.8	7.8	13.6
	5	19	18.4	18.4	32.0
	6	44	42.7	42.7	74.8
	7	26	25.2	25.2	100.0
	Total	103	100.0	100.0	

helps students to empathize more with others

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	4	3.9	3.9	3.9
	3	4	3.9	3.9	7.8
	4	13	12.6	12.6	20.4
	5	29	28.2	28.2	48.5
	6	36	35.0	35.0	83.5
	7	17	16.5	16.5	100.0
	Total	103	100.0	100.0	

provides a more realistic learning experience while practicing communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	4	3.9	3.9	3.9
	3	5	4.9	4.9	8.7
	4	6	5.8	5.8	14.6
	5	29	28.2	28.2	42.7
	6	39	37.9	37.9	80.6
	7	20	19.4	19.4	100.0
	Total	103	100.0	100.0	

provides students with more detailed personal feedback on their communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	3	2.9	2.9	2.9
	3	5	4.9	4.9	7.8
	4	9	8.7	8.7	16.5
	5	21	20.4	20.4	36.9
	6	42	40.8	40.8	77.7
	7	23	22.3	22.3	100.0
	Total	103	100.0	100.0	

will make communication skills training accessible to more students

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	1.0	1.0	1.0
	2	2	1.9	1.9	2.9
	3	4	3.9	3.9	6.8
	4	6	5.8	5.8	12.6
	5	24	23.3	23.3	35.9
	6	44	42.7	42.7	78.6
	7	22	21.4	21.4	100.0
	Total	103	100.0	100.0	

provides easier opportunities for asynchronous learning

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	3	6	5.8	5.8	5.8
	4	15	14.6	14.6	20.4
	5	24	23.3	23.3	43.7
	6	35	34.0	34.0	77.7
	7	23	22.3	22.3	100.0
	Total	103	100.0	100.0	

provides more proficient opportunities to distance learning students

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	1.0	1.0	1.0
	3	5	4.9	4.9	5.8
	4	19	18.4	18.4	24.3
	5	23	22.3	22.3	46.6
	6	30	29.1	29.1	75.7
	7	25	24.3	24.3	100.0
	Total	103	100.0	100.0	

makes it less complicated to practice my communication skills

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	3	2.9	2.9	2.9
	3	7	6.8	6.8	9.7
	4	11	10.7	10.7	20.4
	5	25	24.3	24.3	44.7
	6	35	34.0	34.0	78.6
	7	22	21.4	21.4	100.0
	Total	103	100.0	100.0	

would serve as a selling point to attract students to our institution over others

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	1.0	1.0	1.0
	3	6	5.8	5.8	6.8
	4	8	7.8	7.8	14.6
	5	24	23.3	23.3	37.9
	6	39	37.9	37.9	75.7
	7	25	24.3	24.3	100.0
	Total	103	100.0	100.0	

would provide me with more detailed information on the individual students' performance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	2	1.9	1.9	1.9
	3	4	3.9	3.9	5.8
	4	14	13.6	13.6	19.4
	5	23	22.3	22.3	41.7
	6	43	41.7	41.7	83.5
	7	17	16.5	16.5	100.0
	Total	103	100.0	100.0	

would involve less trainers for the same amount of students

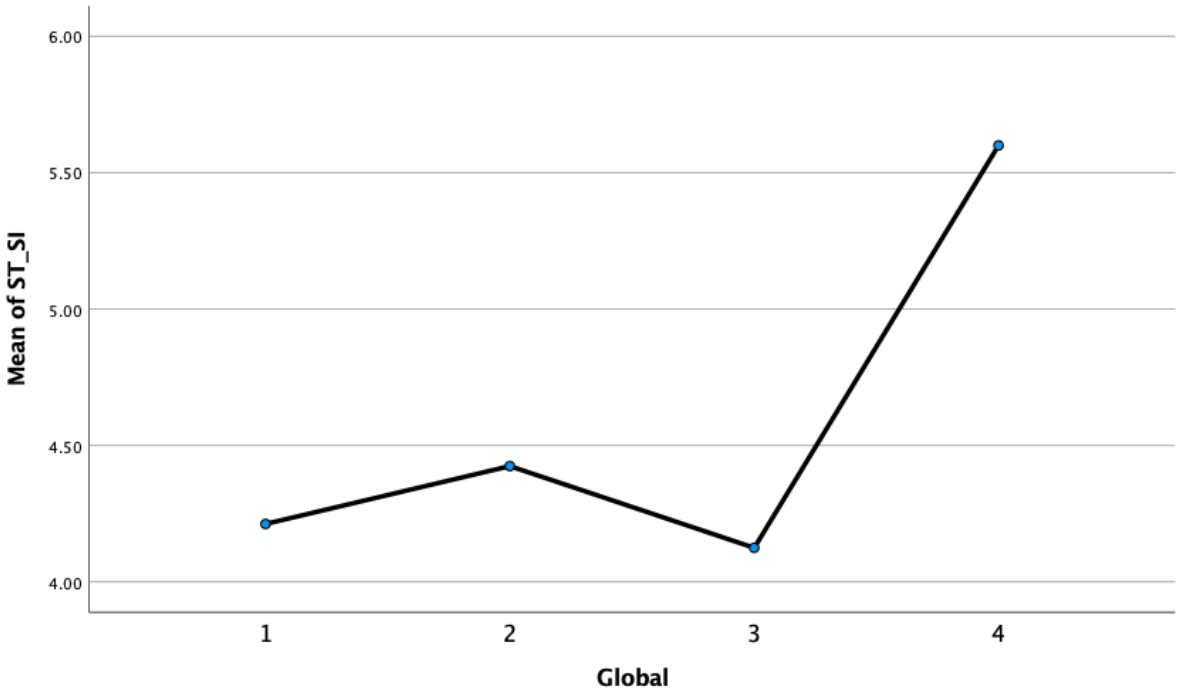
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	1	1.0	1.0	1.0
	2	11	10.7	10.7	11.7
	3	11	10.7	10.7	22.3
	4	22	21.4	21.4	43.7
	5	21	20.4	20.4	64.1
	6	23	22.3	22.3	86.4
	7	14	13.6	13.6	100.0
	Total	103	100.0	100.0	

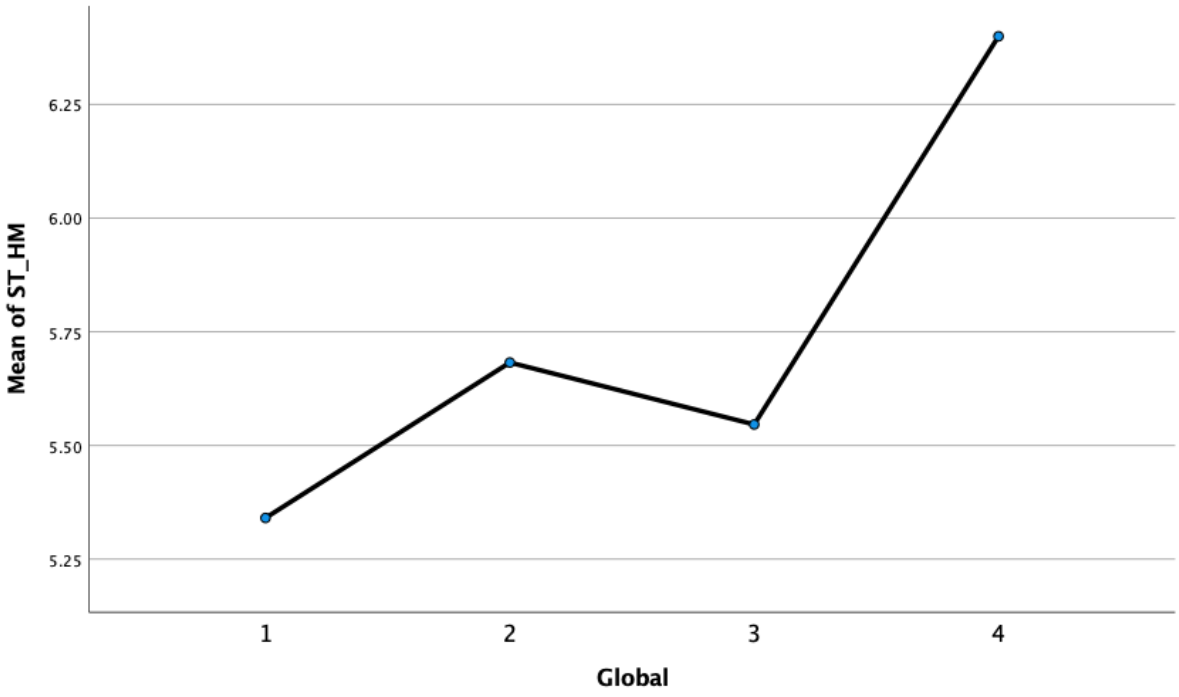
Appendix 10 – Table 8 – results of ANOVA tests on country

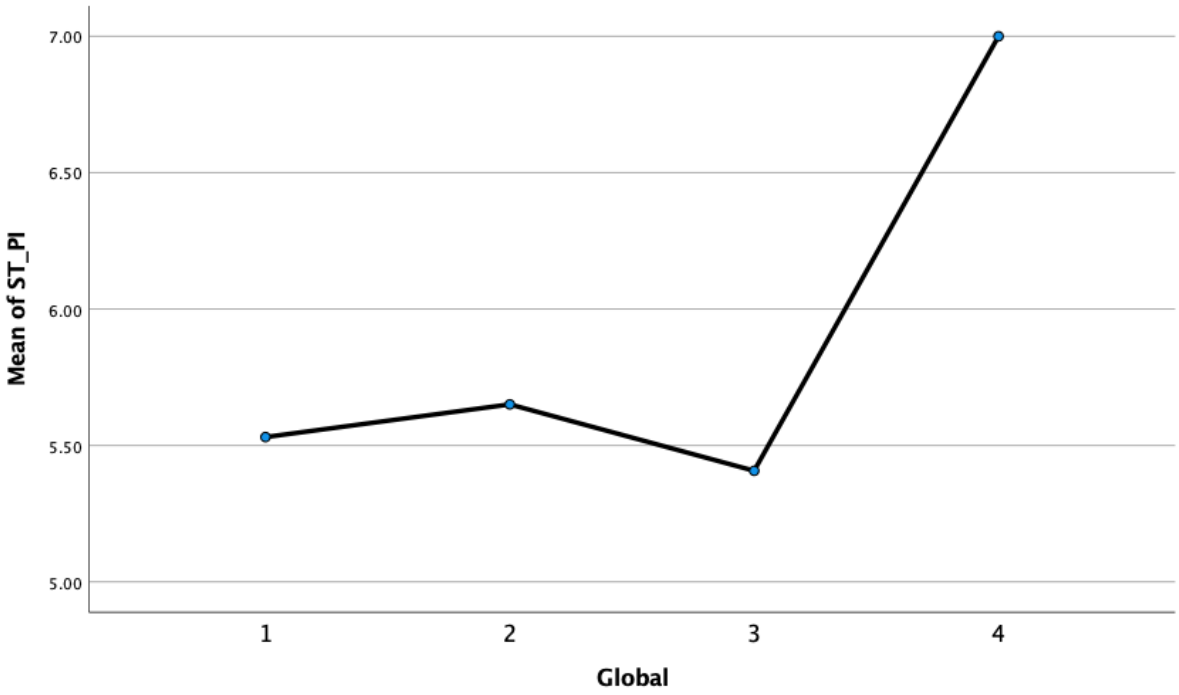
Part 1 - students

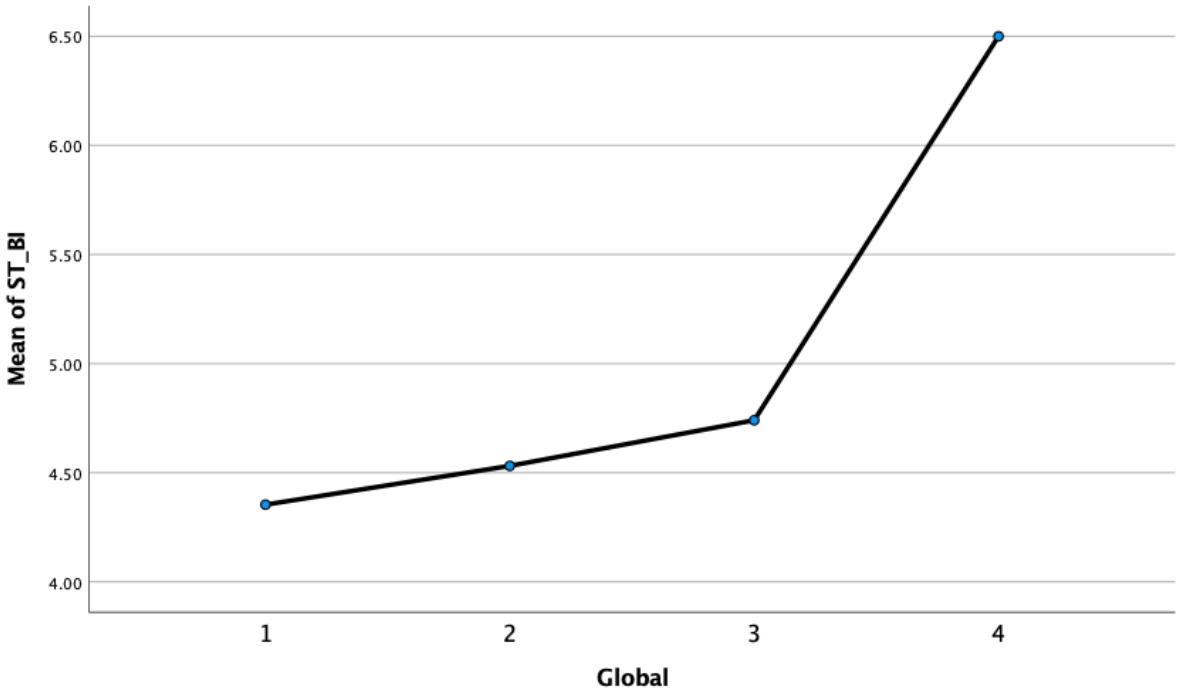
ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
ST_PE	Between Groups	7.182	3	2.394	1.490	.216
	Within Groups	761.373	474	1.606		
	Total	768.554	477			
ST_EE	Between Groups	5.782	3	1.927	1.183	.316
	Within Groups	772.513	474	1.630		
	Total	778.295	477			
ST_SI	Between Groups	16.364	3	5.455	2.495	.059
	Within Groups	1036.233	474	2.186		
	Total	1052.597	477			
ST_FC	Between Groups	7.697	3	2.566	1.633	.181
	Within Groups	744.787	474	1.571		
	Total	752.484	477			
ST_HM	Between Groups	12.604	3	4.201	2.614	.051
	Within Groups	761.704	474	1.607		
	Total	774.308	477			
ST_PI	Between Groups	14.832	3	4.944	3.257	.021
	Within Groups	719.486	474	1.518		
	Total	734.318	477			
ST_BI	Between Groups	27.340	3	9.113	4.010	.008
	Within Groups	1077.327	474	2.273		
	Total	1104.668	477			


6.00
5.50
5.00
4.50
4.00
Mean of ST_SI
1
2
3
4
Global


6.25
6.00
5.75
5.50
5.25
Mean of ST_HM
1
2
3
4
Global

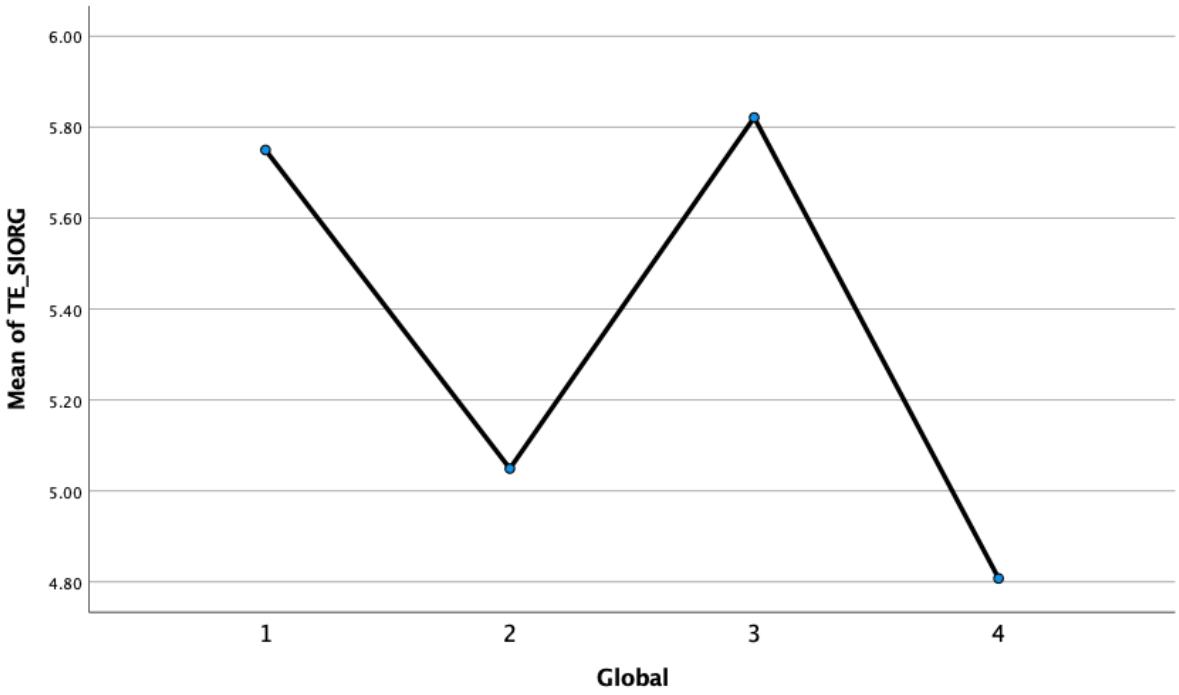




Part 2 – instructors

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
TE_PE	Between Groups	1.606	3	.535	.496	.686
	Within Groups	105.766	98	1.079		
	Total	107.373	101			
TE_EE	Between Groups	.154	3	.051	.069	.976
	Within Groups	72.476	98	.740		
	Total	72.630	101			
TE_SIPERS	Between Groups	3.409	3	1.136	.644	.588
	Within Groups	172.852	98	1.764		
	Total	176.261	101			
TE_SIORG	Between Groups	9.994	3	3.331	2.866	.040
	Within Groups	113.900	98	1.162		
	Total	123.895	101			
TE_FC	Between Groups	5.602	3	1.867	1.307	.276
	Within Groups	139.977	98	1.428		
	Total	145.578	101			
TE_HM	Between Groups	2.587	3	.862	1.215	.308
	Within Groups	69.527	98	.709		
	Total	72.113	101			
TE_PI	Between Groups	3.562	3	1.187	1.381	.253
	Within Groups	84.281	98	.860		
	Total	87.843	101			
TE_BI	Between Groups	8.714	3	2.905	1.225	.305
	Within Groups	232.380	98	2.371		
	Total	241.094	101			

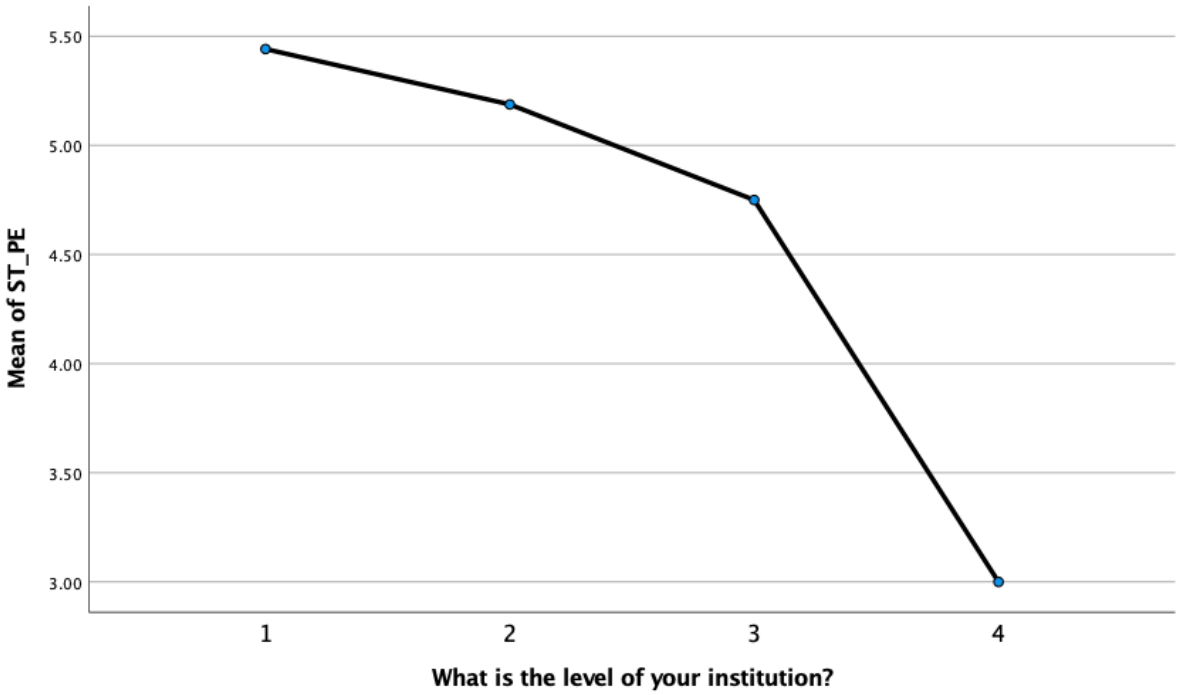

6.00
5.80
5.60
5.40
5.20
5.00
4.80
Mean of TE_SIORG
1
2
3
4
Global

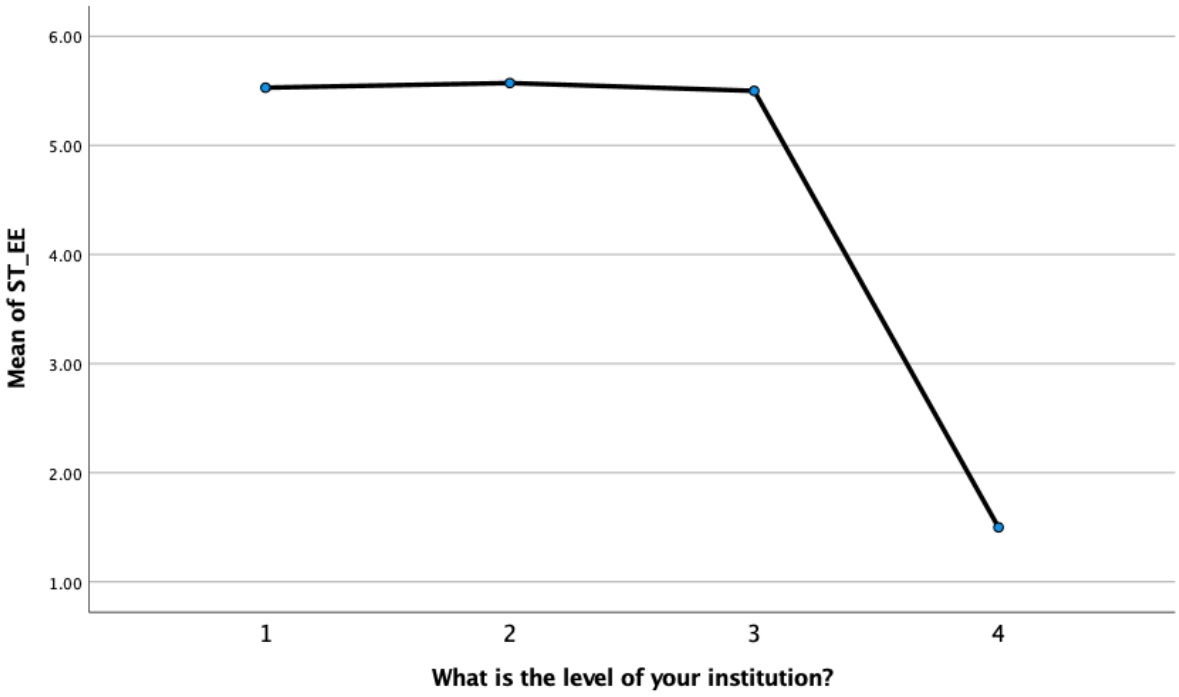
Appendix 11 – Table 9 – results of ANOVA tests on level of institution

Part 1 – students

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
ST_PE	Between Groups	13.664	3	4.555	2.859	.037
	Within Groups	758.203	476	1.593		
	Total	771.867	479			
ST_EE	Between Groups	16.590	3	5.530	3.416	.017
	Within Groups	770.576	476	1.619		
	Total	787.167	479			
ST_SI	Between Groups	3.679	3	1.226	.551	.647
	Within Groups	1058.569	476	2.224		
	Total	1062.248	479			
ST_FC	Between Groups	5.718	3	1.906	1.210	.306
	Within Groups	749.719	476	1.575		
	Total	755.437	479			
ST_HM	Between Groups	8.446	3	2.815	1.743	.157
	Within Groups	768.678	476	1.615		
	Total	777.124	479			
ST_PI	Between Groups	1.790	3	.597	.385	.764
	Within Groups	738.010	476	1.550		
	Total	739.800	479			
ST_BI	Between Groups	7.925	3	2.642	1.145	.330
	Within Groups	1098.057	476	2.307		
	Total	1105.981	479			

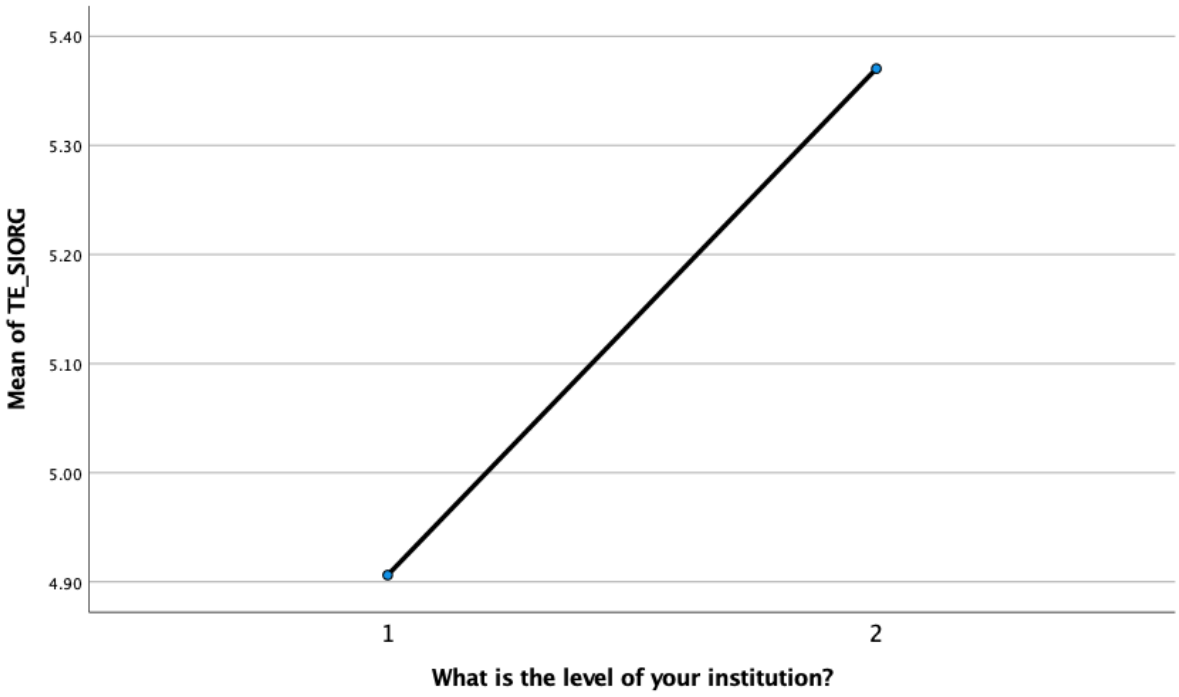




Part 2 – instructors

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
TE_PE	Between Groups	.000	1	.000	.000	.985
	Within Groups	107.372	100	1.074		
	Total	107.373	101			
TE_EE	Between Groups	1.128	1	1.128	1.577	.212
	Within Groups	71.502	100	.715		
	Total	72.630	101			
TE_SIPERS	Between Groups	.047	1	.047	.027	.870
	Within Groups	176.214	100	1.762		
	Total	176.261	101			
TE_SIORG	Between Groups	5.474	1	5.474	4.622	.034
	Within Groups	118.421	100	1.184		
	Total	123.895	101			
TE_FC	Between Groups	4.266	1	4.266	3.019	.085
	Within Groups	141.313	100	1.413		
	Total	145.578	101			
TE_HM	Between Groups	.773	1	.773	1.083	.300
	Within Groups	71.341	100	.713		
	Total	72.113	101			
TE_PI	Between Groups	2.284	1	2.284	2.669	.105
	Within Groups	85.560	100	.856		
	Total	87.843	101			
TE_BI	Between Groups	3.160	1	3.160	1.328	.252
	Within Groups	237.934	100	2.379		
	Total	241.094	101			


5.40
5.30
5.20
5.10
5.00
4.90
Mean of TE_SIORG
1
2
What is the level of your institution?

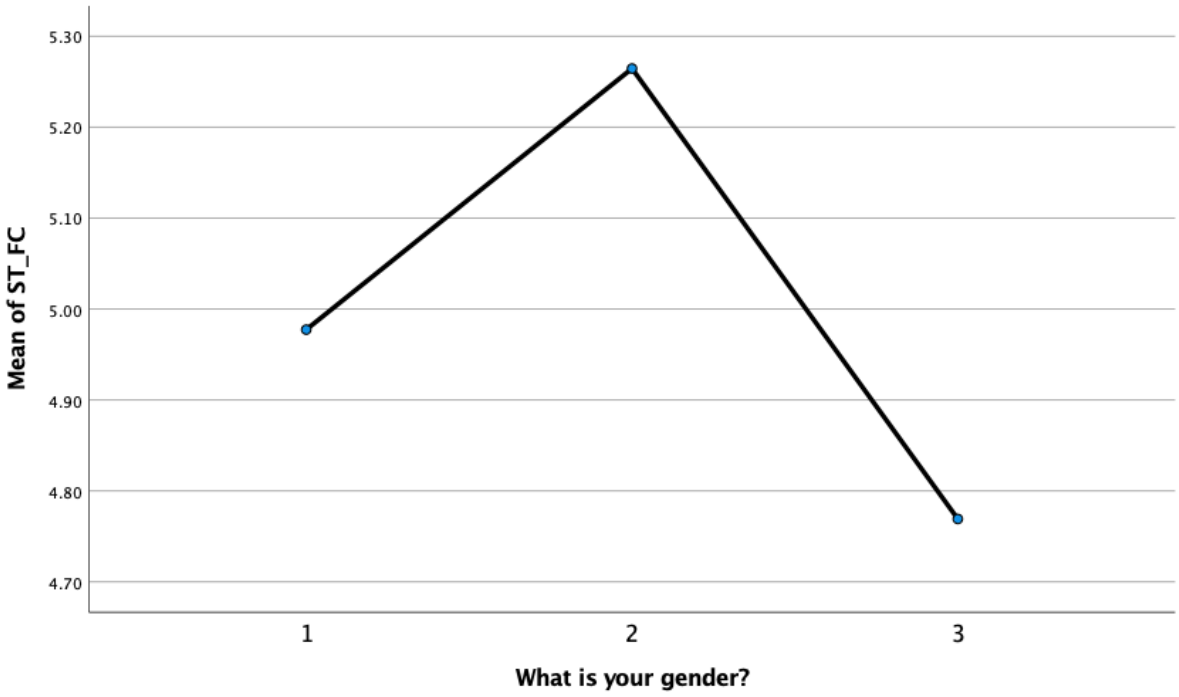
Appendix 12 – Table 10 – results of ANOVA test on gender

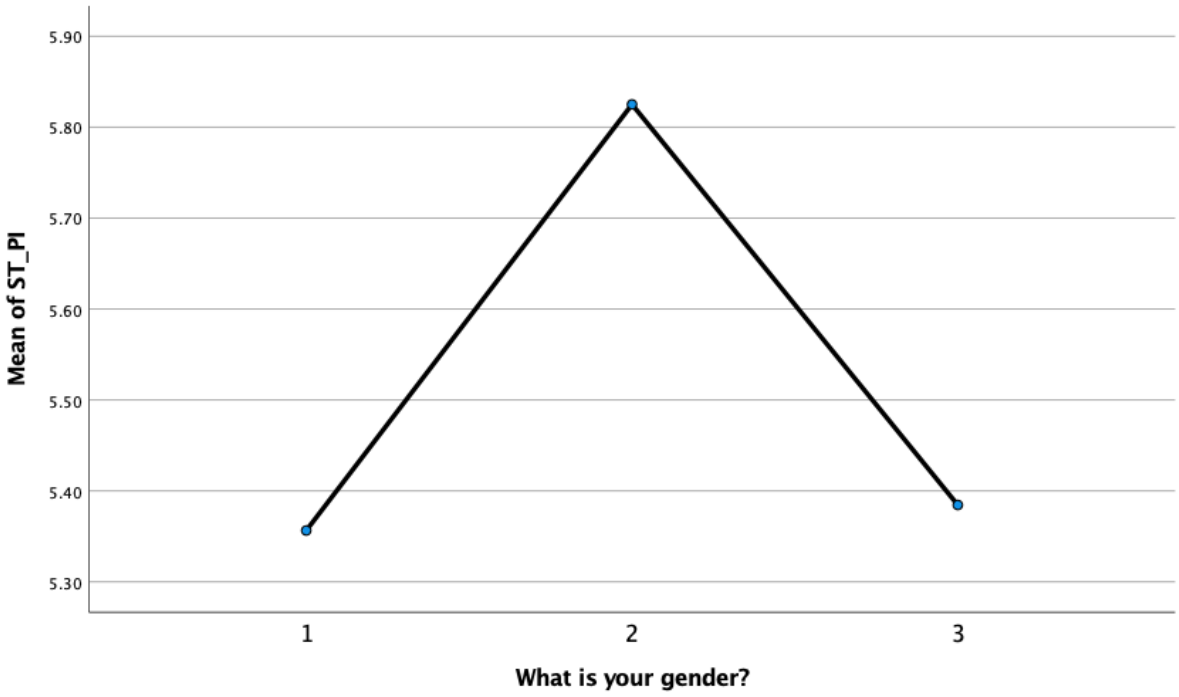
Part 1 – students

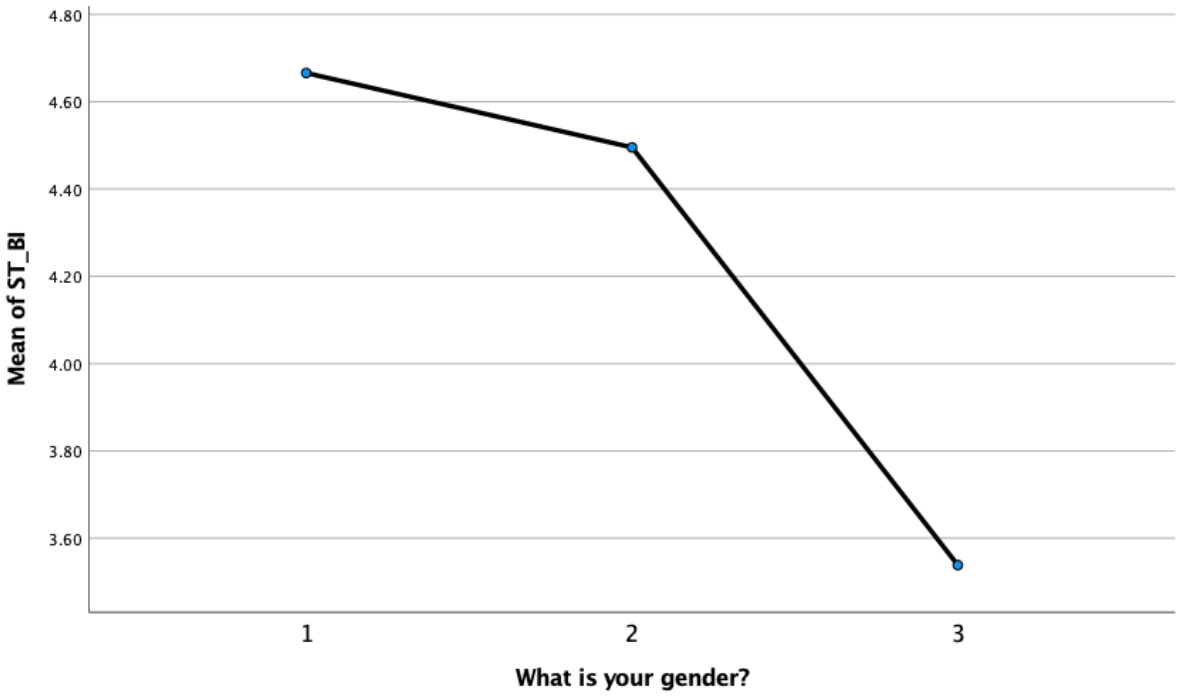
ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
ST_PE	Between Groups	6.419	2	3.209	2.000	.136
	Within Groups	765.448	477	1.605		
	Total	771.867	479			
ST_EE	Between Groups	19.673	2	9.836	6.113	.002
	Within Groups	767.494	477	1.609		
	Total	787.167	479			
ST_SI	Between Groups	2.504	2	1.252	.564	.570
	Within Groups	1059.744	477	2.222		
	Total	1062.248	479			
ST_FC	Between Groups	11.113	2	5.557	3.561	.029
	Within Groups	744.324	477	1.560		
	Total	755.437	479			
ST_HM	Between Groups	1.150	2	.575	.354	.702
	Within Groups	775.974	477	1.627		
	Total	777.124	479			
ST_PI	Between Groups	26.064	2	13.032	8.710	<.001
	Within Groups	713.736	477	1.496		
	Total	739.800	479			
ST_BI	Between Groups	17.227	2	8.614	3.774	.024
	Within Groups	1088.754	477	2.283		
	Total	1105.981	479			


Mean of ST_EE
5.80
5.70
5.60
5.50
5.40
5.30
5.20
1
2
3
What is your gender?


Mean of ST_FC
5.30
5.20
5.10
5.00
4.90
4.80
4.70
1
2
3
What is your gender?





Part 2 – instructors

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
TE_PE	Between Groups	.145	1	.145	.135	.714
	Within Groups	107.228	100	1.072		
	Total	107.373	101			
TE_EE	Between Groups	1.353	1	1.353	1.898	.171
	Within Groups	71.277	100	.713		
	Total	72.630	101			
TE_SIPERS	Between Groups	.098	1	.098	.056	.814
	Within Groups	176.164	100	1.762		
	Total	176.261	101			
TE_SIORG	Between Groups	.122	1	.122	.099	.754
	Within Groups	123.772	100	1.238		
	Total	123.895	101			
TE_FC	Between Groups	.318	1	.318	.219	.641
	Within Groups	145.260	100	1.453		
	Total	145.578	101			
TE_HM	Between Groups	.162	1	.162	.225	.636
	Within Groups	71.951	100	.720		
	Total	72.113	101			
TE_PI	Between Groups	.911	1	.911	1.048	.309
	Within Groups	86.932	100	.869		
	Total	87.843	101			
TE_BI	Between Groups	.013	1	.013	.006	.941
	Within Groups	241.080	100	2.411		
	Total	241.094	101			

Appendix 13 – Table 11 – results of general linear modelling of student perceptions – main effects only

Tests of Between-Subjects Effects

Dependent Variable: ST_BI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	622.877[a]	12	51.906	51.355	<.001	.577
Intercept	2.227	1	2.227	2.203	.138	.005
Whatisyourgender	4.858	2	2.429	2.403	.092	.011
Age_rec	.273	1	.273	.270	.603	.001
ST_PE	17.080	1	17.080	16.898	<.001	.036
ST_EE	.002	1	.002	.002	.967	.000
ST_SI	81.703	1	81.703	80.835	<.001	.152
ST_FC	11.750	1	11.750	11.626	<.001	.025
ST_HM	16.236	1	16.236	16.063	<.001	.034
ST_PI	.436	1	.436	.431	.512	.001
videogaming	5.846	1	5.846	5.784	.017	.013
virtualrealityineducation	19.399	1	19.399	19.193	<.001	.041
communicationskillstraining	1.920	1	1.920	1.899	.169	.004
Error	455.845	451	1.011			
Total	10646.500	464				
Corrected Total	1078.722	463				

a. R Squared = ,577 (Adjusted R Squared = ,566)

Parameter Estimates

Dependent Variable: ST_BI

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower Bound	Upper Bound	
Intercept	-.797	.385	-2.068	.039	-1.554	-.040	.009
[Whatisyourgender=1]	.617	.293	2.105	.036	.041	1.193	.010
[Whatisyourgender=2]	.504	.290	1.737	.083	-.066	1.073	.007
[Whatisyourgender=3]	0[a]	.	.	.	.	.	.
Age_rec	-.013	.024	-.520	.603	-.060	.035	.001
ST_PE	.259	.063	4.111	<.001	.135	.383	.036
ST_EE	.002	.049	.041	.967	-.094	.098	.000
ST_SI	.373	.041	8.991	<.001	.292	.455	.152
ST_FC	.164	.048	3.410	<.001	.070	.259	.025
ST_HM	.238	.059	4.008	<.001	.121	.355	.034
ST_PI	-.036	.055	-.657	.512	-.145	.072	.001
videogaming	-.072	.030	-2.405	.017	-.131	-.013	.013
virtualrealityineducation	.138	.031	4.381	<.001	.076	.199	.041
communicationskillstraining	-.047	.034	-1.378	.169	-.115	.020	.004

a. This parameter is set to zero because it is redundant.

Appendix 14 – Table 12 – results of general linear modelling of student perceptions – main effects and moderating variables

Tests of Between-Subjects Effects

Dependent Variable: ST_BI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	679.343[a]	48	14.153	14.707	<.001	.630
Intercept	3.206	1	3.206	3.331	.069	.008
Whatisyourgender	3.407	2	1.704	1.770	.172	.008
Age_rec	1.759	1	1.759	1.827	.177	.004
ST_PE	.024	1	.024	.025	.874	.000
ST_EE	.087	1	.087	.091	.763	.000
ST_SI	2.688	1	2.688	2.793	.095	.007
ST_FC	.284	1	.284	.296	.587	.001
ST_HM	.421	1	.421	.437	.509	.001
ST_PI	.687	1	.687	.714	.399	.002
videogaming	1.441	1	1.441	1.497	.222	.004
virtualrealityineducation	2.783	1	2.783	2.892	.090	.007
communicationskillstraining	5.524	1	5.524	5.740	.017	.014
Whatisyourgender * ST_PE	2.871	2	1.436	1.492	.226	.007
Whatisyourgender * ST_EE	.797	2	.398	.414	.661	.002
Whatisyourgender * ST_SI	.966	2	.483	.502	.606	.002
Whatisyourgender * ST_FC	2.480	2	1.240	1.289	.277	.006
Whatisyourgender * ST_HM	.926	2	.463	.481	.618	.002
Whatisyourgender * ST_PI	1.895	2	.947	.985	.374	.005
Age_rec * ST_PE	.263	1	.263	.273	.602	.001
Age_rec * ST_EE	18.265	1	18.265	18.979	<.001	.044
Age_rec * ST_SI	.001	1	.001	.001	.973	.000
Age_rec * ST_FC	8.251	1	8.251	8.574	.004	.020
Age_rec * ST_HM	2.218	1	2.218	2.305	.130	.006
Age_rec * ST_PI	.018	1	.018	.019	.891	.000
ST_PE * videogaming	.137	1	.137	.142	.707	.000
ST_EE * videogaming	1.859	1	1.859	1.932	.165	.005
ST_SI * videogaming	.376	1	.376	.391	.532	.001
ST_FC * videogaming	.509	1	.509	.528	.468	.001
ST_HM * videogaming	.048	1	.048	.050	.823	.000
ST_PI * videogaming	.840	1	.840	.873	.351	.002
ST_PE * virtualrealityineducation	.603	1	.603	.626	.429	.002
ST_EE * virtualrealityineducation	1.275	1	1.275	1.325	.250	.003
ST_SI * virtualrealityineducation	2.240	1	2.240	2.327	.128	.006
ST_FC * virtualrealityineducation	.139	1	.139	.144	.704	.000
ST_HM * virtualrealityineducation	.152	1	.152	.158	.691	.000
ST_PI * virtualrealityineducation	.000	1	.000	.000	.989	.000
ST_PE * communicationskillstraining	.755	1	.755	.785	.376	.002
ST_EE * communicationskillstraining	1.655	1	1.655	1.720	.190	.004
ST_SI * communicationskillstraining	.954	1	.954	.992	.320	.002
ST_FC * communicationskillstraining	.356	1	.356	.370	.544	.001
ST_HM * communicationskillstraining	.010	1	.010	.010	.919	.000
ST_PI * communicationskillstraining	.464	1	.464	.482	.488	.001
Error	399.379	415	.962			
Total	10646.500	464				
Corrected Total	1078.722	463				

a. R Squared = ,630 (Adjusted R Squared = ,587)

Appendix 15 – Table 13 – results of general linear modelling of instructor perceptions – main effects only

Tests of Between-Subjects Effects

Dependent Variable: TE_BI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	137.094[a]	12	11.425	12.098	<.001
Intercept	.315	1	.315	.333	.565
Whatisyourgender	.277	1	.277	.294	.589
videogaming	.002	1	.002	.002	.964
virtualrealityineducation	3.063	1	3.063	3.243	.076
communicationskillstraining	.187	1	.187	.198	.658
Experiencewithusingtechnologyineducation	4.211	1	4.211	4.460	.038
TE_PE	10.653	1	10.653	11.281	.001
TE_EE	1.141	1	1.141	1.209	.275
TE_SIPERS	4.825	1	4.825	5.109	.027
TE_SIORG	.491	1	.491	.520	.473
TE_FC	3.607	1	3.607	3.820	.054
TE_HM	1.398	1	1.398	1.481	.227
TE_PI	5.685	1	5.685	6.020	.016
Error	73.656	78	.944		
Total	2094.222	91			
Corrected Total	210.750	90			

a. R Squared = ,651 (Adjusted R Squared = ,597)

Parameter Estimates

Dependent Variable: TE_BI

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Intercept	-.483	.951	-.508	.613	-2.377	1.411
[Whatisyourgender=1]	-.124	.229	-.542	.589	-.579	.331
[Whatisyourgender=2]	0[a]	.	.	.	.	.
videogaming	.003	.074	.045	.964	-.144	.151
virtualrealityineducation	.146	.081	1.801	.076	-.015	.308
communicationskillstraining	-.033	.073	-.445	.658	-.178	.113
Experiencewithusingtechnologyineducation	-.183	.087	-2.112	.038	-.356	-.010
TE_PE	.516	.154	3.359	.001	.210	.822
TE_EE	-.205	.186	-1.099	.275	-.575	.166
TE_SIPERS	.279	.123	2.260	.027	.033	.524
TE_SIORG	.091	.126	.721	.473	-.160	.342
TE_FC	.265	.135	1.954	.054	-.005	.534
TE_HM	-.179	.147	-1.217	.227	-.471	.114
TE_PI	.389	.158	2.454	.016	.073	.704

a. This parameter is set to zero because it is redundant.

Appendix 16 – Table 12 – results of general linear modelling of instructor perceptions –main effects and moderating variables

Tests of Between-Subjects Effects

Dependent Variable: TE_BI

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	174.674[a]	47	3.716	4.430	<.001
Intercept	1.103	1	1.103	1.314	.258
Whatisyourgender	.013	1	.013	.015	.902
videogaming	3.929	1	3.929	4.683	.036
virtualrealityineducation	2.731	1	2.731	3.255	.078
communicationskillstraining	.473	1	.473	.564	.457
Experiencewithusingtechnologyineducation	1.179	1	1.179	1.405	.242
TE_PE	1.395	1	1.395	1.663	.204
TE_EE	.976	1	.976	1.163	.287
TE_SIPERS	1.844	1	1.844	2.198	.145
TE_SIORG	.309	1	.309	.369	.547
TE_FC	.381	1	.381	.454	.504
TE_HM	.072	1	.072	.085	.772
TE_PI	1.155	1	1.155	1.377	.247
virtualrealityineducation * TE_PE	.123	1	.123	.147	.703
virtualrealityineducation * TE_EE	.662	1	.662	.789	.379
virtualrealityineducation * TE_SIPERS	2.635	1	2.635	3.141	.083
virtualrealityineducation * TE_SIORG	.215	1	.215	.256	.616
virtualrealityineducation * TE_FC	.008	1	.008	.009	.924
virtualrealityineducation * TE_HM	1.364	1	1.364	1.626	.209
virtualrealityineducation * TE_PI	.862	1	.862	1.028	.316
Experiencewithusingtechnologyineducation * TE_PE	.021	1	.021	.024	.876
Experiencewithusingtechnologyineducation * TE_EE	.098	1	.098	.117	.734
Experiencewithusingtechnologyineducation * TE_SIPERS	.033	1	.033	.039	.845
Experiencewithusingtechnologyineducation * TE_SIORG	.193	1	.193	.230	.634
Experiencewithusingtechnologyineducation * TE_FC	.003	1	.003	.003	.956
Experiencewithusingtechnologyineducation * TE_HM	.981	1	.981	1.170	.285
Experiencewithusingtechnologyineducation * TE_PI	3.110	1	3.110	3.706	.061
Whatisyourgender * TE_PE	.029	1	.029	.034	.854
Whatisyourgender * TE_EE	1.266	1	1.266	1.510	.226
Whatisyourgender * TE_SIPERS	.135	1	.135	.161	.690
Whatisyourgender * TE_SIORG	.384	1	.384	.458	.502
Whatisyourgender * TE_FC	.269	1	.269	.321	.574
Whatisyourgender * TE_HM	1.029	1	1.029	1.227	.274
Whatisyourgender * TE_PI	.171	1	.171	.203	.654
videogaming * TE_PE	1.208	1	1.208	1.440	.237
videogaming * TE_EE	.080	1	.080	.096	.758
videogaming * TE_SIPERS	.016	1	.016	.019	.891
videogaming * TE_SIORG	.098	1	.098	.116	.735
videogaming * TE_FC	.042	1	.042	.051	.823
videogaming * TE_HM	.269	1	.269	.320	.574
videogaming * TE_PI	1.178	1	1.178	1.404	.243
communicationskillstraining * TE_PE	.007	1	.007	.009	.927
communicationskillstraining * TE_EE	.145	1	.145	.173	.680
communicationskillstraining * TE_SIPERS	.449	1	.449	.535	.469
communicationskillstraining * TE_SIORG	1.883	1	1.883	2.245	.141
communicationskillstraining * TE_FC	1.962	1	1.962	2.338	.134
communicationskillstraining * TE_HM	.006	1	.006	.007	.933
communicationskillstraining * TE_PI	.106	1	.106	.126	.724
Error	36.076	43	.839		
Total	2094.222	91			
Corrected Total	210.750	90			

a. R Squared = ,829 (Adjusted R Squared = ,642)

Appendix 17 – research protocol

Dear educator

You have successfully applied for the Immersive Soft Skills Grant, created by *Bodyswaps*. One of the objectives of the programme is to investigate the use of immersive learning to support soft skills training for higher education students.

As indicated during the application, you have agreed that data will be collected for research purposes. This research protocol provides you with the necessary information to carry out the study as intended.

Please provide your students with this information via your own communication channels and/or in class, prior to the experiment.

Aims of research

The goal of the research is twofold and aims to investigate how both students and educators/facilitators experience the *Bodyswaps* VR soft skills training suite.

Procedure and duration of the research

Before the experiment:

1. You will receive all necessary supportive materials from the *Bodyswaps* team by Laura Heath via email.

2. The *Bodyswaps* team will provide an initial training for the setup of the headset and app via a webinar.

3. You should try to provide for a room with two seats and desks: one for the VR experiment, one for answering the survey. Make sure there is enough light, but not excessive sun light as this may hinder the performance of the virtual reality headset.

4. To allow for an optimal experience, a pair of noice-cancelling headphones could be used. In this way, the participant is not distracted by potential noise from the environment

5. Predefine the ground level and safe area before the experiment to save time. If necessary, refer to this help section: https://www.oculus.com/safety-center/

During the experiment:

1. Ask the participant to sit down on a chair at the desk, before putting on the VR headset.

2. Explain in a nutshell how to interact with the virtual environment by showing the controllers and buttons needed.

3. Assist the participant to put on the headset properly and make sure their vision is clear and sharp, to mitigate nausea and headache.

4. The participant takes one module from the *Bodyswaps* VR library at will. There are no limitations to the content, so each participant can choose which module to take. Duration of one module is approximately 20 minutes.

After the experiment:

Immediately after having taken one module, participants must fill in a survey. Please provide a computer or laptop in the same room to take the survey, in order to make sure participants complete the survey to the end. We advise not to fill in the survey using mobile devices such as tablets or mobile phones. Although the survey tool is fully responsive, answering the survey questions on mobile devices is not very comfortable.
The first question of the survey holds an informed consent to process the data.

General remarks:

Completion of the experiment and survey is due by June, 4 2023.

As an educator/facilitator, please take some time to try out the *Bodyswaps* modules first. In this way, you will be able to help students more proficiently in case of problems.

Bear in my mind, **both students and educator/facilitator(s)** have to take the modules and fill in the survey.

Potential risks

Some participants may experience nausea, headache, eyestrain or other physical discomfort. These symptoms have in general no long-term effects. However, always assist a participant when immersed in virtual reality. Make sure someone is present to observe the experiment. When a participant wearing the virtual reality headset experiences physical discomfort, the experiment should be stopped immediately, and support should be provided. It is advised to provide for an adjacent room, to allow participants to recover after the iVR experience during 10-15 minutes or until they feel well.

Support

In case of technical issues of any kind, please refer to the Bodyswaps team at **laura@bodyswaps.co**. For all matters concerning this research, you can send an e-mail to the responsible researcher Carl Boel at **carl.boel@thomasmore.be**

We thank you most kindly to participate in this research!

Carl Boel, researcher XR for learning and training, Thomas More University of Applied Sciences

Christophe Mallet, CEO, Bodyswaps

Appendix 18 – information letter to instructors and staff

To whom it may concern

Your institution has successfully applied for the Immersive Soft Skills Grant, created by *Bodyswaps*. One of the objectives of the programme is to investigate the use of immersive learning to support soft skills training for higher education students.

As indicated during the application, you have agreed that data will be collected for research purposes. This information letter provides you with the necessary information concerning the research. A research protocol, including informed consent for all participants is supplied in the addendum.

Aims of research

The goal of the research is twofold and aims to investigate how both students and educators/facilitators perceive immersive virtual reality (iVR) as an instructional method to train soft skills, using the *Bodyswaps* suite.

Procedure and duration of the research

Students and educators/facilitators are invited to immerse themselves in an iVR learning experience. They put on a *Meta Quest 2* iVR headset and complete a module from the *Bodyswaps* library.
The Bodyswaps VR suite offers several VR modules to train soft skills. There are several modules available (e.g. public speaking, inclusive leadership, job interview, active listening), but all have the same design. The trainee is set in a virtual environment with one or more virtual conversation partners. Based on a scenario, the trainee is asked to engage with the virtual conversation partner, e.g. in a job interview. The trainee talks and listens to the virtual conversation partner, as if it was a real job interview. The virtual conversation partner is life-like, both in design and in behavior. The trainee is supported by help features in terms of prompts. After the training, the trainee gets feedback on his performance, according to some metrics such as fluency, eye contact, and appropriateness. Finally, the trainee 'swaps bodies', takes the perspective of the conversation partner and watches how he performed earlier. This can be considered as a stimulated recall protocol: the trainee is taken back to the training, 'relives' the training and metacognition and reflection is fostered through this 'body swapping'. An example can be found here: https://youtu.be/6yHLewoYDqA More information on the library can be found at https://bodyswaps.co/soft-skills-training-in-vr/

Students and educators/facilitators are free to decide which module or modules they would like to complete. Each module takes approximately 20 minutes to complete.

After completion, students and educators/facilitators will fill in an online survey investigating their perceptions. The survey will take approximately take 10 minutes to complete. All supportive materials will be provided for by the *Bodyswaps* team via email. You will also be invited to participate in a webinar delivering technical support by the *Bodyswaps* team.

The experiment and survey should be carried out between May, 15 and June, 4 2023.

Participation to this study is voluntary: you have the right to stop participating at any time. You do not have to give a reason for this and it will not have any negative repercussions. At any time you can also ask to end any further processing of your data and to delete the data that have already been collected.

Potential risks

Some participants may experience nausea, headache, eyestrain, or other physical discomfort. These symptoms have in general no long-term effects. When a participant wearing the virtual reality headset experiences physical discomfort, the experiment should be stopped immediately, and support should be provided.

Data processing

No personal data such as name or e-mail will collected.

All data collected will be pseudonymized, using a randomly generated 6-digit code. The file linking the individual answer to the code is only available to the responsible researcher and secured with a password. This file will be destroyed after 5 years.

During the VR training module personal data will be collected by the VR developer Bodyswaps, including your spatial movements, a recording of your voice, what you say, the time and date of starting and completing the VR training module. These data are used to analyse and provide feedback on your performance. Data will not be kept by Bodyswaps after the training, apart for training the software, improving the platform, legitimate commercial interest or detecting illegal activities. However, all data will be fully anonymized so that it cannot be traced back to you. Data will be saved on servers located in Europa and United Kingdom. Appropriate safeguards are taken to protect your personal data. Data will only be kept only as long as there is a legitimate business need. Otherwise the data will be deleted. For a full overview of the privacy policy of Bodyswaps and your rights when using your personal information, please refer to: https://bodyswaps.co/privacy-policy/#what-personal-information-do-we-collect-and-why or contact the Bodyswaps Data Protection Officer at hello@bodyswaps.co

The study is conducted in accordance with the Declaration of Helsinki, following the Ethical Protocol as defined by Thomas More University of Applied Sciences. Data will be processed, saved and secured according to the applicable regulations, in particular the General Data Protection Regulation (GDPR), as described in the Research and services privacy statement by Thomas More, which can be found here: https://www.thomasmore.be/en/research-and-services-privacy-statement For more information about this privacy statement or for complaints concerning the processing of your personal data, you can contact the Thomas More data protection officer via privacy@thomasmore.be.

This study has been reviewed and approved by the Social and Societal Ethics Committee (SMEC) of KU Leuven [fill in approval number]. In case of complaints or other concerns with regard to the ethical aspects of this research I can contact SMEC: smec@kuleuven.be

Support

In case of technical issues of any kind, please refer to the *Bodyswaps* team at laura@bodyswaps.co. For all matters concerning this research, you can send an e-mail to the responsible researcher Carl Boel at carl.boel@thomasmore.be

Appendix 19 – information letter to students

Dear student

Your institution has successfully applied for the Immersive Soft Skills Grant, created by *Bodyswaps*. One of the objectives of the programme is to investigate the use of immersive learning to support soft skills training for higher education students.

As indicated during the application, your institution has agreed that data will be collected for research purposes. This information letter provides you with the necessary information concerning the research.

Aims of research

The goal of the research is twofold and aims to investigate how both students and educators/facilitators perceive immersive virtual reality (iVR) as an instructional method to train soft skills, using the *Bodyswaps* suite.

Procedure and duration of the research

You are invited to immerse yourself in an iVR learning experience. You will put on a Meta Quest 2 iVR headset and complete a module from the *Bodyswaps* library.
The Bodyswaps VR suite offers several VR modules to train soft skills. There are several modules available (e.g. public speaking, inclusive leadership, job interview, active listening), but all have the same design. The trainee is set in a virtual environment with one or more virtual conversation partners. Based on a scenario, the trainee is asked to engage with the virtual conversation partner, e.g. in a job interview. The trainee talks and listens to the virtual conversation partner, as if it was a real job interview. The virtual conversation partner is life-like, both in design and in behavior. The trainee is supported by help features in terms of prompts. After the training, the trainee gets feedback on his performance, according to some metrics such as fluency, eye contact, and appropriateness. Finally, the trainee 'swaps bodies', takes the perspective of the conversation partner and watches how he performed earlier. This can be considered as a stimulated recall protocol: the trainee is taken back to the training, 'relives' the training and metacognition and reflection is fostered through this 'body swapping'. An example can be found here: https://youtu.be/6yHLewoYDqA More information on the library can be found at https://bodyswaps.co/soft-skills-training-in-vr/
You are free to decide which module or modules you would like to complete. Each module takes approximately 20 minutes to complete.

After completion, you will be asked to fill in an online survey investigating your perceptions. The survey will take approximately take 10 minutes to complete.

The experiment and survey will take place between May, 15 and June, 4 2023.

Participation to this study is voluntary: you have the right to stop participating at any time. You do not have to give a reason for this and it will not have any negative repercussions. At any time you can also ask to end any further processing of your data and to delete the data that have already been collected.

Potential risks

Some participants may experience nausea, headache, eyestrain, or other physical discomfort. These symptoms have in general no long-term effects. When experiencing physical or mental discomfort, the experiment will be stopped immediately, and support will be provided.

Data processing

No personal data such as name or e-mail will collected.

All data collected will be pseudonymized, using a randomly generated 6-digit code. The file linking the individual answer to the code is only available to the responsible researcher and secured with a password. This file will be destroyed after 5 years.

During the VR training module personal data will be collected by the VR developer Bodyswaps, including your spatial movements, a recording of your voice, what you say, the time and date of starting and completing the VR training module. These data are used to analyse and provide feedback on your performance. Data will not be kept by Bodyswaps after the training, apart for training the software, improving the platform, legitimate commercial interest or detecting illegal activities. However, all data will be fully anonymized so that it cannot be traced back to you. Data will be saved on servers located in Europa and United Kingdom. Appropriate safeguards are taken to protect your personal data. Data will only be kept only as long as there is a legitimate business need. Otherwise the data will be deleted. For a full overview of the privacy policy of Bodyswaps and your rights when using your personal information, please refer to: https://bodyswaps.co/privacy-policy/#what-personal-information-do-we-collect-and-why or contact the Bodyswaps Data Protection Officer at hello@bodyswaps.co

The study is conducted in accordance with the Declaration of Helsinki, following the Ethical Protocol as defined by Thomas More University of Applied Sciences. Data will be processed, saved and secured according to the applicable regulations, in particular the General Data Protection Regulation (GDPR), as described in the Research and services privacy statement by Thomas More, which can be found here: https://www.thomasmore.be/en/research-and-services-privacy-statement For more information about this privacy statement or for complaints concerning the processing of your personal data, you can contact the Thomas More data protection officer via privacy@thomasmore.be.

This study has been reviewed and approved by the Social and Societal Ethics Committee (SMEC) of KU Leuven [fill in approval number]. In case of complaints or other concerns with regard to the ethical aspects of this research I can contact SMEC: smec@kuleuven.be

Support

For all matters concerning this research, you can send an e-mail to the responsible researcher Carl Boel at carl.boel@thomasmore.be

Appendix 20 - informed consent

Informed consent

Title of the research:
Perceptions of higher education students and instructors on immersive virtual reality as an instructional method to train soft skills

Name + contact details of supervisor and researcher(s):
Carl Boel, carl.boel@thomasmore.be, 0032 474 68 62 25, Thomas More University of Applied Sciences, Department of Digital Media Experiences

Goal and methodology of the research:
In this study we investigate which factors contribute to or inhibit the acceptance and use of immersive virtual reality to learn soft skills by higher education students and instructors. Participants will experience an interactive soft skills immersive virtual reality training, after which they will be asked to answer an online survey on their perceptions.

Duration of the experiment:
2023-05-15- to 2023-06-04

- I understand what is expected of me during this research.

- I know that I will participate in the following trials or tests: I will take an immersive virtual training on soft skills (*Bodyswaps*) and will be asked to answer an online survey on my perceptions of the VR experience. Duration of the VR training module is on average 20 minutes; answering the survey questions takes about 10 minutes.

- I know that my participation may be associated to risks or discomforts: I might experience headache, eye strain, neck strain, nausea. These symptoms will however disappear shortly after removing the VR headset and have no longer-term effects.

- I or others can benefit from this research in the following ways: my participation offers a contribution to the scientific research. I know that I will not receive any further reward or compensation for my participation.

- I understand that my participation to this study is voluntary. I have the right to stop participating at any time. I do not have to give a reason for this and I know that it will not have any negative repercussions for me. At any time I can also ask to end any further processing of my data and to delete the data that have already been collected.

- The results of this study can be used for scientific goals and may be published. My name will not be published. The confidentiality of the data will be protected in all stages of the research. The researchers will take the following measures to protect my privacy: all data will be pseudonymized after full data collection. A separate encrypted key-file linking participants to codes will be stored separately and is accessible to the researcher only. This key-file will be destroyed after 5 years. Data will be processed, protected and saved according to the applicable GPDR regulations as described in the Research and services privacy statement by Thomas More which can be found here: https://www.thomasmore.be/en/research-and-services-privacy-statement

- During the VR training module personal data will be collected by the VR developer Bodyswaps, including your spatial movements, a recording of your voice, what you say, the time and date of starting and completing the VR training module. These data are used to analyse and provide feedback on your performance. Data will not be kept by Bodyswaps after the training, apart for training the software, improving the platform, legitimate commercial interest or detecting illegal activities. However, all data will be fully anonymized so that it cannot be traced back to you. Data will be saved on servers located in Europa and United Kingdom. Appropriate safeguards are taken to protect your personal data. Data will only be kept only as long as there is a legitimate business need. Otherwise the data will be deleted. For a full overview of the privacy policy of Bodyswaps and your rights when using your personal information, please refer to: https://bodyswaps.co/privacy-policy/#what-personal-information-do-we-collect-and-why or contact the Bodyswaps Data Protection Officer at hello@bodyswaps.co

- In the context of transparency in scientific research the data of this study may be shared with others, such as researchers from different universities. In that case only non-identifiable data will be shared. It will not be possible for others to know that I have participated in this study or to know which data belong to me.

- I would like to be informed about the results of this research. The researchers may contact me for this purpose using the following e-mail address: carl.boel@thomasmore.be

_____

- For questions and for the execution of my rights (access to my data, rectification of the data, …) after my participation I know that I can contact: Carl Boel (carl.boel@thomasmore.be)
  More information with regard to privacy in research can be found at https://www.thomasmore.be/en/research-and-services-privacy-statement With further questions about privacy issues I can contact the data protection officer: privacy@thomasmore.be
  Concerning the data collected by Bodyswaps, please refer to the Data Protection Officer at hello@bodyswaps.co

- This study has been reviewed and approved by the Social and Societal Ethics Committee (SMEC) of KU Leuven (*fill in approval number*). In case of complaints or other concerns with regard to the ethical aspects of this research I can contact SMEC: smec@kuleuven.be

- I know that I can contact the individuals/organizations below if I would experience any discomfort or difficulties as a result of some of the subjects that were the topic of this research: carl.boel@thomasmore.be

I have read and understood the information in this document and I have received an answer to all my questions regarding this research. I give my consent to participate.

Date:

Name and signature of the participant

Name and signature of the researcher

10 Information on the author

Thomas More is the largest University of Applied Sciences in Flanders, Belgium, with more than 20,000 students and a range of bachelor's degree, short bachelor's degree and postgraduate programmes taught in both English and Dutch. Through its excellent professional higher education, practice-oriented research and scientific consultancy, Thomas More is an important engine of innovation.
Our 250 researchers combine scientific expertise with practical knowledge and experience to provide evidence-based solutions and innovations for the largest and most urgent societal challenges. Our research is multidisciplinary by nature, combining knowledge from different domains and disciplines.
The Centre of Expertise Sustainable Business and Digital Innovation has a proven track record in the field of extended reality (XR) and digital experiences, enabling education, SME's, large companies and public organisations to improve their products and services. Our Centre of Expertise has a successful track record in both local and EU funded projects from different programs (Creative Europe, Erasmus+, ERDF-Interreg-ESF, Horizon 2020/Europe, CORNET, COST), as a partner or as a coordinator.

Carl Boel

Carl Boel was a secondary education teacher in English and Dutch for 15 years. Since 2006 he investigated how technology could enhance his courses and teaching practice. He inspired hundreds of teachers and staff with keynotes and workshops. In 2016 he started working at Ghent University as a lecturer in academic writing and presentation skills. These courses were integrated into other courses within the concept of language across the curriculum. In 2018 he was asked by Odisee to create a MOOC strengthening novice preservice teachers in their communication and self-regulating skills.

Since 2019 he works as a researcher at Thomas More investigating how the affordances of XR can enhance a learning and training experience. He combines expertise from both research and industry with a focus on evidence-based instructional design. Carl is a researcher on XR in education, both at Thomas More University of Applied Sciences and at Ghent University, where he is completing his PhD on this topic. He is involved in several research projects on XR, both domestic and internationally. Carl also leads the Learning Network on XR in education in Flanders and was the main author for the advisory policy report on XR in education for the Ministry of Education in Flanders. He continues to expand his XR network in both academia and industry: as co-chair within the program committee of the Immersive Learning Research Network (iLRN); as co-chair of XR Valley, which aims to bring together everything XR in Belgium; and as program curator for learning and training of the Immersive Tech Week (formerly VR Days).

As an independent XR-designer he founded Virtual Learning is Reality and has designed, developed and tested multiple learning experiences for companies, organizations and governmental institutions. While doing so, he noticed a need for scalable XR solutions which led to the birth of Dexr, an authoring tool to create your own XR training, guided by evidence-based instructional design principles.

CONTACT

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https://www.researchgate.net/profile/Carl-Boel-2

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