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Comparative Analysis of Employee Training Using Conventional Methods and Virtual Reality

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Abstract: This paper deals with an innovative method of employee training. Its concept is based on an experiment comparing a conventional training method with virtual reality (VR) training. For the evaluation, a questionnaire was designed to assess how much probands remembered immediately after the training. The area of training was the handling of sharp objects in a healthcare environment. The length of both types of training was 30 minutes). The conventional training was in the form of a presentation, the innovative one was virtual reality with guided interaction with objects. The probands were college students. A total of 42 samples were measured, where each proband was trained on only one variant. The main objective was to compare the effectiveness of each training method as a function of time and its effectiveness in terms of memorability. It showed that probands who acquired knowledge using the VR variant remembered more information. It was also found that prior experience with VR did not yield better results.

Keywords: Industry 4.0; new training method; safety training; user acceptance; virtual reality; virtual training

1 INTRODUCTION

Industry 4.0 has brought innovations and opportunities for companies to apply new methods that offer a different perspective on their current strategies. Many organisations have started working on modernising their standards, processes and practices. [1] One of the key input pillars for the application of the new concept is the digitisation of corporate data. The right digitalisation can create a competitive advantage if companies can choose the right methods and processes. This enables businesses to streamline their processes, find new solutions and use their resources efficiently, as well as avoiding waste and trying to reduce costs. [2, 3] With the right digitalisation[4], it is possible to react flexibly to change, create competitive advantages and streamline human resources. Another important feature of Industry 4.0 is integration, which can involve processes throughout the entire organisation (that is, from the production process to the core management). [3, 5]

The concept of virtual reality, which in the sense of Industry 4.0 is closely related to the above concepts, can be explained in several ways. In general, it is a technology that creates an environment using a computer screen where the user experiences the sensation of being surrounded by another space with which they can interact. [6] It is thus a medium that allows people to interact effectively with a digital 3D environment in real time using their natural sensory abilities and skills. [7, 8] Immersion and presence are key features of VR [9]. Immersion is the objective ability of VR to provide the user with faithful, complex and sensory stimuli. Presence is the subjective experience of being present in the virtual world, even when the user knows that the stimuli do not exist in a physical sense in the virtual space [8, 10]. Various devices are able to create this illusion to such a degree that the user can ignore their real surroundings [11]. From the point of view of the engineering industry, an interesting application is the possibility of simulating real processes without any risk exposure [12].

One of the latest concepts that may be of interest to businesses is virtual training (VT). This is the digitisation of a real process into VR for teaching and/or training purposes. The main objective is to impart the necessary skills to the employees and create quality experience and knowledge for the trainees [13, 14]. This method creates the conditions and experience needed to minimise human error in a safe environment. Risky activities can be explained and tasks that require extra attention can be demonstrated. This makes it an interesting tool for training people [13, 15]. Such training is easily repeatable, in an identical setting, with all output data (e.g., evaluation documents) easily recorded.

One area in which VT could be used is in the training of employees. In-house training is a key element in the development and growth of employees, as well as in improving the efficiency and competitiveness of the enterprise as a whole [16]. The disadvantage of VT is that its actual creation as well as implementation can take a few months. Overall, the development of VT can be divided into three phases:

1) Pre-project - mapping of the selected process and scenario preparation
2) Project - environment modelling and application development (setting up logic and writing scripts).
3) Final phase - the implementation period, when the details are fine-tuned with the customer and introduced into the company. [17, 18]

This is also linked to the level of acquisition costs. As this is a new technology, a high initial investment in both hardware and software is required. Further investment is needed in professional staff for equipment maintenance and technical support. Any technical system can experience malfunctions and failures which can cause interruptions in training and loss of staff performance [19, 20]. Another disadvantage is that VR can cause health problems for users. It is important to consider the possibility of Motion Sickness during development and try to eliminate it as much as possible [23].

Well-designed and implemented training can bring many benefits, such as increased productivity, higher employee motivation, reduced staff turnover and improved market positioning. From an Occupational Health and Safety (OHS) perspective, the elimination of workplace accidents can be a key criterion. It is this type of training that is essential for companies to provide their employees with safe conditions in the workplace and to be able to eliminate all risks [22–24]. Using VR for occupational safety training is therefore effective for several reasons. One of the main factors is the possibility of realistic simulations. Due to the interactivity, participants are actively involved in the training, this results in more effective retention of information. Also, the immediate feedback allows them to hone their skills and reactions to different situations. It is therefore an interesting tool for any type of training [25].

1.1 Related Work

A study by Radianti and colleagues (2020) explores the use of VR in the context of education. They investigated the prerequisites for its successful implementation in educational processes for different subjects. The result of their findings was that VR has had positive feedback in the form of practical applications [26]. Also relevant is a study [27] that focused on the use of VR during primary school teaching. This study involved 24 students who participated in a virtual field trip. From this it can be concluded that the current young generation is open to using these digital tools. A strong sense of presence and effective VR immersion provide training in a safe and controlled environment [28]. The effectiveness of digital tools itself is captured in [29], where the authors focused on comparing traditional and computer-based tools by analysing 18 studies. The results showed a positive effect and outcomes when a new (digital tool) was used. Half of the cases had a 20% higher effectiveness and positive attitude recorded by the probands. This result is supported in [15], where immersion and presence are considered as the main advantages of VR for training health professionals. For example, through VR, fear of heights can be overcome. A total of 49 volunteers participated in the experiment [30], with those who underwent VR immersion showing a 75% reduction in their fear of heights. From an industry perspective, even very dangerous jobs such as mining can be simulated, where more than 80% of the participants believed that the depicted hazards were real. [31] In the construction industry, a comparison was made with conventional hazardous work training (e.g. working at heights). The result was a total training time of more than 20 hours over a month for new entrants [32]. In the questionnaire, more than 42% of people thought that lack of knowledge and poor-quality training was the main source of accidents. Compared to the conventional method, participants showed a higher level of knowledge in the field. Thanks to VR, they were able to remember more products and their assembly procedures. The limitations of this study were that these were very simple assemblies. In contrast, Kalkan [33] focused his study on the performance of complex assembly tasks and product quality. His goal was to use VR to reduce the training and knowledge transfer time. The results showed that they were able to reduce training time by 25% and achieved 28% better performance through VR.

In [34] , the standard learning method is compared with VR. The result of this study is that users who trained using VR committed fewer errors than in real buddy training. Another finding was the advantage that VT is shorter, more efficient and less dependent on the trainer.

HSE (explain this abbreviation, is it OHS?) managers who drew on the experience of 540 workers praised the variety of the system, the interactive elements, and the overall attractiveness. They also appreciated the shared learning functionality [35]. Zawadzki focused his research on demonstrating the advantages of VT over traditional training methods. This research was supported by a total of 20 respondents that he tested for each form of training and then compared their results. The outcome was that using VT, respondents had better times in terms of product identification and lower assembly times. He also mentioned some disadvantages. The main disadvantage cited was the high initial investment, which has the potential to pay for itself within a few years. [36] Another comparison was made using fire protection as a test area. Through research and data collection using questionnaires, it was found that VR application is more effective than the conventional method. A total of 80% of the respondents in the questionnaire identified it as an innovative and more effective method [37]. OHS elements appear in most training processes. Electrocution is another hazardous area that is appropriate to virtualise. Based on preliminary validation, it was found that VR application has a strong influence on human behaviour and understanding of OHS knowledge. People were more cautious when the hazard level was higher in VT, the same as if they were in reality [38].

The article [39] focused on a comparative approach between the conventional method and the use of VR in VT. In this analysis, the researchers found that probands who received training in VR showed better knowledge transfer and production. The results were very positive for hands-on learning. On the other hand, the results were not significant for theoretical learning.

The paper [40] reports on training opportunities in OHS in the field of electrical work. Here, the authors suggest VT as the optimal training method. Other important findings that were found are that training in VR has higher efficiency compared to the conventional method, reducing the time for knowledge and experience generation. Another advantage is better applicability in practice and some sources also report a reduction in the cost required for training.[41–43] In general, virtual training makes it easier to create new experiences, build skills and transfer the know-how of the process correctly, resulting in more efficient work with human resources. [44]. Overall, the claim that VR training allows the acquisition of tangible knowledge through the form of experiencing certain situations and then solving them is considered a great advantage. It is the immediate feedback that provides error correction that leads to a better understanding of the issue at hand [45].

1.2 Hypothesis and Research Questions

Based on the above, it can be concluded that VT in the industrial sector is an effective tool and can be more cost-effective in terms of capacity, time, and therefore money spent, than conventional methods. In this paper, we focus on VT in the field of OSH, specifically on the level of memorisation compared to conventional training. Testing of the memorability of a selected process will be performed. Verification of memorability will be done by asking control questions on the selected process.

Based on the standardised training of accident prevention when handling sharps, a questionnaire was developed, and control questions were asked to the respondents. Each of the responses was then converted into scores to allow for better comparison between the two groups (standard and VR training).

Thus, three research questions were set, with a null hypothesis (H0) and an alternative hypothesis (H1) for each question - see below:

Q1: Which group of probands received a higher score?

Q2: Do probands with higher VR experience show better results?

Q3: Do computer game players show better results in VR?

Question Q1 is the main question and Q2 and Q3 are supplementary questions.

2 METHODOLOGY

The aim of this study is to carry out an experimental investigation to compare the effectiveness of VR training versus conventional training in terms of memorisation of the training content in the immediate post-training period. To meet the requirement of the possibility of universality of using the training in different enterprises, a training course that focuses on occupational safety and health was chosen. In the context of this study, this training was specified as training on working with sharp objects and the correct procedure for sharp injuries. We compare two types of training:

- 2D – using a presentation.
- VR – using virtual reality.

In the case of VR training, the training is digitised, and an interactive VT course is created based on interactive user involvement. One of the main advantages of this method is the hands-on execution of tasks, which allows users to acquire skills through realistic simulations and exercises. The primary objective is to assess the memorisation rate of VR compared to the traditional method. The aim is to demonstrate the benefits of a VR tool for employee training.

2.1 Conventional Training (2D)

Probands were given a standard presentation for job training, handling of sharp objects and subsequent injury procedures using frontal teaching. The presentation was prepared as the main aid which was designed to provide probands with comprehensive and understandable information about working with and handling sharps. The risks and correct procedures for sharps injuries were also listed. The presentation included pictures that served as visual support. Their main function was to simply explain the issue, describe a specific case, capture the probands' attention and try to make it more memorable. The training was carried out by a person experienced in this type of work and in training other staff. In addition to the presentation itself, it was necessary to have a room with projection technology. Finally, interactive elements in the form of a discussion were used where the probands could ask questions or have things explained in greater detail.

The total length of the conventional training was set at 30 minutes. This timeframe allowed ample space for in-depth analysis of the topic and interactive discussion. During this time, participants had the opportunity to ask questions about uncertainties and discuss practical applications of the skills learned. For authenticity of the experience, the traditional training was organised so that all the participants from this group attended at the same time. This group dynamic was intended to encourage active participation of the participants and allow them to share their thoughts and experiences in real time. At the end, each proband completed a questionnaire that was the same for both groups.

2.2 Virtual Reality (VR)

For this variant, an application was developed to represent the training in virtual reality. The main function of this application was the simulation of selected processes. The input data for the creation of the VR training was a standardised process of handling, working with and accident prevention with sharp objects. This process was divided into activities that build on each other and represent interdependent steps. Within the simulation, this means that if the first step is not completed, the next steps cannot be started. Another important point is the division of the elements into static and dynamic elements (i.e. those that are interacted with). This type of division has a big impact on performance, as static elements are in one place all the time and can be rendered to increase the fluidity of VR. The application was developed in Unity 3D software. Unity is a very popular development engine that allows the creation of interactive 2D and 3D applications (including VR). A lot of emphasis was placed on the look and quality of the environment to represent the real situation. This element was intended to use as much immersion as possible and to approximate a real situation that may occur in practice. In Fig. 1 – A sample environment from the VR app, you can see that this is a surgery where a syringe is being handled. For better orientation, the user observes everything from a 3rd person perspective and solves the problem that arises for their VR colleague. At the end, each proband completed a questionnaire that was the same for both groups.

Figure 1 A sample environment from the VR app

A virtual guide was used throughout the application to explain each step and also to tell them what to do in which step. Visual management elements were also used to improve navigation in the environment. These elements can be seen in Fig. 2 – Elements of visual management in VR, where the active objects (those that the user can manipulate) are highlighted in blue. The places where they are to be inserted are then highlighted in green.

Figure 2 Elements of visual management in VR

Oculus Quest 2 goggles were used to transmit the virtual environment. This is an All-in-One device, meaning that it does not require any additional communication devices or tracking stations. The main point of these goggles is to make working with them as easy as possible and to be able to provide high quality rendering with maximum comfort. The controls or just your hands can be used to operate them.The integrated motion tracking technology means that the goggles can record the movements of the hands and transmit them to the virtual environment. A time schedule was set with the group that participated in the VR training, with 30 minutes planned for each proband. In the first 10 minutes, the proband had the basics of using the technology explained to them, they were shown the functionality of the hardware and how to set up its interface. In the second part, the proband adjusted the optimal size, improved the sharpness, and increased or decreased the volume of the sound if needed. This was followed by the actual training. 15 minutes per proband was reserved for this, with the length of the "walk-through" application being half that. This provided a time buffer in case any complications arose. At the end, the proband completed a questionnaire. As part of hygiene, the goggles had a rubber cover and were wiped with disinfectant wipes after each use. If any of the probands wore dioptric glasses, a special attachment was used. This hardware has its limits in use, so it was important to have a well-lit room. It was also important to keep the room free of mirrors and other materials that create reflections and could impair hand tracking functionality. In the event of excessive sunlight, it was essential to be able to shutter the windows.

2.3 Research Sample

The study included a total of 42 probands. They were selected from a population of college students and their age range was between 19 and 23 years. This age range ensures a relatively homogeneous sample in terms of learning ability. The probands are students of different majors, which means that their educational backgrounds and experience with the subject matter may vary. This could influence their perception and recall of the information presented during the training. However, most of them had university education in common, which may help to minimise the influence of these variations on the results of the study. We see the above as a limiting factor of the study. The probands were proportionally and randomly divided into two treatment groups to ensure that each group received only one variation of training. This step was essential to compare the effectiveness of the two methods, as it allows us to eliminate possible bias in the results due to awareness of the issue

2.4 Questionnaire

The questionnaire consisted of three sections in total. The first section of the questionnaire focused on basic information about the proband, such as age, gender, and experience with virtual reality. It had a total of 4 questions. This section of the questionnaire aimed to provide demographic data that may influence the participants' reactions and behaviours during the training. For the question focusing on virtual reality experience, a scale was established based on the number of uses, with the lowest value being 0 and the highest being 50 or more. The PC gamer question then focused on the number of hours per week the proband spends playing games. The lowest value was 0 hours and the highest was 20 or more.

The second section contained follow-up questions that related to the actual issues that the training focused on. There were three types of these questions and there were 6 in total. The first section had only one permissible answer. There were three of these questions. For example, a question was "What part of the sharp object should be grasped?" The second section had one or more answers, here the probands could tick any number of answers and there were two questions of this type. The last type was a question where the user assigned a ranking to each activity, according to how they would deal with a sharps injury. This section was used to test whether the participants were able to correctly understand and apply the information given to them during the training.

The third section of the questionnaire dealt with the participants' subjective evaluation of the training they had just received. There were 3 questions in total. Overall, the use of the questionnaire and its structured layout allowed for a systematic evaluation of the results and a comprehensive picture of the effectiveness and benefits of virtual training compared to the traditional training method.

2.5 Monitored Data

From the data collected, several key evaluations were obtained that focused on different aspects of training effectiveness. These evaluations include memorability, effectiveness, and familiarity with the use of VR, which was needed to complete the questionnaire. Memorability is an important factor that measures the ability of participants to remember and reproduce the information and skills that were presented during the training. In this context, the ability to remember was compared between the two groups of participants who received different versions of the training. The results of these tests provided information on how well participants remembered the information learned during the training. Participants' interest and satisfaction are subjective aspects that reflect their perception and evaluation of the training. These evaluations included collecting feedback from participants regarding their personal interest in VT. Interest and satisfaction can be key indicators of training effectiveness, as a positive experience can lead to better engagement and retention of information. These aspects of the evaluation provide a comprehensive view of the effectiveness of the training and allow for the identification of strengths and weaknesses of each method. The combination of objective and subjective measures provides a comprehensive picture of how effective and efficient different approaches to training are on a given issue.

3 RESULTS

In the evaluation we worked with two variants of knowledge testing:

- Variant 1: VR testing with 19 respondents.
- Variant 2: Conventional testing, in paper form (2D) with 21 respondents.

Table 1 Number of correct and incorrect answers

Row labels	Paper	VR	Total sum
Correct	19	18	37
Wrong	2	1	3
Total sum	**21**	**19**	**40**

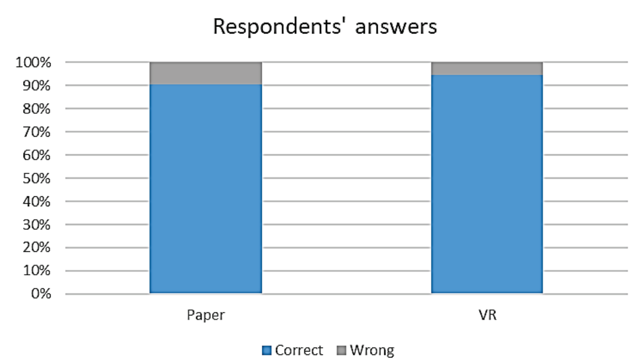

Figure 3 Number of correct and incorrect answers

To display the values, an association table was created, supplemented by a graph. As part of the evaluation process, we formulated three questions (Q1, Q2 and Q3) which are further used to generate three hypotheses. In conducting statistical tests, we set the alpha level of significance at 0.05. This level determines whether we are able to reject the null hypothesis. We obtain the results of this statistic by calculating the p-value, which is the result of the statistical tests performed [46, 47].

First, the answers of each proband were scored. The scoring was done as follows:

Question - only one correct answer. (Total 3 questions)

- Correct 1
- Wrong 0

Question - multiple correct answers. (Total 2 questions)

- Correct 1
- 1 wrong 0.5
- 2 or more wrong 0

Question - ordering of events. (Total 1 question)

- Correct 1
- 1-2 mistakes 0.5
- 3 and more mistakes 0

A new variable was created to represent the total number of points scored by the proband for all scoring questions. The maximum number of points obtained in the testing was 6. In the 2D group an average of 3.73 points was obtained and in the VR group an average of 4.01 points was obtained. Here, descriptive statistics were first calculated, and because the aim was to test the agreement of the mean scores between the forms of testing (2D vs. VR), the normality of the data (i.e., the assumption for the use of parametric tests) was examined using the Shapiro-Wilk (S-W) test [46, 47]. After performing the S-W test, the p-value for the VR variant was calculated as 0.122859473. The scores using VR showed a normal distribution (p-value > 0.05). For the 2D variant, the p-value is calculated as 0.015485487. The score using 2D does not have a normal distribution (p-value < 0.05). Because the normal distribution does not emerge for both sets, we used the nonparametric Mann-Whitney (M-W) test for agreement of medians to test for differences between the sets. Other assumptions for the use of this test include independence of the two samples ($n_1 > n_2$), equal shape, and identity of variances [46].

Q1: Which group of probands received a higher score?

H0: The VR group did not score higher on the knowledge test immediately after exposure compared to the 2D group.

H1: The VR group received a higher score on the knowledge test immediately after exposure compared to the 2D group.

The median score for the VR group is 4.5 and the median score for the 2D group is 4. Due to the small sample size of respondents ($n_1 = 19$, $n_2 = 21$), the test criterion value according to the classical procedure for this test was chosen to be $U = 90$, which was compared with the critical value from the table for the Mann-Whitney test ($U0.05(19;21) = 126$). [48] The p-value for the one-sided hypothesis was calculated as 0.00123962. The test criterion is less than the critical value found. H0 is rejected. Statistical evaluation showed a significant difference in the median scores of comparable groups of probands. The probands who used VR for testing have significantly higher scores than the probands who used the 2D form. This result suggests that switching to virtual reality may have an impact on the test results, which may be important when deciding on the preferred form of testing in each context.

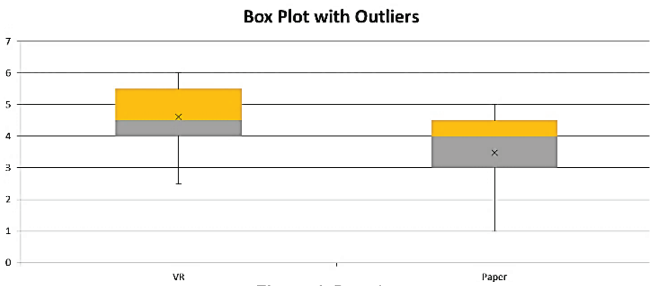

Figure 4 Box plot

A box plot was created as part of the evaluation. It is a graphical tool for displaying data [49]. In this case, the mean, median and quartiles are displayed. If there were outliers, they would also be displayed here.

Q2: Do probands with more VR experience show the best results?

H0: Subjects with higher VR experience do not perform better on the VR knowledge test.

H1: Subjects with higher VR experience show better results in the VR group knowledge test.

The higher VR experience of each proband is specified using a categorical (ordinal) variable (i.e., ordering is possible). Since these are not specific numerical values (i.e., the data do not meet the assumptions of normality), it is not appropriate to use Pearson's correlation coefficient for evaluation purposes, so we used Spearman's correlation coefficient to determine the existence of a relationship. This coefficient is not based on the measured values but on their order. In the calculation, the observed empirical values, which are ranked from lowest to highest, are replaced by their order [46, 50].

The coefficient value was calculated as –0.27377, indicating a possible weak inverse correlation. Due to the low number of respondents (n = 19), this value is not yet statistically significant. The p-value was calculated as 0.25674. H0 is not rejected. It can be concluded that more experience with VR does not yield better results in testing.

Q3: Do PC gamers perform better in VR?

H0: Computer game players do not outperform the VR group on the knowledge test. H1: Computer game players perform better on the VR group knowledge test.

First, the previously created new statistical variable (i.e., gaming scores) was divided into 2 samples. The first sample consists of the total score counts of probands who do not play PC games (i.e., non-gamers) and the second sample consists of probands who play PC games (i.e., gamers). The normality of the data was examined using the S-W test. In this case, the data can be considered as a selection from a normal distribution. The p-value was set as 0.06469 for probands who do not play PC games and 0.1565 for probands who play PC games. In both cases, the p-value is higher than the alpha significance level. For this reason, the F-test for agreement of variances was used, which confirmed a higher p-value (0.86507108) than the alpha level. Thus, the variances are comparable. Therefore, a two-sample t test for agreement of means was used, mainly because of its potential use for sampling smaller ranges [46].

The average was 4.9 for probands who do not play PC games and 4.3 for probands who play PC games. The p-value of the test was set at 0.91625, which is more than the significance level of the alpha. We cannot confirm H0 that gamers have better results. Probands who play PC games do not show better scores than probands who do not play PC games.

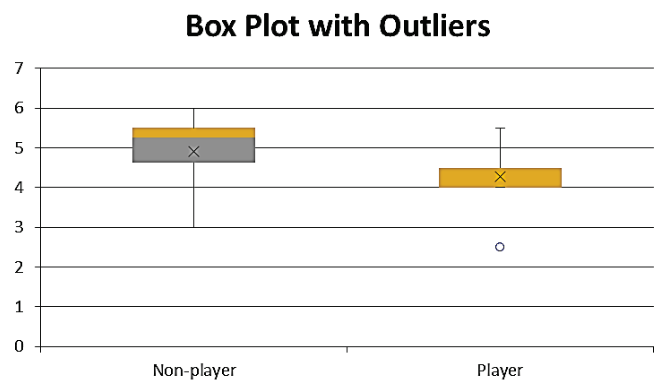

Figure 5 Box plot with Outliers

4 DISCUSSION

The innovation and digitalisation of training has been studied in the past. So has the use of virtual reality in different sectors and phases of training. With our experimental variations, we achieved identical designs - conventional). The research confirmed that the group that underwent VR showed a higher success rate in the final test compared to the 2D group. Similar results were found in the study [39] that looked at the implementation of VR in practical parts of training. Their analysis focuses mostly on the benefits that VR has over standard types of training. Among the main benefits, the authors included hands-on involvement in processes, the possibility of handling expensive or less available tools, and another important perspective is on the user experience and user engagement. VR offers the opportunity to enter an environment that can be more realistic and interactive than traditional training. Users can immerse themselves in situations and environments that would otherwise be inaccessible. This interactivity can lead to higher engagement and better retention of the experience. [28] In terms of learning efficiency and information retention, studies suggest that virtual reality may be more effective than 2D methods. More realistic environments and opportunities for practice and repetition can lead to deeper learning and better retention of information. This can be particularly useful in areas such as medical training, technical practice or safety training where hands-on experience is key [27, 36].

However, there are financial costs to consider, which can be substantial for businesses. Implementing and developing VR can be financially challenging.[27] On the other hand, although the initial costs may be higher, VR can bring long-term savings in training and education. Improved training efficiency and reduced training costs for new employees can provide significant benefits in the long run [35].

The results of our study can be compared with those of [33], where the knowledge gained from a selected process was compared. The probands who were trained by VR performed 28% better in terms of memorisation and number of errors on the selected segment. This research can also be compared with [37], where *a* questionnaire was also found to be a more effective method than traditional training. At the same time, probands received it very positively and considered it to be an innovative training method [40].

Another important element that VR brings is presence and zooming in on dangerous situations. This allows participants to experience dangerous situations without putting their health at risk [31].

Overall, VR is more effective than conventional methods. However, further work could be done to compare memorisation across different time intervals, when probands for a given process would be tested after certain periods of time. This could compare the memorisation of the process with the time elapsed since training [41, 42].

In the context of our study, we use a small number of respondents. Further research would be to expand the number to 100+ respondents for each training area. It would also be useful to explore correlations in age groups and occupational distribution.

5 CONCLUSION

The education system has evolved over the centuries, and it has always adapted to available technologies and the needs of students. We are now on the threshold of further exciting developments, and it is the duty of researchers, educators and teachers to embrace and prepare for them. The generation that are just beginning their education have been online all their lives. The digital world is as important and immersive as the real one. Educating Generation Z is challenging and requires a very different approach to maximise its effectiveness and engagement.

There are many benefits to using VR technology in education. First, VR provides superior visualisation that cannot be obtained in a traditional classroom. It reflects a world in which the younger generation feels comfortable. It is inclusive and allows everyone to participate in the learning process. It provides virtually unlimited access to information. Modern technology used for training increases participation and stimulates collaboration and engagement. It is used for highly effective blended learning, encouraging self-study and individual pursuit of knowledge. Another advantage is the active involvement of users in the training itself. Through interactions, the users' knowledge of the process can be built more effectively. An important aspect is the simulation of risky and dangerous processes, where users can try out the correct safety procedures without putting their lives in danger.

Although the use of modern technology in the educational environment is clearly beneficial, it is not without risks and dangers. One of the main problems is the lack of flexibility. During traditional training, students can ask questions, receive answers, and participate in this discussion. Using a virtual reality headset with specific software, students must follow the rules and cannot do anything other than what is pre-set. In addition, too much focus on digital learning solutions could upset the balance between teaching hard and soft skills.

Therefore, it is essential to find the right balance between traditional training and the use of VR to avoid eliminating the benefits of both methods. Although at first glance VR seems like the right method for future training, the human contact factor must not be forgotten. There are just some parts of training that are better for people if they include the human factor, personal contact and the opportunity to ask for more information. As mentioned in several studies it is effective to supplement standard training methods with different VR components.

The conclusion of this study clearly points to the superiority of VR training as a more effective training tool. However, for such a conclusion, a more detailed study on a larger sample of probands through different psycho-graphical segmentations would be needed. Moreover, VT is not perfect; it is most suitable for teaching procedures and activities that can be algorithmized. Research suggests that through VR it is possible to achieve not only higher levels of participant engagement but also improved memorisation of the material presented. This important factor, which highlights VR's ability to transfer information and skills with greater efficiency, has major implications for the effectiveness of training and education. At the same time, the results of this study motivate further research. One possibility is to extend this type of training to more areas. Where the applications would be focused on processes other than just handling sharp objects. There is currently research being done at our university on the long-term memorization of these training methods. This research is working with a larger sample of probands. Possible future studies could further explore the specific mechanisms behind VR's success in training and identify strategies to maximise its potential. Beyond this, further research could focus on the long-term impacts of VR training, including the lasting memorisation of the knowledge and skills acquired compared to traditional methods.

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Informed Consent Statement

Informed consent was obtained from all the subjects involved in the study.

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