


ANALYSIS OF THE FEASIBILITY OF IMMERSIVE VIRTUALIZATION IN TECHNICAL TRAINING

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ARTICLE INFO	ABSTRACT
<p>Article history:</p> <p>Received 31 January 2023</p> <p>Accepted 27 March 2023</p>	<p>Goal: propose a method of training in regulatory standards using immersive virtualization, aiming at improving student knowledge retention compared to traditional online models.</p> <p>Theoretical Reference: use of literature through research on similar methods already applied in immersive training, dissertations, articles and national standards.</p>
<p>Keywords:</p> <p>Regulatory Norms; Digitization; Immersion; Virtualization.</p> <div data-bbox="172 952 480 1198" style="text-align: center;">  </div>	<p>Method: practical application of training in an immersive environment in two large industries located in the metropolitan region of Curitiba, PR, where the evaluated ones completed an evaluation questionnaire according to their degree of satisfaction, which is the main parameter used in this work to prove the efficiency of the method.</p> <p>Results and conclusion: the practical application of immersive training, compilation of data and analysis of results confirm the viability proposed in the method. As the country develops technologically, the method will have its applicability increasingly accessible and proven.</p> <p>Research implications: a method of technological training developed as an alternative to the current molds, will certainly bring great contributions to the academy, and, at the same time, with the reduction of machine downtime, displacements, logistical costs and agglomerations, this work will bring contributions to the industry.</p> <p>Originality/Value: with the advent of the covid-19 pandemic experienced in recent times, traditional methods of professional training needed to be quickly adapted, aiming to minimize the impact caused by the restriction of physical contact between people. The proposed method provides the possibility of maintaining professional training processes, offering society the possibility of being trained effectively.</p> <p>Doi: https://doi.org/10.26668/businessreview/2023.v8i4.1815</p>

ANÁLISE DA VIABILIDADE DA VIRTUALIZAÇÃO IMERSIVA EM TREINAMENTOS TÉCNICOS

RESUMO

Objetivo: propor um método de capacitação em normas regulamentadoras utilizando a virtualização imersiva, visando a melhora da retenção do conhecimento do aluno se comparada aos modelos *online* tradicionais.

Referencial teórico: utilização da literatura por meio de pesquisas de métodos similares já aplicados em treinamentos imersivos, dissertações, artigos e normas nacionais.

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Método: aplicação prática do treinamento em ambiente imersivo em duas indústrias de grande porte localizadas na região metropolitana de Curitiba, PR, onde os avaliados preencheram um questionário de avaliação de acordo com o seu grau de satisfação, sendo este o principal parâmetro utilizado neste trabalho para comprovar a eficiência do método.

Resultados e conclusão: a aplicação prática do treinamento imersivo, compilação dos dados e análise dos resultados, confirmam a viabilidade proposta no método. À medida que o país se desenvolve tecnologicamente, o método terá sua aplicabilidade cada vez mais acessível e comprovada.

Implicações da pesquisa: um método de capacitação tecnológico desenvolvido como alternativa aos moldes atuais, certamente trará grandes contribuições para a academia, e, ao mesmo tempo, com a redução do tempo de parada de máquinas, deslocamentos, custos logísticos e aglomerações, trarão contribuições deste trabalho para a indústria.

Originalidade/valor: com o advento da pandemia por covid-19 vivenciada nos últimos tempos, os métodos tradicionais de capacitação profissional precisaram ser rapidamente adaptados, visando minimizar o impacto causado pela restrição de contato físico entre as pessoas. O método proposto proporciona a possibilidade do manutenção dos processos de capacitação profissional, oferecendo à sociedade a possibilidade de ser capacitada de modo eficaz.

Palavras-chave: Normas Regulamentadoras, Digitalização, Imersão, Virtualização.

ANÁLISIS DE LA VIABILIDAD DE LA VIRTUALIZACIÓN INMERSIVA EN LA FORMACIÓN TÉCNICA

RESUMEN

Objetivo: proponer un método para la formación en normas reglamentarias utilizando la virtualización inmersiva, con el objetivo de mejorar la retención de conocimientos de los estudiantes en comparación con los modelos tradicionales en línea.

Marco teórico: utilización de la literatura a través de la investigación sobre métodos similares ya aplicados en la formación inmersiva, disertaciones, artículos y normas nacionales.

Método: aplicación práctica de la capacitación en ambiente inmersivo en dos grandes industrias localizadas en el área metropolitana de Curitiba, PR, donde los evaluados rellenan un cuestionario de evaluación según su grado de satisfacción, siendo este el principal parámetro utilizado en este trabajo para comprobar la eficiencia del método.

Resultados y conclusión: la aplicación práctica del entrenamiento inmersivo, la compilación de datos y el análisis de los resultados, confirman la viabilidad propuesta en el método. A medida que el país se desarrolle tecnológicamente, el método tendrá su aplicabilidad cada vez más accesible y comprobada.

Implicancias de la investigación: un método de capacitación tecnológica desarrollado como alternativa a los moldes actuales ciertamente traerá grandes contribuciones a la academia y, al mismo tiempo, con la reducción de paradas de máquinas, desplazamientos, costos logísticos y aglomeraciones, este trabajo traerá contribuciones a la industria.

Originalidad/valor: con el advenimiento de la pandemia de covid-19 experimentada en los últimos tiempos, los métodos tradicionales de formación profesional necesitaron ser rápidamente adaptados, con el objetivo de minimizar el impacto causado por la restricción del contacto físico entre las personas. El método propuesto proporciona la posibilidad de mantener los procesos de formación profesional, ofreciendo a la sociedad la posibilidad de formarse eficazmente.

Palabras clave: Normas Reguladoras, Digitalización, Inmersión, Virtualización.

INTRODUCTION

The need for educational training has always been and always will be latent all over the world. Specifically, training in regulatory norms, a legal requirement in Brazil, is what makes it possible to present the worker with the dangers and risks present in a given situation, making it possible, through actions, procedures and attitudes, to act preventively, avoiding the

occurrence of accidents at work, widely disseminated themes in training areas related to work safety in technical, higher education or specialization courses.

For Zheng and Chook (2019), safety training is essential to perform risky work. With the Covid-19 pandemic event, face-to-face training was severely impacted, as meetings with employees were temporarily removed from corporate calendars. A new standard that, in most organizations, is already and will continue to be a new concept for training, that is, to eliminate or reduce face-to-face exposure as much as possible. The use of digital platforms in the execution of remote training, where some such as Teams, Skype, Zoom, Google Meet, among others, can be mentioned, had an exponential growth never seen before.

The pandemic intensified the use of previously unexplored technological resources, which also meant a challenge in the educational environment for instructors and students, having to quickly adapt to the new standard.

Souto and Albuquerque (2015) state that work safety requires innovation focused on behavior and it is necessary to understand whether the worker is able to perceive the risks of the environment in which he works.

Torreilhas et al. (2019), reinforces that full knowledge of the activities carried out throughout the student's journey, through a good training process, helps to identify the occupational risks inherent in them, adding mastery in the face of the possible conditions that he will face when he becomes involved encounter real situations in the work environment.

The absorption of content and retention of knowledge by the student, aiming at reducing the number of accidents at work, are the great challenges of a training process. With this, the proposal to use technology in the educational field, aimed at training in the area of work safety, compares the effectiveness of the new method with current online models.

According to Braz, Catapan and Rebeyka (2022), the proposed method using technology to train people, due to its flexibility, can be used from anywhere, at any time, in a fully immersive environment, amplifying knowledge retention on the part of from the students.

In this sense, the objective of this article is to present the results obtained in a regulatory standard formation process in two industries, using immersive virtualization, proving its effectiveness in retaining knowledge, trends and points of attention.

THEORETICAL FRAMEWORK

Work safety legislation preliminarily forms the theoretical framework and will provide the necessary foundation that will demonstrate the need and obligation to comply with Brazilian legislation. Next, technology will be presented as a strong ally in people's training processes, including them in training processes, even in times of a pandemic.

METHOD

The methodology used to compose the state of the art of this article is based on scientific articles, technical reports by experts in the field, dissertations and national standards.

The review focuses mainly on the concept of digitization, immersion, virtualization and training using technology as a basis for industrial applications, using the Scopus and Web of Science platforms as the main sources of data collection.

The works used in the research considered articles published in different countries, and that relate to online training using conventional methods and also using technology. In more technologically developed cultures, such as in some countries in Europe and Asia, immersive virtualization is widely used in several sectors, in addition to the training area, and can now be considered a reality, not a trend.

In this way, it is observed that the theme presented in the article comes against a global trend, proven through the extensive research of articles published worldwide.

The training method proposed in regulatory standards using technology as an ally requires a well-defined and clear workflow. In order to propose a remote immersive training method, measure its effectiveness through comparisons with conventional digital platforms through scientific research, in addition to proving the trend of online training that has emerged in a pandemic scenario, some work steps need to be presented.

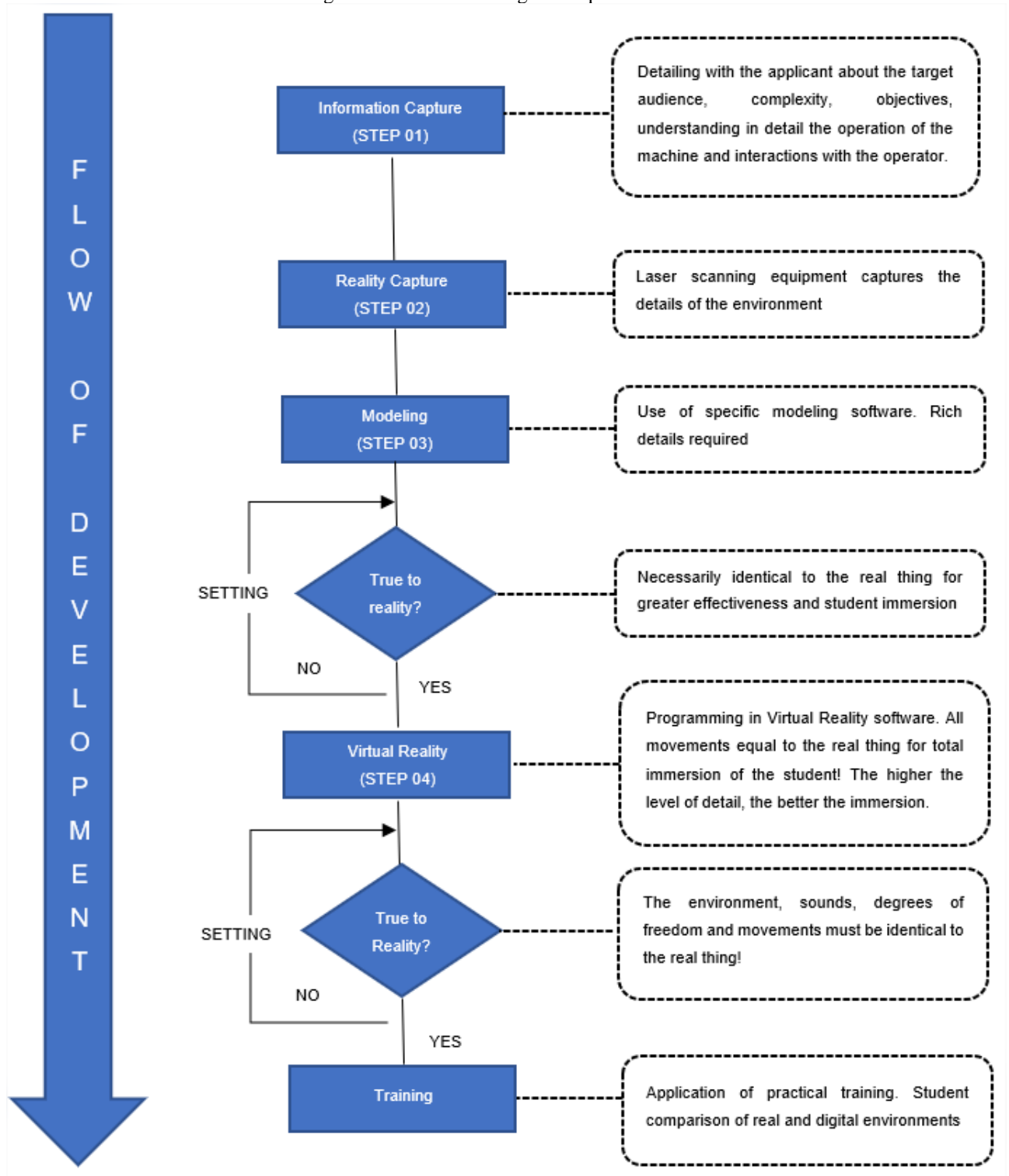
In the development of the methodological proposal, the details of each step necessary for the correct application of the proposed method are observed. All are fundamental within the development flow, which ensures a quality immersion on the part of the student, aiming to amplify their learning. It should be noted that technical knowledge of regulatory standards on the part of the instructor is essential.

The great differential of the proposed method is to reconcile the technical knowledge of the instructor with the possibility of practical simulations using immersive virtualization. These are different but complementary questions. Only the knowledge in regulatory norms or only the knowledge in digitalization and programming, do not satisfy the satisfactory condition of the

method. The maximization of learning occurs precisely through the combination of technical knowledge combined with the use of technological resources.

For a better understanding, figure 1 shows a workflow for the proposed method, showing the work steps complemented with important observations of each phase.

Figure 1. Flow for training development.



Practical Application of the Proposed Method

The practical application of training in an immersive environment was developed in two large industries located in the metropolitan region of Curitiba, PR, belonging to the same group.

The companies are national leaders in the manufacture of fiberglass artifacts and composite materials, used in the manufacture of poles, ducts and pipes that require great mechanical resistance and durability, currently having around 400 direct employees.

Employees from the production and maintenance sectors participated in immersive interactions in order to compare the training previously given in a conventional online way.

According to Braz (2022), after completing each training, the student filled out an evaluation questionnaire with 26 questions, with strategic questions aimed at their degree of satisfaction and applicability of the technology, these being the main parameters used in this work to prove the efficiency of the method.

The research to evaluate the method was carried out with a population of 44 people, in order to evaluate relevant points of the proposed method, which can be observed in Appendix A.

For reasons of confidentiality and because they are going through a work inspection process, the companies requested that they not be featured in this work, as well as names or images of employees, and also suppressing any logo on the uniforms that could identify the evaluated companies.

Figure 2 shows the environment used to carry out the practical part of training at height (NR-35).

The environment was chosen by the company because it is most used by the operational team for process maneuvers, with the greatest need for skilled labor in activities of this nature.

Figure 2. Area of the company used for training at height.



The teams of workers in the production and maintenance sectors have already gone through the mandatory training process in regulatory standard 35 (NR-35) in 2022 in the traditional online model, and can then experience the practical part with the use of immersive virtualization, specifically in November 2022, comparing the methods.

Figure 3 shows images of the point clouds generated from the installation site, used for immersion in regulatory standard 35 (NR-35).

Figure 3. Point cloud environment obtained through laser scanning.



Figure 4 shows several images of some of the company's employees being trained in a practice in an immersive environment. The practices were applied to the maintenance and production teams and to some people in the administrative and management sector.

Collaborators were able to compare the immersive method with the conventional method. All students demonstrated a high receptivity for the experience during the use of immersion equipment.

Figure 4. Immersive hands-on training being delivered to students.



The applied practical training was carried out in the two units of the group, located at the same address, but in different barracks.

RESULTS AND DISCUSSIONS

Several graphs compiling responses on each question answered can be observed in order to understand the applicability, trend, strengths, satisfaction, difficulties and points to improve, of the proposed method.

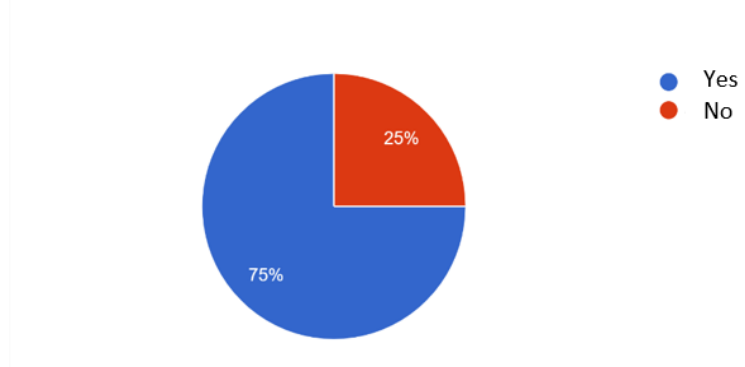
The assessed population was 44 people, during the month of November 2022. All users actively participated in the experience, recording their responses in the applied questionnaire.

Questions 1 to 4 will be left out of this analysis, as they are just personal information such as name, company and contacts. Only the graphs with the most relevant questions and answers for validating the proposed method will be presented in this work.

Figure 5, referring to question 5 of the questionnaire, shows that 75% of those evaluated have never undergone immersive virtualization training, which proves the innovation of the proposed method.

Only 25% of respondents had some kind of contact with technology, however, according to reports, CIPA (Internal Commission for Accident Prevention) training, and no approach in an industrial environment.

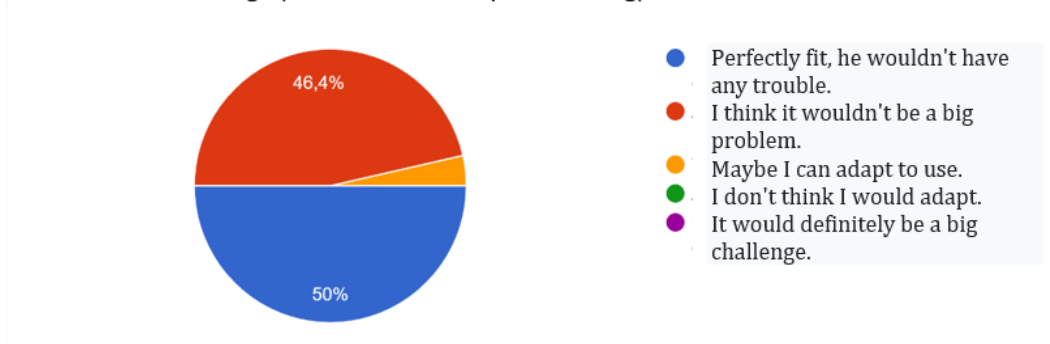
Figure 5. Result referring to contact with technology in training.
5. Have you had any immersive virtualization training?



It is evident that it is an innovation, as the vast majority have never had an immersive virtualization experience and, the minority that has already had contact, was not related to something similar to what was proposed.

In figure 6, referring to question 7 of the questionnaire, a positive point is observed, however, not expected. Almost all of the interviewees answered that they have no, or almost no difficulty in operating the system's manual controls (joysticks).

Figure 6. Result referring to the difficulty of operating the system.
7. Do you consider yourself able to learn and use virtual reality controls during immersive virtualization training? (About its difficulty in handling).



This reported index was not what was expected at the beginning of the development of the research, since, as it is a novelty, a greater number of people with difficulties in handling and operating the system was expected.

The “gamification” increasingly present in homes may have contributed to this index, as it is similar in parts to the system used in training.

This “surprise” can be seen as a “good surprise”, as it would not be a blocking factor in the implementation of an equivalent immersive system for training in the educational area.

The main focus of this research is actually proving the increased effectiveness of training using immersive virtualization, when compared to traditional online platforms, analyzing, mainly, the acceptance of the surveyed population.

In figure 7, referring to question 8 of the questionnaire, in general, it is observed that more than 85% of respondents say that understanding was greater using immersive virtualization compared to traditional online templates, in this case, the Zoom and Teams, for example.

Along the same lines, it is observed that more than 90% of respondents still state that for training in confined spaces and work at height, immersive virtualization contributes to greater assertiveness, as shown in figure 8, referring to question 10 of the questionnaire applied.

Figure 7. Result referring to the understanding of the content using immersion 8. Compared to platforms online (ZOOM/TEAMS) do you think the training in immersive virtualization provided a greater understanding of the applied content?

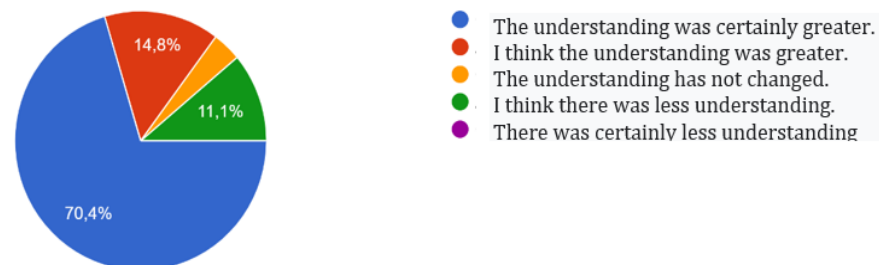


Figure 8. Result of assertiveness using immersion. 10. Do you believe that immersive training contributes to greater assertiveness and understanding in working at heights and in confined spaces, for example?



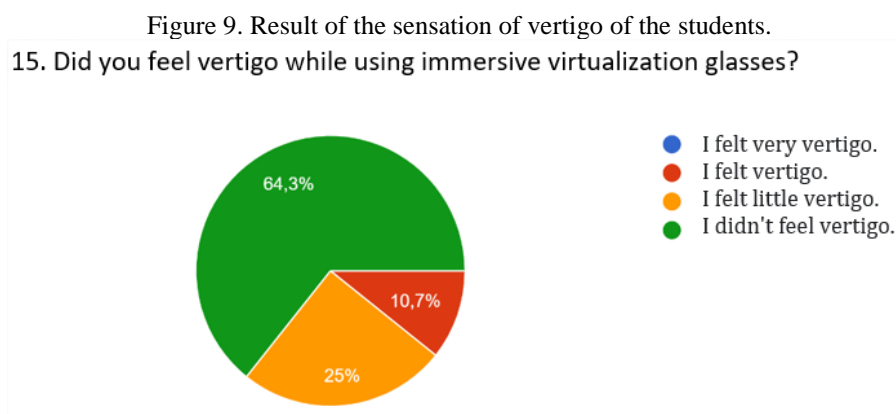
In the analysis of the results of the two graphs presented, it is evident that immersive virtualization, both in different training and in specific training of regulatory standards, such as those mentioned, when compared to conventional online models, stands out in terms of assertiveness and understanding on the part of the student, which proves that the method is effective for this population.

This proof of the large difference in the percentage of people who have already gone through practical training, compared to virtualization, was already expected at the beginning of the work, as the method is innovative.

Another factor of great relevance for the study and feasibility of the proposed method would be the possibility of vertigo in students during the application of immersion in the environment.

To carry out the practical part of the training in regulatory standard 35 (NR-35), the student is placed in situations that offer a feeling very similar to the real condition, that is, he observes the virtual environment as if he were actually in the same environment physicist. The richness of details of the proposed method offers a differentiated experience. It is not just a prepared environment, but exactly the same environment to which the student is used to developing their daily operating routines.

The student's comparison between the environment he is used to and the immersive environment is the method's great differential. Figure 9, referring to question 15 of the questionnaire, presents the results related to vertigo during training.



It is observed that 64% of those surveyed reported that they did not feel vertigo during the application of the method. Another 35% reported that they felt a certain type of vertigo, in different degrees, however, they did. This is an extremely relevant factor for the method, as it

can become an impediment for some companies. The analysis of a lower degree of immersion can be evaluated on a case-by-case basis.

In figure 10 and figure 11, questions 16 and 17 of the questionnaire, respectively, the issue of dispersion was analyzed.

The use of cell phones, messages, conversations, movements, among other factors, certainly affect the student's concentration during training. This dispersion factor had a significant increase with the evolution of smartphone technology.

The vast majority of the Brazilian population, and even the world population, has a cell phone that, in addition to its main use as a telephone, has functions such as games, emails, social network accounts, weather, movies and endless applications with the most diverse purposes, thus enhancing the dispersion factor.

In training both in the conventional online modality and in the face-to-face modality, dispersion can be considered a problem for learning retention.

The comparison of the distraction factor using the online platforms Zoom and Teams were compared with the use of the proposed method, with the results presented below.

Figure 10. Result of the dispersion factor analysis.

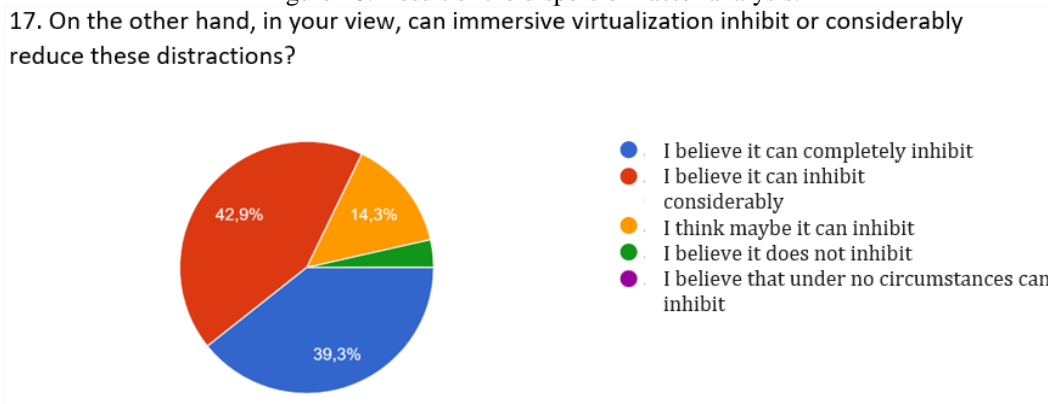
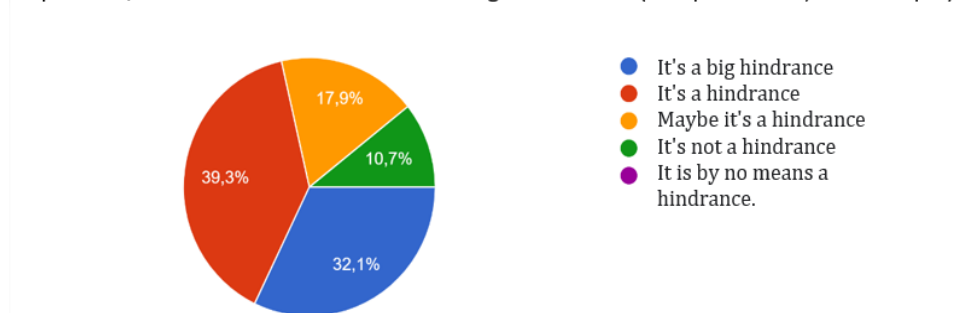


Figure 11. Result of the distraction factor of the students.

16. In your opinion, in training carried out on conventional platforms (ZOOM/TEAMS), are dispersion /distraction obstacles to knowledge retention? (Cell phone use, for example)



It is observed in the graphs presented that only 10% of the evaluated population considers that distraction is not an obstacle in the retention of knowledge, however, practically 90% of the interviewees consider that, at some level, this factor is a problem in learning.

In the same way, over 97% of respondents agree that the proposed method of immersive virtualization can inhibit such distractions. This indicator is extremely important for the viability of the method, because when the student is in a totally immersive environment, he is currently using virtual reality glasses, not being able to see around, be distracted by movements, operate his phone cell phone, among several other factors that would cause their dispersion. It is completely focused and directed towards the immersive experience, enhancing, even if unconsciously, your learning.

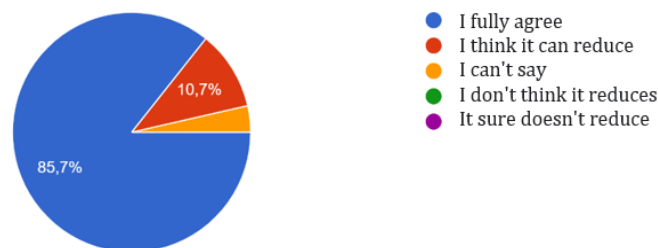
The risk factor for accidents was also evaluated in the survey. It is not uncommon for us to learn about the occurrence of accidents with students during the application of practical training. Specifically in the training applied and developed to validate the method, training for work at heights is high-risk training. Exposing the student at a certain time can already be considered a risk factor. Several people even imagine that they suffer or may suffer a panic attack, for example, when exposed to a risky situation. In this case, they should be placed in an environment with a height greater than which they are not used to.

The proposed method, due to its richness of detail and high degree of immersion, provides the student with the sensation of height, however, in a controlled environment, with total safety. In case of detection of a possible crisis by the student, then the maximum degree of result of the proposed method is achieved: The preventive action, guaranteeing that that student would not be able to be exposed in a real condition of height!

In figure 12, question 25 of the applied questionnaire, the analysis of the risk factor by the students is observed, when submitted to height.

Figure 12. Result of risk reduction analysis.

25. Regarding the risks: Do you agree that immersive virtualization can reduce the incidence of accidents during training? (Level drop, for example).

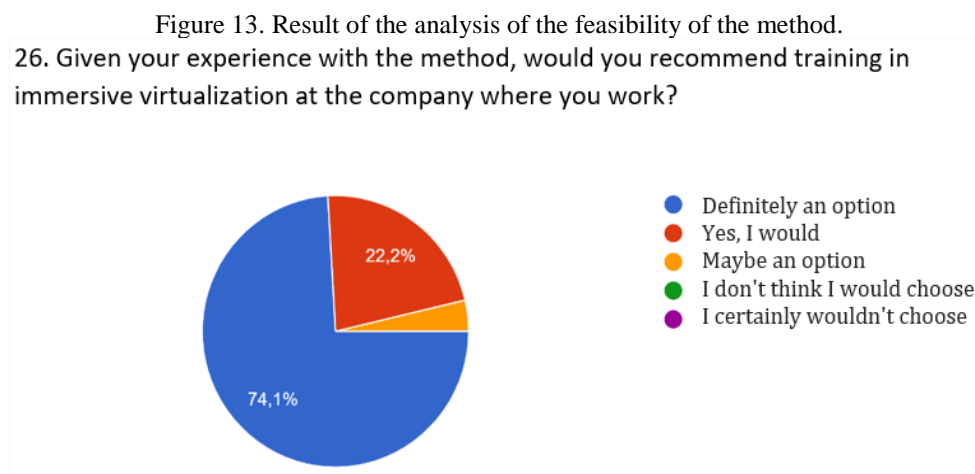


About the total number of students who performed the experience at height in an immersive environment, more than 96% agree that the use of the proposed method can reduce the incidence of accidents during training. None of the interviewees responded to the contrary. This factor proves that the method, in addition to expanding knowledge retention, described above, also contributes to eliminating the risk of accidents during training. The benefit of being able to make mistakes, simulate and test without causing any real negative impact is fundamental.

And, finalizing the analysis of the proposed method, in addition to the technical issues analyzed, the possibility of application in the respective companies is also a relevant item.

It would be of no use for the method to be well evaluated by the students, if it did not have the perspective of practical application in companies.

Figure 13, question 26 of the questionnaire, presents the analysis of the students' answers regarding this question.



Of the total number of students who answered to the questionnaire, more than 96% of those interviewed answered that yes, they would recommend the use of immersive virtualization in their companies for training.

This positive factor is fundamental for the development of more and more immersive methods, range of applications and norms in the training process in companies and educational institutions.

FINAL CONSIDERATIONS

In this article, a new method of training in regulatory norms is proposed and evaluated, using the digitalization of environments, which in turn, uses state-of-the-art technology such as

laser scanning and virtual reality for the complete development and application of these trainings.

The contribution of this work is mainly in the following aspects: (1) Ensure compliance with regulatory standards in terms of training, using immersion technology. (2) Present the possibility of using immersive technology also in the training area, detaching the understanding of applications only in applied engineering. (3) Technologically “work around” some restrictions imposed by the pandemic factor, such as crowds in face-to-face training. (4) Present the possibility of carrying out virtual training with total immersion, quality and retention of knowledge, replacing mere “slides” presentations or simultaneous online transmissions. (5) Show a new training format, in line with the technological evolution the world is going through. (6) Prove that knowledge retention is greater using the method, when compared to traditional models. (7) Prove that the proposed method reduces almost entirely the dispersion caused by external agents, such as cell phones and conversations, when compared to traditional methods. (8) Prove that the modality reduces the risk of accidents compared to the practical method of instruction. (9) Prove that the vast majority of the surveyed public would choose to use immersive virtualization in training, which shows that the method is promising.

The practical application of immersive training, compilation of data and analysis of results confirm the viability proposed in the method. As the country develops technologically, the method will have its applicability increasingly accessible and proven.

REFERENCES

Birt, James; Vasilevski, Nikolche. Comparison of Single and Multiuser Immersive Mobile Virtual Reality Usability in Construction Education. *Educational Technology and Society*, vol. 24, no. 2, p. 93–106, 2021. Available at: <<https://www.scopus.com/inward/record.uri?eid=2-s2.0-85104000685&partnerID=40&md5=836ca2dae807f23d35ef2b3b16e98e>>.

Braz, Silvio Marcos; Catapan, Márcio Fontana; Rebeyka, Claudimir José. (2022). Regulatory standards training using immersive virtualization. *Revista Foco*, v.15, n.4, e0476, p.01-18, 2022, doi: 10.54751/revistafoco.v15n4-012.

Braz, Silvio Marcos. (2022). Method of training in regulatory standards using virtual reality. Thesis (Master's degree). Graduate Program in Manufacturing Engineering, Federal University of Paraná, Curitiba, PR, Brazil.

Dalgarno, Barney; Lee, Mark. What are the learning affordances of 3-D virtual environments? *British Journal of Educational Technology*, v. 41, no. 1, p.10-32. 2010.

Scuisato, Dione Aparecida. Media in education: A proposal to enhance and streamline teaching practice with the use of virtual environments for collective and collaborative learning. Available at: <http://www.diaadiaeducacao.pr.gov.br/portals/pde/arquivos/2500-8.pdf>.

Sherman, William; Craig, Alan. Understanding virtual reality: interface, application, and design. San Francisco: Elsevier, 2003.

Souto, Clodovaldo Nogueira; Albuquerque, Gerson Luis. Perception of risk: an innovative and participatory approach in the electricity sector. Scientific Technical Congress of Engineering and Agronomy, CONTECC 2015. Available at: http://www.confex.org.br/media/Eletricista_percepcao_de_risco_uma_responsabilidade_inovadora_e_participativa_no_setor_eletrico.pdf.

Torrecilhas, Arthur Ribeiro; Sella, Márcio Ronald; Carraro Flavio Augusto; Frias, Juliana. Improvement of the Preliminary Risk Analysis (APR) integrated to the Ishikawa Diagram for risk prevention in operational procedures in civil construction: application of the APRi tool in a sanitation work in the pipeline laying process. In: ENEGEP 2019 National Meeting of Production Engineering, 2019, SANTOS/SP - BRAZIL, 2019. v. 39. DOI.org (Crossref), doi:10.14488/ENEGEP2019_TN_WPG_297_1679_38441.

Zheng, Hong Sim; Chook, Yvonne; Hakim, Muhammad Amir; Lim, Woan. "Design of Virtual Reality Simulation-based Safety Training Workshop," 2019. IEEE International Symposium on Haptic, Audio and Visual Environments and Games (HAVE), 2019, pp. 1-6, doi: 10.1109/HAVE.2019.8921366.

APPENDIX

Appendix A - Immersive Virtualization Training Evaluation Questionnaire

1. What is your name?
2. Company you work for?
3. Email?
4. Telephone for contact?
5. Have you had any immersive virtualization training?
6. What about practical training? Have you ever done it?
7. Do you consider yourself able to learn and use virtual reality controls during immersive virtualization training? (About its difficulty in handling).
8. Compared to platforms online (ZOOM/TEAMS) do you think the training in immersive virtualization provided a greater understanding of the applied content?
9. About traditional hands-on training: Do you think they provide a greater understanding of the content compared to those carried out on platforms such as ZOOM and TEAMS?
10. Do you believe that immersive training contributes to greater assertiveness and understanding in working at heights and in confined spaces, for example?
11. Would you hire or recommend regulatory training on immersive virtualization for your company?
12. Is your company open to implementing new technologies, such as immersive virtualization training?
13. Does your company invest in training frequently?
14. Do you agree that a training project in immersive virtualization provides great financial savings for the company in the medium term?
15. Did you feel vertigo while using immersive virtualization glasses?
16. In your opinion, in training carried out on conventional platforms (ZOOM/TEAMS), are dispersion /distraction obstacles to knowledge retention? (Cell phone use, for example)
17. On the other hand, in your view, can immersive virtualization inhibit or considerably reduce these distractions?
18. Can the possibility of simulating actions/situations in immersive virtualization provide a more careful/technical evaluation at the end of the training? (Comparing with traditional assessments)
19. Hands-on training provided by immersive virtualization encourages more behavioral change compared to training on platforms online (ZOOM/TEAMS...)?

20. Now about the practical face-to-face training: Do you believe that they can stimulate more behavioral change compared to training in immersive virtualization?
21. Immersive virtualization enables more comprehensive training compared to those performed on platforms online traditional?
22. Can feedbacks from immersive virtualization training generate more accurate reports on deficiencies in a company's employees?
23. In your opinion, solving doubts in immersive virtualization is easier and more objective compared to platforms online conventional (ZOOM/TEAMS)?
24. Now about the hands-on practical training: Is the solution of doubts easier and more objective compared to training in immersive virtualization?
25. Regarding the risks: Do you agree that immersive virtualization can reduce the incidence of accidents during training? (Level drop, for example).
26. Given your experience with the method, would you recommend training in immersive virtualization at the company where you work?