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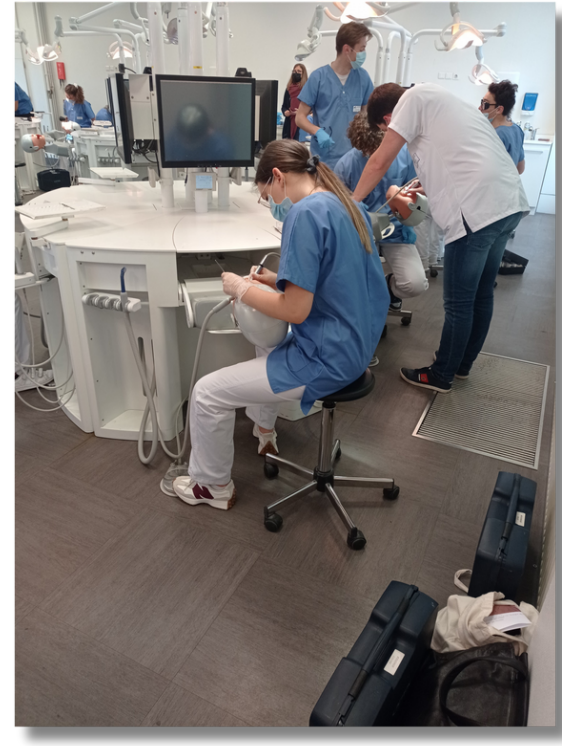
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Contributions, use and appropriation of a virtual environment for learning to perform dental procedures

A.

Introduction

Simulation has long been an integral part of training, particularly for the acquisition of technical skills. Industry, crafts, aeronautics, health, etc..., many sectors are concerned. In dental training (dental surgeons), students learn professional gestures on mannequin heads called "phantoms". In the last few years, the introduction of virtual reality simulation has been a significant development in dentistry training programmes.



Student exercising on a dental phantom

C.

The thesis

The thesis presented is in Information and Communication Sciences. In fact, we are interested in the discourse and practices of the stakeholders in order to determine the potential or actual uses of the technologies. The objectives are to study the contribution of virtual reality to the learning of the dental gesture, the use of a specialized VR environment by students and teachers, the potential transformations engendered on the circulation of knowledge within a teaching-learning situation, and more broadly the integration of the simulator into training. Virtual reality is a "scientific and technical field that uses computer and behavioural interfaces to simulate the behaviour of 3D entities in a virtual world, interacting in real time with each other and with one or more users in pseudo-natural immersion via sensory-motor channels" Fuchs, Moreau, Berthoz and Vercher (2006, p.8) [1]. It can be made up of various pieces of equipment, making it a "multi-instrumental" technical device (Loison et al, 2023) [2]. The immersion and interaction induced by the use of virtual reality can therefore have an impact on its use and appropriation by stakeholders.



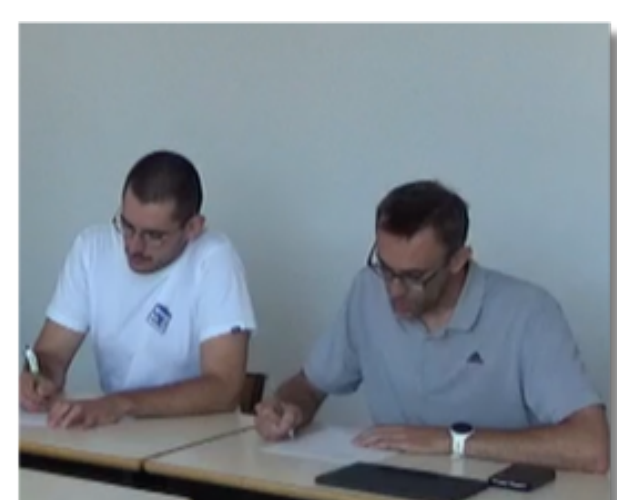
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PhD student

D.

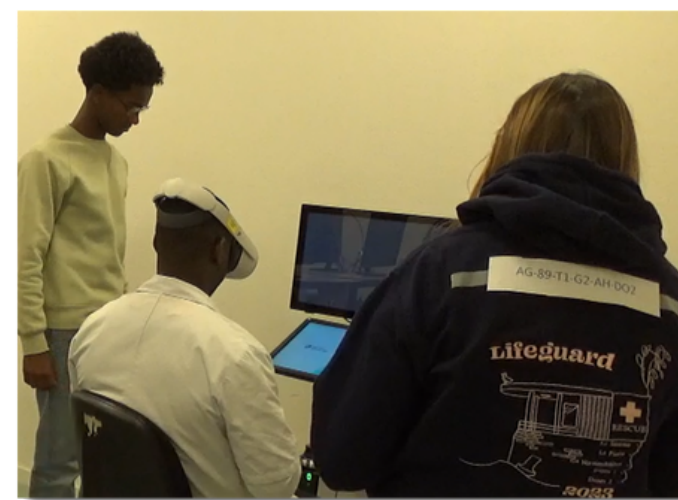
Methodology



Semi-directive interviews or focus groups



self-administered questionnaires



Filmed observations in teaching-learning situations

In the context of this complex study situation, we opted for a mixed method consisting of qualitative surveys using semi-directive interviews or focus groups, and quantitative surveys using self-administered questionnaires and filmed observations in teaching-learning situations. The questionnaires were constructed using the "Tam_INJ" instrumental acceptance scale applied to ICT (Caron, Heutte, 2017) [3]. Exploratory studies were carried out during the first year of the thesis with students and teachers to evaluate their feelings and feedback on 1) the transition from "conventional" simulation on a phantom to simulation using virtual reality 2) the use of the simulator with and without a headset. A longitudinal study is currently being carried out with students and teachers using various protocols and organised into different phases: T0: Surveys on perceptions of virtual reality T1: Surveys on feelings and feedback on the use of the Virteasy simulator after one or two sessions T2: Surveys of feelings and feedback on the use of the Virteasy simulator after several sessions.

E.

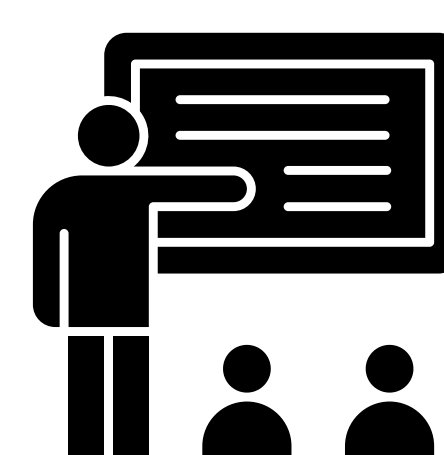
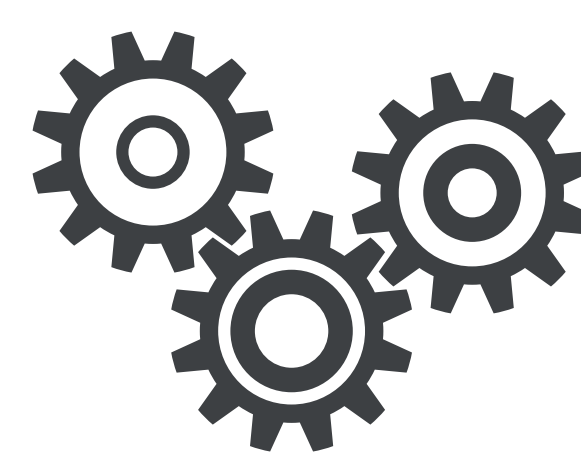
Initial leads

Through the various surveys, we can see that the use of the simulator is perceived positively by students and teachers and is considered useful for learning the drilling gesture and as a contribution to current training in dentistry.

Analysis of the data suggests a number of areas for improvements:

- technical and functional improvements to the Virteasy Dental simulator. These concern the essential elements that replicate the dental surgeon's environment (use of the mirror in indirect vision, sensitivity of the haptic arm, visibility of depths, realism of dental textures, adjustment of brightness with the lamp, choice of burs, possibility of using both hands, etc.) but also the acquisition of the expected technical skills (support points, posture, asepsis).
- pedagogical improvements (guided exercises at different levels of autonomy, global approach of the patient, textual and sensory feedback).

With regard specifically to the headset, its use in a teaching-learning situation increases the time taken to launch an exercise (parameter setting, safety perimeter) and can disconnect during exercises, which interferes with the user's experience. It changes the interactions between teacher and student and the user's perception of their body. Around 20% of respondents reported side effects.



F.

Conclusion

We can already see from our results that the use of the virtual reality headset has an impact on the use, appropriation and circulation of information within the teaching-learning situation. We believe that it is preferable, in the teaching sequence, to gradually and successively integrate the different instruments of the simulator, ranging from partial immersion (only haptics) to total immersion (haptics and virtual reality). What's more, the time it takes to get familiar with a new tool, such as the one we are studying, combined with the learning of new skills, must be taken into account as part of the educational and training engineering process. Similarly, the simulator's appropriation by teachers prior to its deployment with students is an essential condition for its integration into the training.



Practical training room with dental students



Student exercising on a dental phantom



Teaching-learning situation
with the Virteasy Dental® simulator



Student practising
on the Virteasy Dental® simulator



References

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