frontiers in Virtual Reality

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Medical students' acceptance of virtual reality for clinical competence development: a technology acceptance model study in Mauritius

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This study investigates the acceptance of Virtual Reality (VR) as an innovative tool for enhancing practical learning in medical education in Mauritius. Developing clinical competence requires hands-on experience; however, students often lack confidence when transitioning from simulated training on dummies and mannequins to real patient interactions. VR-based medical simulation offers immersive, repeatable, and risk-free environments that enable students to practice clinical procedures without compromising patient safety. Medical training in Mauritius is still done through traditional means and students often find themselves struggling to adapt to real life situations in hospitals whereby with the implementation of VR as training medium, their performance can improve. Guided by the Technology Acceptance Model (TAM), this research examines medical students' perceived usefulness, perceived ease of use, and behavioural intention to adopt VR for skill acquisition. The actual use was not taken into consideration since the students were inexperienced in VR and had a single use of the immersive software for the experimental testing. A mixed-methods approach was employed, involving 81 medical students from the University of Mauritius and Sir Seewoosagur Ramgoolam Medical College for a first phase and 11 more for a second phase. Participants engaged with VR headsets and simulation software before completing a structured questionnaire and participating in interviews. Quantitative data were analysed using SmartPLS, while qualitative data were thematically analysed in alignment with TAM constructs. Findings reveal a strong positive inclination toward VR adoption, with perceived usefulness emerging as a key determinant of behavioural intention. However, several implementation barriers were identified, including technological constraints, cost considerations. The study contributes to the growing body of educational technology research by demonstrating the potential of VR to bridge the gap between theoretical instruction and clinical practice, particularly in resource-constrained higher education contexts and demonstrate that VR has the potential to be successfully integrated as a learning medium.

KEYWORDS
higher education in Mauritius, innovative, medical education, VR in education, VR training

1 Introduction

This study aims to explore the use of Virtual Reality in supporting the learning of medical procedures. Virtual Reality (VR) is increasingly being adopted in medical education as an immersive technology capable of simulating complex clinical environments and enhancing experiential learning (Pottle, 2019). By enabling users to interact within computer-generated, three-dimensional environments, VR facilitates the development of transferable clinical skills in a safe and controlled setting. Its application in medical training is particularly significant, as it allows learners to practice procedures repeatedly without posing any risk to patients, thereby addressing longstanding challenges associated with limited access to hands-on training opportunities (Pottle, 2019). According to Kyaw et al. (2019) it was found that VR highly improves the acquisition of skills among health professionals when compared with traditional education.

The disruption caused by the COVID-19 pandemic further highlighted the limitations of traditional medical education in Mauritius, particularly in relation to practical and laboratory-based learning. While many institutions successfully transitioned to online teaching, the delivery of practical training remained constrained due to its inherently physical nature. This has accelerated interest in alternative approaches, such as VR, that can support skill acquisition beyond the confines of physical laboratories.

In Mauritius, practical medical classes were postponed during the long-term school closure of the COVID-19 pandemic even if theoretical classes were being held online and even exams were being carried out online. Indeed, one institution in Mauritius, which had shifted to online learning mode, was the University of Mauritius (UoM). In March 2020, academics were required to use Google Classroom and Moodle to carry their lessons online and UOM through its Centre for Innovative and Lifelong Learning (CILL) has been providing ongoing training to academics on Moodle for over a decade. In 2019, UoM has moved to the Learner Centred Credit System (LCCS) and by August 2019, several training on using Google Classroom, Google Meet and ZOOM were provided to all academics and this has been of a great help and was implemented by March 2020 after the lockdown. In 2021, UOM considered doing online remote class tests as students were not allowed on campus as per the government sanitary measures. For this purpose, several policies were devised and the UOM's rules and regulations pertaining to examination were modified and approved. Online class tests were carried out via Google Meet and the procedures to carry the class tests were communicated to all academic, administrative staff and students.

While VR adoption in medical education has been extensively studied in high-income contexts (e.g., USA, UK, China), limited research examines acceptance factors in small island developing states (SIDS) such as Mauritius, where infrastructure constraints, curriculum centralization, and resource limitations create distinct implementation challenges not captured by existing models. Higher education institutions of the country are increasingly integrating digital technologies, yet, there is limited empirical evidence on the effectiveness and acceptance of VR as a tool for practical medical training. Understanding how students perceive and adopt such technologies is critical for informing sustainable integration strategies.

To address this gap, the present study investigates the use of VR as a complementary tool for enhancing practical learning in medical education within the Mauritian context. Drawing on the Technology Acceptance Model (TAM), the study examines students' perceptions of VR, focusing on perceived usefulness, perceived ease of use, and behavioural intention to adopt the technology for skill acquisition. The research is conducted within two key medical education institutions: the University of Mauritius and the Sir Seewoosagur Ramgoolam Medical College, providing a relevant context for exploring the integration of VR medical software in higher education. It has as aim, to evaluate the potential of Virtual Reality (VR) as a tool to enhance medical practical training in tertiary-level medical education in Mauritius. Specifically, it seeks to examine how VR can complement traditional face-to-face learning by supporting the development of clinical skills in a safe, immersive, and repeatable environment. It assesses specifically student acceptance of this medium of teaching and learning.

The study is guided by the following research questions Figures 1–3:

- What are medical students' perceptions of VR's perceived usefulness (PU) and perceived ease of use (PEU) for clinical skill acquisition?
- How do PU and PEU predict behavioural intention (BI) to adopt VR training among Mauritian medical students?
- What implementation barriers do students identify for VR integration into medical curricula?

2 Literature review

Virtual Reality (VR) enables users to interact within immersive three-dimensional environments that simulate real-world experiences, offering significant potential for experiential learning (Horváth et al., 2023). In educational contexts, particularly in medical training, VR facilitates the visualisation of complex anatomical structures and clinical scenarios, thereby enhancing learners' understanding of otherwise abstract concepts. Supported by advancements in artificial intelligence, VR environments provide adaptive, interactive, and real-time simulations with high ecological validity, contributing to improved learner engagement and motivation (Lege and Bonner, 2020). Furthermore, VR has been shown to foster the development of cognitive, psychomotor, and collaborative skills, while enabling access to learning experiences that are otherwise impractical or inaccessible in traditional settings (Blazauskas et al., 2017; Maricic et al., 2019).

The acceptance of VR by educators as a training medium has been studied by Skvortsova et al. (2025). The researchers explored the acceptability, intention to use, barriers, facilitators, and perceived advantages and disadvantages of incorporating virtual reality (VR) into serious illness communication training and it was found that educators generally held positive attitudes towards its use due to its key advantage, which is its immersive nature, while they also observed that a lack of human interaction would be a disadvantage. The study also mentioned that major barriers to its adoption would be financial constraints and the need for VR training. Similarly, a study conducted by Huang and

Liaw (2018) investigated students' acceptance of virtual reality (VR) learning environments by integrating the Technology Acceptance Model (TAM) with constructivist learning principles. The study measured factors influencing learners' intentions to use VR for educational purposes, including perceived usefulness, perceived ease of use, self-efficacy, interaction, and learning motivation. The results reveal that students are more likely to adopt VR for learning when they perceive it as useful, easy to use, engaging, and supportive of their learning needs (Huang and Liaw, 2018).

Within medical education, several studies have demonstrated the effectiveness of VR as a pedagogical tool. For instance, Lopez et al. (2021) compared VR-based instruction with traditional teaching methods in neuroanatomy and found that students using VR significantly outperformed their peers in spatial understanding, structural relationships, and functional interpretation. These findings highlight the ability of immersive environments to support complex spatial learning, which is often challenging to achieve through conventional lecture-based approaches. Similarly, VR-based simulations have been shown to enhance procedural training by allowing repeated practice in a controlled and risk-free environment, thereby improving skill acquisition and reducing the likelihood of clinical errors (Apell and Hidefjäll, 2022).

The use of immersive technologies in surgical and clinical training further underscores the importance of experiential and cognitive learning processes. VR enables learners to engage in repeated, deliberate practice, which is essential for the development of psychomotor skills and clinical precision. Unlike traditional training environments, which are often constrained by time, resource availability, and patient safety considerations, VR provides unlimited opportunities for practice across diverse clinical scenarios. Empirical evidence suggests that students trained using VR demonstrate improved performance, faster task completion, and better skill transfer in real clinical settings compared to those trained using conventional methods (Apell and Hidefjäll, 2022).

Despite these advantages, existing literature has primarily focused on the effectiveness of VR in enhancing learning outcomes, with comparatively limited attention given to students' acceptance of VR as a learning tool, particularly in Mauritius. While studies have



FIGURE 1
Removal of suture done in guided mode, involving the manipulation of both controllers and good precision. Created with Medical Assisting Clinical Suite Professional.

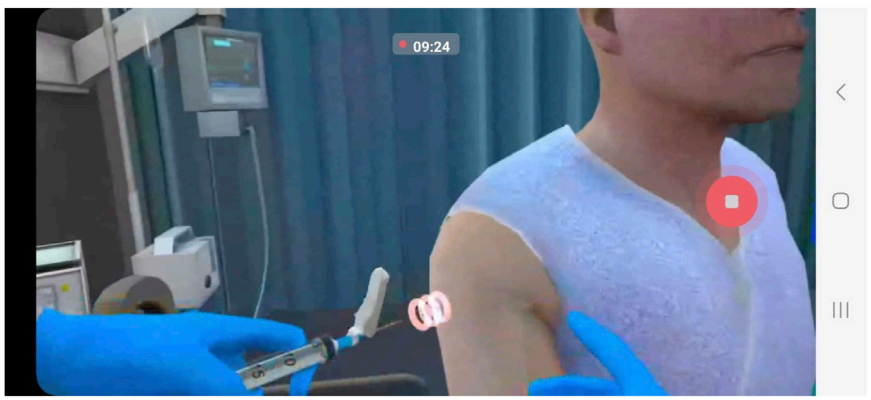

FIGURE 2
Injection procedure, done in guided mode. Created with Medical Assisting Clinical Suite Professional.

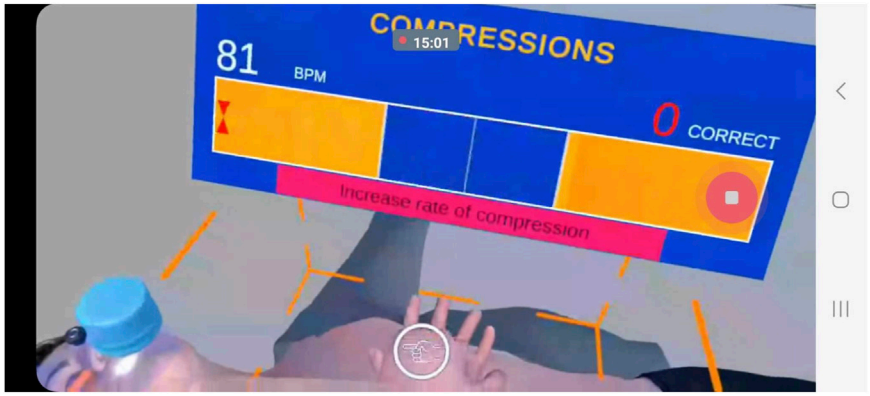

FIGURE 3
Learning to do CPR – Cardiopulmonary resuscitation in guided mode. Created with Medical Assisting Clinical Suite Professional.

acknowledged the importance of usability, engagement, and cognitive impact, fewer have examined how students perceive the usefulness and ease of use of VR technologies, and how these perceptions influence their intention to adopt such tools in medical training.

Hence, this study adopts the Technology Acceptance Model (TAM) to investigate the factors influencing medical students' acceptance of VR in practical learning environments because it provides a simple and well-established framework for examining users' acceptance of new technologies unlike the Unified Theory of Acceptance and Use of Technology (UTAUT), which incorporates multiple determinants and moderating variables. The TAM framework is more suitable for smaller sample sizes and it aligns well with the objectives of this study, which seek to understand students' perceptions and acceptance of VR technology in an educational setting.

By integrating insights from both educational effectiveness and technology adoption perspectives, this research aims to provide a more comprehensive understanding of VR integration in medical education, particularly within emerging and developing educational contexts.

It has been shown that the "advantages of integrating VR technology in education are vast" (Kamińska et al., 2019), including the following:

1. "VR allows for better visualisation of things that cannot be shown in books."
2. "It allows the younger generations to feel comfortable with learning."
3. "It proposes an inclusive aspect for all types of learners."
4. "It allows unlimited time to practice and give unlimited access to information."
5. "VR allows for collaborative learning."
6. "VR goes according to the pace of the learner" (Kamińska et al., 2019).

Used to its full potential, VR technology has transformative aspects capable of promoting innovative teaching methods through immersive learning environments. Indeed, it emerges as a crucial tool for ophthalmic and surgery education. The technology enables students to vividly observe experimental environments and surgical scenarios, facilitating practical learning experiences, contrary to traditional modes of science education which often face challenges such as limited student engagement, high equipment maintenance costs, and safety concerns. VR offers a solution by providing a targeted and immersive learning environment, thereby addressing these issues and improving overall learning outcomes. Since it provides a simulated world with patients, students can immerse themselves in realistic scenarios and learn effectively.

The advantages of VR technology over instructional videos were highlighted by Zhao et al. (2020), including the realistic simulation of clinical scenarios, interactive learning, convenience, and reusability of course content. Their research discussed the growing need for intuitive and novel teaching methods, particularly for contemporary students who seek diverse and engaging information. VR, as demonstrated in a survey among engineering students, evoked positive emotions, with VR teaching tools scoring higher in surprise and excitement compared to traditional methods.

Similarly, because younger generations are highly familiar with digital technologies, it becomes essential to integrate these tools into medical training as VR "allows for a first-person active learning experience through different levels of immersion" (Zhao et al., 2020). The authors found that virtual reality interventions enhanced learners' test scores in comparison with conventional video-based methods. Increased interactivity also contributed to better knowledge acquisition among students. Indeed, "most of the participants in the study reported that the immersive virtual reality methods that were used were easier and made their learning more enjoyable" (Zhao et al., 2020). The researchers also identified a positive relationship between motivation and academic performance, highlighting motivation as a driving force behind successful learning. However, the immersive nature of VR also presented challenges, as some participants found the experience overwhelming. Zhao et al. (2020) noted that "using virtual reality gave students cybersickness, such as nausea, disorientation and headache." Although the researchers encouraged the use of VR in medical training, they recommended additional studies to address these side effects.

Mystakidis et al. (2021) also found that learning with VR tools requires certain learner attributes. Firstly, students should possess relevant technical skills. Moreover, learners should demonstrate positive attitudes and perceptions towards learning through technological tools. On a deeper level, personality attributes such as cognitive ability, conceptions of studying and learning, level of interest, and capacity for autonomous learning also play an important role.

These variables are subject to change depending on the emotions experienced by learners during the learning process. Consequently, the proper design and implementation of VR experiences can either enhance or negatively affect learners' interest in education. Equally impactful in e-learning is the level of technical competence associated with the systems being used. Mystakidis et al. (2021) noted that "several studies have confirmed that this factor can obstruct learning when neglected." In other words, before the implementation of VR software in learning environments, teachers and tutors should be aware of the technological proficiency level of their students and provide additional support when necessary.

The researchers mentioned that several factors can enable virtual reality classes to perform effectively. These include:

a. Having good access to technology,
b. Ensuring that non-technical users are able to operate the equipment effectively, particularly when faced with technical issues,
c. Providing fluid and uninterrupted user access at all times,
d. Ensuring strong and reliable system performance, and
e. Establishing an effective user support system (Mystakidis et al., 2021).

In terms of learning design, the important factors identified were:

a. Teachers' own perceptions towards virtual reality,
b. The integration of an appropriate learning theory,
c. The creation of a social community that allows learners to interact through tools such as chat rooms or discussion forums, and

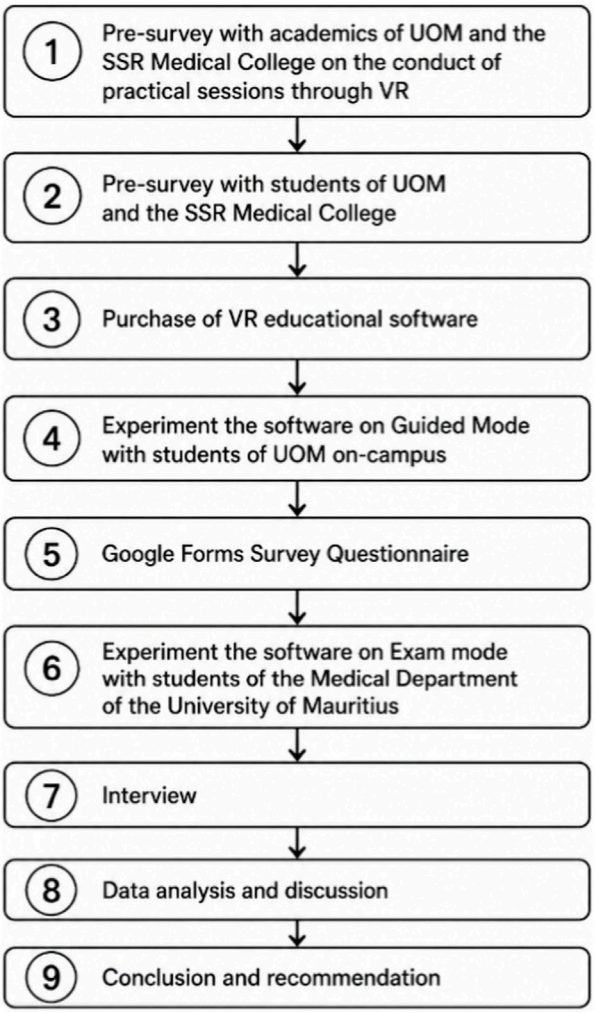

FIGURE 4
Steps involved in the methodology.

TABLE 1 Demographic data.

Characteristic	Sample size: 81	Department Number	Medicine Percentage %
Gender	Male	38	46.91
	Female	43	53.09
Age Year of study	19–21	42	51.85
	22–24	33	40.74
	23–25	1	1.23
	26–28	2	2.47
	30–47	3	3.70
	Year 1	2	2.47
	Year 2	36	44.44
	Year 3	25	30.86
	Year 4	7	8.64
	Year 5	6	7.41
	Final year	5	6.17

d. The establishment of clear rules and regulations governing collaboration and communication, especially within less structured environments and activities (Mystakidis et al., 2021).

The study concluded that virtual immersive educational reality "appears to require yet another set of skills in addition to the skills required for teaching in 2D environments" (Mystakidis et al., 2021). The researchers recommended meaningful contexts, purposeful activation, learner agency, intrinsic emotional engagement, holistic social integration, and obstacle removal as essential components for effective VR-based learning environments.

Hence, it becomes crucial to adopt appropriate instructional design strategies when implementing VR into a training curriculum, as research strongly suggests that technology alone does not automatically promote learning. Rather, the effectiveness of VR depends on the use of well-designed software that stimulates cognitive engagement appropriately. Consequently, educational activities involving VR should be carefully designed to ensure alignment with the curriculum and achievement of the intended learning outcomes. As noted by Mystakidis et al. (2021), "the software and educational activities can be highly realistic or even totally imaginary, but the important point is that these should be geared towards attaining the desired learning outcome." Prior to these considerations, the acceptance of both students and teaching staff becomes a fundamental first step. Before investing in VR infrastructure, institutions must first establish whether students would accept and engage with such technologies. The Technology Acceptance Model (TAM) provides a validated framework for assessing this prerequisite condition, focusing on perceived usefulness and ease of use as determinants of adoption intention (Figure 4).

3 Methodology

The methodology for this research paper involves testing of the Meta Quest 2 headset as equipment and a medical software, the Medical Clinical Assistant, Professional Suite with students of medicine department. The Meta Quest 2 headset was a stand-alone headset and came equipped with controllers.

The software specifications are:

The Medical Assisting Clinical Suite (Professional) is a virtual reality training application designed for medical assisting students and healthcare professionals. The software provides immersive training in 33 clinical procedures commonly assessed in the Certified Medical Assistant (CMA) examination. It incorporates guided, expert, and examination modes, enabling learners to practise clinical skills independently while receiving immediate feedback and performance analytics. The application is licensed as a permanent educational product and supports repeated practice in a risk-free virtual environment.

The software was used in two educational institutions; the University of Mauritius and the SSR Medical College. As a first step, a small pre-survey was carried out among the academics of the University of Mauritius and the SSR Medical College to know their views on the use of virtual reality as a pedagogical tool. The main aim was to gather opinions as to whether they perceive this tool to be efficient as a teaching and learning aid and if they would be willing to use it in their practice as it would help them in several ways that traditional teaching using books and the usual media like videos and presentations

would not be able to. The questions have been designed through Google forms.

The second step was to gather the opinion of students through a second pre-survey which was carried among students of the University of Mauritius and the SSR Medical College and the practical testing was done with an academic of the medical department of the University of Mauritius and then with students of the medicine department of both institutions. The testing time with students spanned from November 2024 to May 2025 and is divided in two phases. Testing on Guided Mode in the software was done up till April 2025 and took place at the CILL department of the University of Mauritius, located in Ebene, for the University of Mauritius students and at the seat of the SSR Medical College for those who attend this institution. Since testing involved the in-person presence of the students, the time constraint had to be adjusted and scheduled well. The second phase of the testing relates to carrying out the procedures in the software on Guided, Expert and Exam modes and it was done from mid-April 2025 to May 2025 at the CILL department of the University of Mauritius. This phase involved a small group of eleven students from the medical department of the University of Mauritius who completed all procedures in the software in Exam mode and who responded to an interview afterwards.

The students who participated in the testing phase responded to a request for same from the researcher and it was on a voluntary basis. They had no previous experience with using VR for training purposes.

Below is the demographic analysis of the students for Phase 1, shown in Table 1.

The Medical Assisting Clinical suite (Professional) was considered based on the following reasons listed below:

According to the description on Meta Store, the software is:

"Intended for medical assisting students and working professionals seeking a skills refresher, the Medical Assisting Clinical Suite (Professional) is clinical training in an immersive healthcare setting that teaches you how to prepare for, setup, document, and perform 33 clinical skills procedures common to the CMA/RMA/NCMA/CCMA/CMAC Certification Exams. This is a permanent education license, providing unlimited practice 'anytime-anywhere', immediate feedback, analytics, and guided, expert, and exam modes to check progress and build confidence.

A certificate of completion is available upon successful completion of all exam modes. Below are the specifications of the software that was used for this study (Table 2).

Immersive learning is a paradigm shift that is already underway in healthcare education, where leading research shows that learners acquire clinical skills more rapidly, with fewer errors, and retain learned skills longer through immersive learning experiences" (Meta, 2024).

The procedures that if offers are listed below in Table 3.

The software allows for casting of what the students were doing in real time in the immersive environment on a mobile phone and below are figures of some procedures:

Guidelines for testing VR Software: Medical Assisting Clinical Suite (Professional).

For the University of Mauritius and the SSR Medical College:

TABLE 2 Specifications of medical assisting clinical suite professional.

Feature	Details
Software name	Medical assisting clinical suite (professional)
Developer	Clinic Immersives (Incite VR)
Platform	Meta quest (formerly oculus quest) and pico neo devices
Initial release	October 2021
Purpose	VR-based training for medical assisting students and professionals preparing for the CMA (AAMA) certification examination
Content	Includes 33 clinical skills procedures covering preparation, setup, documentation, and performance of common medical assisting tasks
Learning modes	Guided mode, expert mode, exam mode, analytics, immediate feedback, and certificate of completion
License type	Permanent education license allowing unlimited practice
Cost	US$149.99 for the professional edition

TABLE 3 Procedures available in the medical assisting clinical suite professional.

Procedures	Details
Tutorial	
Labs/Precautions	a) Fire safety b) Handwashing c) CPR
Injections	a) Intradermal b) Intramuscular c) Subcutaneous
Vital signs	a) Temperature labs b) Apical pulse c) Radial pulse d) Respirations e) Blood pressure f) Weight and height
Surgical procedures	a) Skin prep b) Gait belt c) Suture removal
Vascular procedures	a) Venipuncture b) Capillary puncture c) Haematology testing d) Capillary puncture e) Glucose testing
General procedures	a) Oral medication administration b) Obtain samples for culture c) Irrigate the eye and instil eye medication d) Assess peak flow e) Paediatric assessment
Laboratory testing labs	a) Rapid infectious mononucleosis test b) Rapid strep test c) Routine clinical urinalysis test

Guidelines – Time frame 30 min
Do the tutorial first and then choose 2 procedures, all in guided mode
Check for
1. Ease of use of the VR equipment and software
2. Ability to understand instructions and carry out procedures
3. Ability to complete the procedures
4. Belief in ability to do same on live objects
5. Check for engagement level, motivation, understanding, retention of information and success rate

After the testing phase was completed with the 81 students, a group of 11 students from the medicine department of the University of Mauritius were randomly chosen to complete all procedures in the software through the Exam mode. They also participated voluntarily and were keen advocates of using VR as innovative learning tool for their training purposes. All students, 6 females and 5 males in their twenties, studying in their second year, second semester, have not yet started doing practical sessions in their tutoring. They were only involved in the theoretical parts of studying medicine and the way towards practical sessions would involve a dummy in the first hand and then moving on to real patients. Each student took 30 min in all, to do the tutorial and then do two to three procedures on all three modes. After they were done, they answered an interview to assess whether they felt confident enough to perform these procedures in real life situations.

The interview lasted 15 min with each student, the questions were open ended and was done on a face-to-face mode. Participation for this phase of the testing was done on a voluntary basis, whereby the students were informed of the proceeds and they willingly came forward to experience doing medical procedures through the VR. All responses were recorded through the written format. Their responses were assessed through a thematic context, the TAM model.

After the first testing phase, students filled in a Google Form Survey questionnaire, with Likert Scale and after the second testing phase, students answered a short interview. To analyse the data, a mixed-methods research design was employed whereby the quantitative data was analysed statistically using SmartPLS while the qualitative data was examined according to the themes of the TAM (Davis, 1989). Participants responded on anonymous grounds and were assured of confidentiality and incorporating both positively and negatively worded items. To ensure the validity of the questionnaire, the measurement items were adapted and reviewed for relevance to the study, which can be categorised as a pilot testing. Several items were recoded and reverse-coded prior to data analysis to ensure consistency in the responses. The use of both quantitative and qualitative data provided complementary perspectives and supported a more complete understanding of VR acceptance by the students who participated in the testing.

Theme	Questions
Perceived usefulness (PU)	"Do you feel that using the VR medical software helped improve your understanding of the medical procedure? How so?" "From your experience of the VR session do you feel you learned more effectively than in a real-life or textbook scenario? Justify your answer" "Do you think VR-based practice can complement or even replace traditional learning methods in some areas? Why or why not?"
Perceived ease of use (PEU)	"Did you encounter any challenges while navigating through the VR system? How did you overcome them?" "How did you feel about the physical comfort and usability of the VR equipment (e.g., headset, controls)?"
Attitude toward using VR (ATT)	"How did you feel while performing the medical procedure in VR – did it feel engaging, boring, realistic, or artificial?"
Behavioural intention to use VR (BIU)	"Do you feel motivated to use VR again for future training? Why or why not?" "Would you recommend the use of VR to your peers? Why?"
Challenges/ Barriers – Overlap with PEU	"Did you encounter any challenges while navigating through the VR system? How did you overcome them?"
Suggested improvements	"What improvements, if any, would be advantageous for VR training in the medical field?"

(*Continued*)

The data was analysed using SmartPLS four software. The Partial Least Squares Structural Equation Modelling (PLS-SEM) approach was employed to assess both the measurement model and the structural model. The bootstrapping procedure was performed using 5,000 bootstrap samples to determine the significance of the path coefficients. The sign change option was set to "Individual Sign Changes." Prior to analysis, the dataset was screened for missing values. Responses with substantial missing data were excluded from the analysis, while isolated missing values were handled using mean replacement.

Required permission for the testing process was sought out from the Ministry of Education and Human Resource for a certificate of 'No Objection' so as to be able to carry out the experimenting of the VR Software. Permission was duly granted for testing of VR equipment at the University of Mauritius and the SSR Medical School. As a second step, permission was sought from the University of Mauritius for Ethical Clearance and such was duly received (MTE/37REC/UOM/349) on 26 July 2024.

3.1 Qualitative analysis of interview for phase 2 of testing

From the interview, responses themed according to the TAM framework, display a high tendency of acceptance of VR as a tool for their practical training. The feedback received is categorised as:

3.1.1 Perceived usefulness

Q 1: Do you feel that using the VR medical software helped improve your understanding of the medical procedure? How so?
Q2: Do you think VR-based practice can complement or even replace traditional learning methods in some areas? Why or why not?
Q3: From your experience of the VR session do you feel you learned more effectively than in a real-life or textbook scenario? Justify your answer.

3.1.2 Perceived ease of use and challenges encountered

Q4: Did you encounter any challenges while navigating through the VR system? How did you overcome them?
Q5: How did you feel about the physical comfort and usability of the VR equipment (e.g., headset, controls)?

3.1.3 Attitude towards use

Q6: How did you feel while performing the medical procedure in VR? Did it feel engaging, boring, realistic, or artificial?

3.1.4 Behavioural intention to use

Q7: Do you feel motivated to use VR again for future training? Why or why not?
Q8: Would you recommend the use of VR to your peers? Why?

4 Results

The total survey with all students from both institutions combined reached a number of 81 students. They found the software easy to navigate even if some mentioned that they would have preferred to have more time to get used to its interface so as to better manipulate it. The instructions were clear to them and the procedures that they had to complete were easy to navigate through. 94.7% among them did not feel any health issues while using the VR headset, which is related to the cyber sickness associated with it. Those who did feel some adverse health issues felt nausea, headache and eye strain. For 77.8% of the students, it was their first time using a VR headset, more specifically, for learning purposes. The majority of the students were involved in theory classes and had no practical classes yet and for them, the VR tools helped them achieve their learning objectives while two among them, who were experienced in doing medical procedures with patients, found the interface too game like and even mentioned that they lacked real immersive environment features such as sounds and voice use. For most of them, though, the environment was realistic. All of them felt like they had a skill enhancement after using the software, which refers to virtual reality helping students reach their learning gains. Students can use VR tools and equipment to practice and in this particular field, the students felt like they practiced many procedures that are required of them to learn, for example, doing injections or venipuncture the right way. Though satisfaction was there at all levels, they expressed some complaints pertaining to the VR software being of the first-generation type, with no conversation with the patient and having to follow a list of items which should be done in order, which means that the user is not free to experiment with the patient as he wills. This may be due to the fact that there is no AI involved in this particular software as there is in the newer interfaces that are available to be used for training but the students enjoyed the practice nevertheless. Other complaints related to needing more time to get used to how to use controllers to grab objects, perform procedures and how to walk about in the software while using the joysticks. This brings out the fact that students will need to be tutored into how to use the tools well and this will require that the lecturers be themselves well versed with these tools.

Some students enjoyed the interactivity, the new mode of learning which makes the process of acquiring knowledge more fun, without needing to put in stressful effort but which gets done fluidly. There was a comment which mentions that the VR cannot replace real life experiences as the procedures done in the software are not exactly the same as they will be done with a real patient and this brings out the strong point that the essence of introducing VR in tertiary education in Mauritius is not to bring it to replace lecturers or real life experiences but to be used in conjunction to allow for further practice and learning to take place with the younger generations who needed the technological help as they are programmed for same.

4.1 Statistical analysis of the post testing survey in relation to the TAM

To analyse the level of acceptance of the VR technology from the students, the Technology Acceptance Model (TAM) was used as the theoretical framework. The TAM model is commonly used to describe users' behaviour towards accepting a new technology. It bases itself on factors such as:

- Perceived Usefulness (PU),
- Perceived Ease of Use (PEU),
- Behavioural Intention to Use (BIU) (Davis, 1989).

The Actual Use (AU) was removed from the final TAM model because the study did not collect behavioural usage data such as duration or frequency. Since all 81 participants interacted with the VR system only once during a guided session, the measured AU items represented perceptions rather than actual behavioural use. This is accentuated by the study of Schorr, (2023) titled "The Technology Acceptance Model (TAM) and its Importance for Digitalization Research: A Review," who mentions that only a few TAM studies have recorded the Actual use whilst the main focus remained on the behavioural intention to use the technology. Similarly, the study of (Musa, 2024), titled Marketing research trends using technology acceptance research, clearly mentions that "an individual's actual use of the technology is directly influenced by the intention to use and hence some studies omit the Actual use in favour of the Behavioural Intention to use."

Furthermore, a quantitative approach was adopted, and data were collected through a structured questionnaire. To analyse the data, Partial Least Squares Structural Equation Modelling (PLS-

SEM) was applied. This method is appropriate for examining relationships between variables and assessing how effectively the model explains students' responses. Key indicators such as R-squared values, model fit indices, and measures of reliability and validity were used to evaluate the strength and quality of the model. The acceptable value ranges for these indicators were interpreted according to Hu and Bentler (1999), while the Cronbach's alpha values were referenced according to Cronbach (1951).

A coding system was applied to the responses obtained from the survey questionnaire, and the data were grouped according to the four factors related to the Technology Acceptance Model (TAM). However, it should be noted that, for the purposes of this thesis, a simplified version of the TAM was used.

Analysis of TAM Structures

The structural model holds a good global fit, with an SRMR of 0.047, which falls within the acceptable limit (<0.08). Overall, the model demonstrates good construct validity and acceptable structural fit for examining VR acceptance within the TAM framework, as demonstrated by the correlation and the R^2 values. The R^2 values are considerably higher than those commonly reported in TAM research. Such high coefficients of determination may indicate a particularly strong relationship between the constructs within the study context. However, they also raise questions regarding potential common method bias, conceptual overlap between constructs, or insufficient discriminant validity. This may be explained by the fact that many participants were first-time users of virtual reality technology. VR is still relatively uncommon in Mauritian higher education and was presented as novel and innovative to the students.

Gender	Male	Female	Total		
Number	38	43	81		
Perceived usefulness	Mean	Standard deviation	Skewness	Kurtosis	Cronbach's alpha
How realistic did the virtual environment and medical scenarios feel?	4.062	0.807	−0.115	−1.471	0.859
How satisfied are you with the overall experience of using the VR medical software?	4.025	0.831	−0.047	−1.573	
Perceived ease of use					
How clear were the instructions	3.963	0.793	0.067	−1.418	0.927
How easy was it to navigate through the VR Medical Software?	3.914	0.789	0.157	−1.389	
Intention to use					
How likely are you to recommend a VR software for training purposes?	4.086	0.834	−0.166	−1.567	0.904
How effective was the VR software in helping you achieve the learning objectives?	3.988	0.809	0.023	−1.488	

The data was collected through a Google Form survey with a Likert Scale rating whereby 5 represents 'Strongly Agree' and 1 represents 'Strongly Disagree.' With the highest agreement being x = 4.086, the average agreement across all items is high (x = 3.963–4.086), clearly suggesting that VR for training purposes in education is highly advocated for among the participants. All the responses show a strong internal consistency with the alpha values (0.859, 0.904 and 0.927).

Model fit		
SRMR	Estimated model	0.047
NFI		0.807
R^2	BIU	0.759
	PU	0.815

Phase 2 – April 2025 to May 2025.

The second data gathering activity conducted on the integration of Virtual Reality (VR) technology, done with students of the University of Mauritius and the SSR Medical College yielded fruitful answers, with the majority of respondents expressed a preference for incorporating VR into practical STEM courses, with 100% agreement among participants due to their ease with technological tools and with the swift progress of AI.

From the interview, responses themed according to the TAM framework, display a high tendency of acceptance of VR as a tool for their practical training. The feedback received is categorised as:

4.1.1 Perceived usefulness

Q 1: Do you feel that using the VR medical software helped improve your understanding of the medical procedure? How so?

Q2: Do you think VR-based practice can complement or even replace traditional learning methods in some areas? Why or why not?
Q3: From your experience of the VR session do you feel you learned more effectively than in a real-life or textbook scenario? Justify your answer.

The majority of the students mentioned many advantages that they perceived from practicing medical procedures through the VR software. Among these were, 'we could perceive things that we usually only learn from books," or "we could practice for an endless number of times." One student mentioned that since he has not yet started doing procedures on real patients, practicing through a VR software, which was very realistic due to its immersive nature, gave him more confidence to apply the skills he acquired in a real-life situation. On the same grounds, the majority responded that practicing through the VR definitely complements the traditional learning methods but will never be able to replace the human interaction which is needed to deal with patients. One student mentioned that the patient in the software does not represent the reality as he does not interact. Pertaining to Q3, all respondents felt more engaging interactions through manipulating the controllers in an immersive environment which made them remember the essential steps that are needed to do these procedures successfully. Other than having more engagement, there was a mention that learning through this method is more fun and less boring.

4.1.2 Perceived ease of use and challenges encountered

Q4: Did you encounter any challenges while navigating through the VR system? How did you overcome them?
Q5: How did you feel about the physical comfort and usability of the VR equipment (e.g., headset, controls)?

The students found the equipment very user-friendly and comfortable to wear. They adjusted to its requirements very easily like adjusting it on their head and getting used to the controllers. It is worth mentioning that due to the time factor, the students did not get much time to get used to the equipment but they used it only for the software testing. One student mentioned of neck pain he felt after using the headset for 30 min whilst none of the participants mentioned nausea or headaches. So, they mentioned that the main challenges they felt was using the controllers. Some had some problems grabbing objects and even doing the procedures, like suture removal. But, after proper guidance and several attempts, such was done successfully. This brings out the crucial point that students will have to be used to how to use the equipment properly before practicing through it.

4.1.3 Attitude towards use

Q6: How did you feel while performing the medical procedure in VR–did it feel engaging, boring, realistic, or artificial?

For this question, ten respondents mentioned about the positive aspects of learning through the VR. The experience was "fun, engaging, realistic and interesting." One respondent among the eleven mentioned that though it "was artificial, it was a good experience before doing those same procedures in real life." However, one respondent only mentioned that the experience was too artificial and lacked the human interaction that is present in hospitals. One the whole, the attitude towards using the VR for training was a good and positive one.

4.1.4 Behavioural intention to use

Q7: Do you feel motivated to use VR again for future training? Why or why not?
Q8: Would you recommend the use of VR to your peers? Why?

For these two questions, all respondents answered positively. They are definitely motivated to use the VR for training and would surely recommend its use in education to their peers. One of the reasons one participant gave is: "yes, it provides unprecedented exposure to clinical setting allowing students to take part in the procedure with no possible complications for the patient," thereby accentuating the safety measures that training through VR provides to both students and to the patients. Other reasons include: "yes, as the VR provides immediate application of learned theoretical knowledge which is vital for a better understanding of the medical procedures and for remembering all the steps easily." The same trend goes for the recommendation of its use since practicing through it is very engaging and is very close to real life practice as compared to theory.

4.1.5 Improvements

Q9: What improvements, if any, would be advantageous for VR training in the medical field?

For this question, all respondents mentioned the fact that the software is of the first-generation level and lacks interaction. They would have preferred to be able to talk to the patients, respond to them and check their bodies. Also, with the use of AI, they would be motivated to practice more complex procedures, like surgeries.

For the testing of VR equipment and software with medical students of the University of Mauritius and the SSR Medical School, both the Meta Quest 2 headset and the medical software, 'The Medical Clinical Assistant Professional Suite,' obtained from the Meta Quest store, were used. Due to timetable constraints and the structured academic schedules of the students, a convenience sampling approach was adopted. A total of 92 participants were able to complete the VR testing for both phases. While this sample size was constrained by practical limitations, it is considered to be acceptable. The students of both institutions have a tight schedule and time had to be found in between their classes to allow for them to participate in the testing session. The testing spanned over 6 months as each student took 30 minutes with the equipment which consisted of one headset only.

5 Limitations

This study is subject to several limitations that should be acknowledged when interpreting the findings. First, the research

was conducted within a specific disciplinary context, focusing solely on medical education at the tertiary level. As such, the generalisability of the findings to other academic fields remains limited. Additionally, the study employed a convenience sampling approach within a single national context, which may not fully capture broader variations in technology adoption across different institutions or regions.

6 Future research

Pertaining to future research, it has to be noted that beyond higher education, there is significant scope to examine the feasibility and impact of VR integration at the secondary and primary education levels, particularly within the Mauritian context where such studies remain scarce. Early exposure to immersive learning technologies may influence students' cognitive development, engagement, and digital competencies, thereby shaping long-term educational outcomes. At the tertiary sector, more concise studies can be done which involves conducting a randomized controlled trial comparing VR training to mannequin-based training. Another impactful research that can be done is measuring skill transfer after being trained in VR or high-fidelity simulations towards real patients, which would imply investigating the number of VR sessions that are needed for skill retention. The role of cybersickness as a TAM variable can also be put under study.

7 Discussion and conclusion

The findings of this study provide strong empirical support for the integration of Virtual Reality (VR) into tertiary-level medical education in Mauritius. Consistent with prior research, the results demonstrate that VR enhances learners' engagement, motivation, and understanding of complex clinical procedures. In particular, the high levels of perceived usefulness and behavioural intention observed among participants indicate that VR is not only pedagogically effective but also well accepted as a training tool. This aligns with existing studies, such as (Lopez et al., 2021), which highlight the superiority of VR-based learning over traditional methods in facilitating spatial understanding and procedural accuracy.

From a theoretical perspective, the study reinforces the applicability of the Technology Acceptance Model (TAM) in immersive learning environments, with perceived usefulness emerging as a key determinant of students' intention to adopt VR for skill acquisition. The findings further suggest that the experiential and interactive nature of VR strengthens learners' confidence and supports the development of psychomotor skills through repeated, risk-free practice. This is particularly significant in medical education, where opportunities for hands-on training may be constrained by time, resources, and patient safety considerations.

Since the students had no previous experience in VR, the PU was identified as principal determinant and this was demonstrated in previous research which suggested that PEU may be particularly influential among novice users who have limited experience with a technology. Indeed, Sun and Zhang (2006) reported that the effect of perceived ease of use on behavioural intention and perceived usefulness is stronger for inexperienced users than for experienced users. Since many participants in the present study had limited prior exposure to virtual reality technology, ease of use was expected to play an important role in shaping their acceptance of VR for learning purposes.

Despite these advantages, the successful implementation of VR requires a structured and strategic approach. The study highlights the necessity of establishing a comprehensive framework that addresses infrastructure readiness, curriculum integration, staff training, and ethical considerations. Without such a framework, the adoption of VR risks remaining fragmented or underutilised.

At a broader level, the findings underscore the importance of policy-level intervention to support the sustainable integration of immersive technologies in education. A national strategy would enable standardisation across institutions, facilitate funding mechanisms, and ensure that best practices are followed in the use of VR for medical training. In this context, VR should be viewed not merely as a technological enhancement, but as a transformative tool capable of reshaping how clinical skills are taught and assessed.

This study contributes to the existing literature by extending the application of the Technology Acceptance Model (TAM) within immersive Virtual Reality-based medical training contexts. Specifically, it highlights the role of experiential and simulation-based learning environments in strengthening perceived usefulness and behavioural intention, suggesting that traditional technology acceptance frameworks can be enriched by incorporating elements of experiential learning. Furthermore, the study introduces a structured implementation framework which is the Blended Medical Procedures Simulation Model and which provides a practical and scalable approach for integrating VR into medical curricula in resource-constrained settings.

Some of the criteria that could add to bias in this study are:

1. The absence of a control group to compare the reactions of students pertaining to studying through the traditional way and through VR.
2. Secondly, since all students who were tested had a single exposure to the software, and it was a novel item, it drove to high acceptability.
3. Since the researcher was present when the students filled in the survey, this could point that students showed a tendency towards acceptance which relates to the concept of social desirability.

In conclusion, this study provides initial evidence that medical students in Mauritius perceive VR as a useful and acceptable supplement to traditional training. Future research should assess whether these positive perceptions translate into measurable gains in clinical competence. By enabling immersive, repeatable, and safe learning experiences, VR contributes to the development of more confident and competent healthcare practitioners. For a developing context such as Mauritius, the adoption of VR represents an opportunity to modernise medical training and align with global trends in simulation-based

education. However, its long-term success will depend on the establishment of coherent institutional strategies and supportive national policies that ensure its effective and equitable implementation.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found in the article/supplementary material.

Ethics statement

The studies involving humans were approved by Ministry of Education and Human Resources Mauritius and Ethics Committee of the University of Mauritius. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

SG: Writing – original draft, Writing – review and editing. GB: Supervision, Writing – review and editing. MS: Supervision, Writing – review and editing.

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Conflict of interest

The author(s) declared that this work was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The author(s) declared that generative AI was used in the creation of this manuscript. Generative AI tools (ChatGPT, OpenAI) were used to assist with language editing and structuring of the manuscript. The author takes full responsibility for the content.

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