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Research Article

Virtual reality in undergraduate business education: How learning occurs across Kolb's experiential learning cycle

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ABSTRACT

Virtual reality's (VR) potential and applications in education gained much interest recently, particularly as a pedagogical tool in higher education. It is well recognized for its immersive nature, promoting interaction and a sense of realism. A noticeable gap exists in the empirical application of VR in business education grounded in a specific learning theory. This study applies Kolb's experiential learning theory and employs Kolb's four-stage cycle to examine the impact of VR-immersive pedagogy—an area that remains underexplored. The study is qualitative and uses thematic analysis with ChatGPT as a research tool. While language models, such as ChatGPT, have gained much attention as a research tool, the benefits and limitations must be critically considered. The findings provide a comprehensive narrative of how students engage in the four phases of Kolb's learning cycle: concrete experience, reflective observation, abstract conceptualization, and active experimentation. This study also identified the challenges and practical difficulties encountered in using VR in the classroom. It provides educators with a deeper understanding of the pedagogical impact of VR, enabling them to make informed decisions regarding curriculum design and pedagogy to facilitate experiential learning. This study highlights the potential of language models to enhance qualitative data analysis.

Keywords: virtual reality, student experience, experiential learning, higher education, business education, GenAI

INTRODUCTION

Virtual reality (VR) has gained much attention as a promising tool in the field of education (Baxter & Hainey, 2020; Radianti et al., 2020). VR is a computer-generated, simulated environment that enables users to experience a three-dimensional, interactive experience, inducing feelings of presence and realism (Loureiro et al., 2021; O'Connor & Worman, 2019; Radianti et al., 2020). VR has been defined in numerous ways, but the notions of immersion, interaction, and presence remain central to its conceptualization (Baxter & Hainey, 2020, p. 414). A noticeable gap exists in the adoption of VR technology in undergraduate business education (Radianti et al., 2020). As Radianti et al. (2020) noted recently, VR applications in business education remain at the "experimental stage," with limited efforts on how they are integrated into course content and classroom use. Current studies are rarely grounded in a learning theory, particularly in explicitly demonstrating how students' progress through the learning process in immersive interaction with VR tools. Hence, the present

This study is based on classroom activities conducted by one of the authors as part of regular teaching practice.

study seeks to examine learning through immersive VR mechanisms in business education grounded in experiential learning theory (ELT).

ELT has been extensively and consistently applied as a foundational framework in higher education (Hubbard, 2025; Kolb & Kolb, 2017). Underpinned by the works of Dewin, Lewin, and Piaget, ELT emphasizes the central role of the 'experience' in the learning process (A. Kolb, 1984). The theory centers on learners' direct experiences and involvement in real-life activities (A. Kolb, 1984; Kolb & Kolb, 2005, 2017). Experiential learning is synonymous with 'learner-centered' education and deeply rooted in the belief that individuals learn best by doing, reflecting, and applying their knowledge in real-life contexts.

In higher education, institutions continually aim to enhance students' life skills and augment their employability. As a result, experiential learning's emphasis on active, industry-related practice is consistently associated with numerous benefits. These benefits encompass enhancements in technical skills, improved application of knowledge to practical scenarios, the cultivation of transferable skills, increased student satisfaction and engagement, and indications of improved employability (Henríquez et al., 2025; Jamison et al., 2022; Kang et al., 2022). As such, immersive learning through VR applications is best suited to undergraduate business courses because they can provide realistic simulations of workplace scenarios, promote hands-on experiences, and foster a deeper understanding of the complexities of human behavior in business contexts (Hubbard, 2025; Radianti et al., 2020). This paper explores a comprehensive narrative of how students acquire knowledge through Kolb's four-stage learning cycle, using immersive cases in VR in the organizational behavior course (D. A. Kolb, 2014; Kolb & Kolb, 2005, 2017). While most studies in ELT have shown beneficial outcomes, it has been criticized for its limited consideration of digital learning contexts (Henríquez et al., 2025). Furthermore, past studies applied selected stages of the cycle, often without explicitly demonstrating the full experiential learning process. As a result, the effectiveness of this theory, through its full-stage application, has not been clearly demonstrated in the literature (Henriquez et al., 2025). The paper addresses these limitations by demonstrating the complete experiential learning cycle, thereby providing a more comprehensive application of ELT. It addresses the central question: How do undergraduate students perceive the impact of VR-based immersive learning on their business course?

The study aims to uncover students' firsthand experiences in each phase of the ELT cycle: concrete experience, reflective observation, abstract conceptualization, and active experimentation. As an empirical basis for our study, a case-based simulation in the organizational behavior class was used, combining narrative depth, interactive interviews, and behavioral insights to create a rich and interactive learning environment (Galunic et al., 2023).

LITERATURE REVIEW

Virtual Reality in Higher Education

The use of VR in higher education is believed to have the potential to transform teaching and learning experiences. It provides opportunities for students to gain in-depth knowledge of complex subjects, enhance their understanding of concepts, and facilitate learning through virtual simulations (Radianti et al., 2020; Udeozor et al., 2023). Several studies explored the use of VR in various fields (Radianti et al., 2020). VR has been utilized to revolutionize teaching complex subjects by providing immersive learning experiences and replicating real-world scenarios, thereby promoting authentic and hands-on experiences. According to Radianti et al. (2020), the interest in research related to immersive technologies for educational purposes has increased, recognizing the rise of VR applications in higher education. In fact, VR versions of business cases have recently been developed; however, limited empirical analyses of these cases exist (Stern et al., 2021). Moreover, most studies on VR applications were not theoretically anchored on a specific learning theory, particularly in an undergraduate business course, a gap that this study attempts to address (Radianti et al., 2020).

VR use in higher education yields promising outcomes. Students often report increased motivation, improved engagement, and active participation. The immersive nature of VR-led activities was found to facilitate deeper learning and promote high retention of knowledge compared to traditional teaching methods. VR also allows for the development of practical skills and critical thinking through interactive

simulations and problem-solving scenarios. In fact, VR is found to lead to greater immersion and presence in the virtual world (Hubbard, 2025). Moreover, VR can provide access to remote or inaccessible locations, expanding learning opportunities beyond physical constraints (Baxter & Hainey, 2020; Di Natale et al., 2020; Hernandez-Pozas & Carreon-Flores, 2019; Loureiro et al., 2021; O'Connor & Worman, 2019; Radianti et al., 2020; Sholihin et al., 2020; Udeozor et al., 2023). Despite the potential benefits, there are several issues and challenges associated with VR use. A primary concern is the cost of VR equipment, software, and content production, which may prove costly for institutions and students (Hernandez-Pozas & Carreon-Flores, 2019; Loureiro et al., 2021; Radianti et al., 2020). A few technical issues were also raised such as motion sickness and discomfort, and also the need for high-end computing resources which have impeded the widespread adoption of VR (Radianti et al., 2020). Digital overload may also result from the use of multiple technologies alongside VR (Tafesse et al., 2024). Hubbard (2025) stressed that an increased cognitive load is prevalent compared to written and video presentations (Hubbard, 2025).

Additionally, designing and developing effective VR learning experiences requires specialized expertise and substantial time investment, making this a challenge for educators in creating relevant content (Englund, 2017; Loureiro et al., 2021). Furthermore, there is a lack of effective and standardized guidelines and best practices of VR-based instruction in higher education, which hinders the use and implementation of this learning tool (Baxter & Hainey, 2020; Di Natale et al., 2020; Hernandez-Pozas & Carreon-Flores, 2019; Hubbard, 2025; Loureiro et al., 2021; O'Connor & Worman, 2019; Radianti et al., 2020; Sholihin et al., 2020). Given the varied and sometimes conflicting evidence in the literature, it is necessary to determine the most effective approach to using VR in undergraduate business courses, particularly one grounded in the experiential learning model.

Kolb's Experiential Learning Theory

Kolb and Kolb (2005) define experiential learning as the direct involvement of learners in real-world experiences. In experiential learning, learners go beyond the traditional classroom lectures by engaging in hands-on activities, simulations of workplace scenarios and the practical applications of knowledge (Kolb & Kolb, 2017). It recognizes that knowledge and skills are acquired more effectively when learners are actively participating or deeply engaged in the learning process (Loureiro et al., 2021; O'Connor & Worman, 2019; Radianti et al., 2020; Sholihin et al., 2020). Experiential learning allows learners to explore and experiment while realizing the connections between theory and practice. Direct involvement helps learners gain a deeper understanding of theoretical concepts as well as acquire practical knowledge and skills necessary for the workplace or real-life contexts, so as to increase their value in the labor market (Aguilar et al., 2026).

This study applies ELT as a well-established framework recognized as an effective method to enhance student learning outcomes and widely utilized across diverse educational contexts (Kiess, 2022; Niman & Chagnon, 2021). By systematizing experiential learning into a four-stage cyclical process, ELT offers significant value in fostering deep learning, promoting critical thinking, and enabling the application of knowledge in real-world situations (Foley, 2020). Compared to other learning theories, ELT offers a more holistic and learner-centered perspective by integrating cognition, affect, and experience, thereby addressing the limitations of purely behavioral or cognitive approaches (Kolb & Kolb, 2017). However, existing ELT studies do not always implement the model in a clear, theory-driven, or comprehensive manner. Such partial or incorrect applications of the ELT cycle may limit its effectiveness and hinder students' deep learning (Meyer et al., 2021; Nagel et al., 2024).

Kolb and Kolb (2005) contend that experiential learning unfolds in a process involving four interrelated stages: concrete experience, reflective observation, abstract conceptualization, and active experimentation. These elements are highly relevant in higher education settings and have been widely researched and applied in the area of teaching and learning (Kolb & Kolb, 2017).

Concrete experiences

This stage is the foundation for subsequent learning. It is a vital component of the experiential learning process, enabling learners to engage directly in real-life situations, activities, or events. Learning occurs when students are immersed in activities and focus on applying concepts to real-world scenarios. This is also referred to as 'learning by doing' (Kolb & Kolb, 2005, 2017). Kolb and Kolb (2005) believe that students learn

more effectively through direct experience rather than memorization or passively absorbing information (D. A. Kolb, 2014; Kolb & Kolb, 2005, 2017).

Reflective observation

Involves observing experiences through objective and introspective processes. Learners reflect on their activities through careful observations and being aware of their emotional responses in understanding the concepts and theories learned (Chiu, 2019; Gittings et al., 2020; Kolb & Kolb, 2005, 2017). This stage allows the learner to step back, process their experiences, analyze them by examining the events and their reactions, and consider the implications and consequences.

Abstract conceptualization

It involves the development of theories, concepts, and generalizations as outcomes of learners' concrete experiences. This process encourages learners to engage in critical thinking, analyze patterns, and form conceptual frameworks that help make sense of their experiences (D. A. Kolb, 2014; Kolb & Kolb, 2005, 2017). This transition enables learners to develop theories and a conceptualization of how real-world works based on their personal experience.

Active experimentation

This stage involves the application of new knowledge and skills in practical situations (Kolb & Kolb, 2005, 2017). It demonstrates the importance of testing concepts and theories learned, experimenting with different approaches, and learning from outcomes. This is the final stage of the learning cycle, in which learners are encouraged to take risks, explore new approaches, and engage in deeper problem-solving. It allows learners to gain practical experience, receive feedback, and refine their understanding and skills (Sinha, 2023).

Kolb's experiential learning offers a dynamic, holistic framework for understanding the nature of immersive learning through VR. The experiential learning cycle suggests that learning is an ongoing process of experiencing, reflecting, conceptualizing, and experimenting (A. Kolb, 1984; D. A. Kolb, 2014; Kolb & Kolb, 2005, 2017). Learners can enter the cycle at any stage and move through it in a continuous manner, building upon their previous experiences and expanding their knowledge and skills along the way. The experiential learning framework is set at the individual level, dependent on individual learning styles and learning spaces (Kolb & Kolb, 2017; Sinha, 2023). Examining how learners go through each of the stages allows educators to understand and design a systematic and effective learning experience, thereby enhancing engagement in the course.

MATERIALS AND METHODS

Data Collection

This exploratory study is the first of its kind in the Gulf Region, particularly in the United Arab Emirates public university. This research took advantage of the university's initiative to introduce VR-based learning into some selected courses on an experimental basis. Organizational behavior was one of the courses selected for this initiative by integrating a VR-based case study into the course delivery.

A qualitative research design was employed, focusing on context analysis of students' reflective assessment write-ups, conversation analysis and observations which offered a systematic narrative of students' immersive experience in each stage of Kolb's experiential learning model. These techniques allow for the non-intrusive collection of data that is naturally occurring within the educational setting, capturing students' authentic responses to their VR experience (Creswell, 2009; Creswell & Poth, 2016).

The immersive case study has been developed by a world-renowned business school known for its expertise in crafting, practical and industry-driven cases. With a strong reputation for delivering well-designed and effective case studies, the developer ensures that the content is both insightful and impactful for real-world business applications. The case is set in 2025 and in space where participants are immersed in a futuristic mission to Mars. Students are required to gather information, discuss and make tough decisions

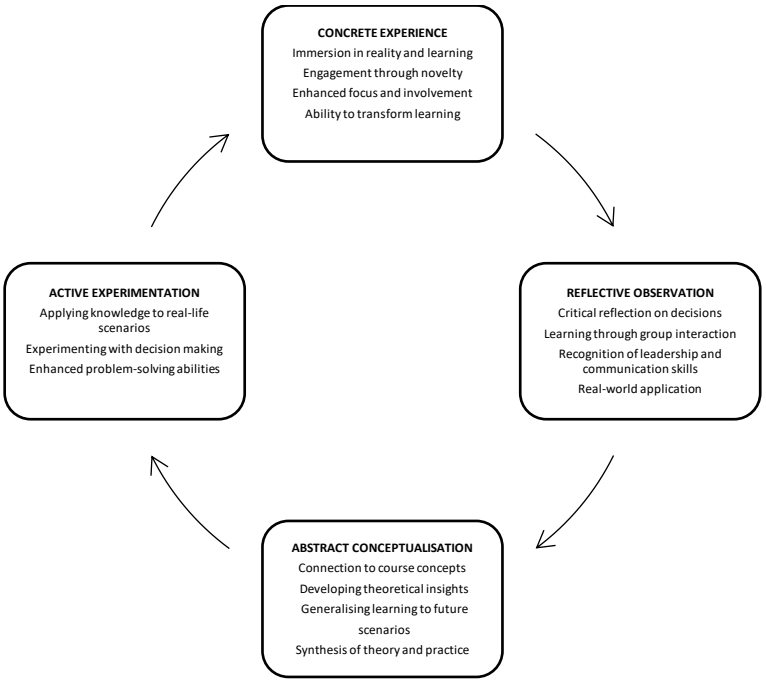

Figure 1. Key themes: Experiential learning through VR (Source: The authors)

independently and as a group. Students were not provided with preparatory materials to create a more realistic experience, allowing them to engage as they would in real-world business scenarios.

Before the start of the session, the instructor sets the stage by introducing a video relevant to the case context. The first part introduces students to identify and understand the problem and an overview of the tasks. Students were asked to convene in groups to discuss and share their initial findings. During the session, individual decisions were finalized by selecting their choices in VR. These answers were saved in the dashboard system. Students were then asked to continue the case; they were required to listen to each team member in the mission as they provided further information to guide the characters involved in their decisions. Students were given sufficient time to debate their decisions and the rationale for them.

A debriefing class followed. Students were required to submit a reflection, which served as the primary data source. These documents provided rich insights into students' perceptions of their experiences, enabling the researcher to examine how the VR immersive case study influenced their understanding of organizational behavior concepts (Creswell & Poth, 2016). In addition, the experiences they shared during the debriefing session were also documented. Casual conversations during and after the activity were also considered. The author's observations, along with multiple data sources, were part of the triangulation process.

Participants

The research was conducted with two groups of students enrolled in the organizational behavior course. The course marked the first time a VR case was introduced and is likely one of the few instances where VR has been used for undergraduate students in the country. The participants include 65 students during the academic year 2024-2025.

Analysis

Key themes were identified as shown in **Figure 1**, corresponding to the key stages of Kolb's ELT. In addition to the researcher's manual analysis in reviewing key themes, ChatGPT was employed as an assistant to organize and code the qualitative data. ChatGPT is considered a state-of-the-art language model and has been found useful in teaching and research (Rudolph et al., 2023). The use of generative AI, such as ChatGPT, to support qualitative analysis, particularly in thematic analysis, has gained recognition recently. Christou (2024) believed that the use of ChatGPT has the potential to aid in multiple stages of thematic analysis such as 'in generating codes, identifying potential themes within a data set, providing contextual information on themes to aid in their interpretation…' (Christou, 2024, p. 567). Researchers believe that the key advantage of using

ChatGPT is its capability to offer speed and efficiency in analyzing qualitative data sets compared to traditional manual analysis (Bijker et al., 2024; Christou, 2023; Farber, 2025; Morgan, 2023; Perkins & Roe, 2024). This enables ChatGPT to swiftly review extensive data sets, understand key themes and provide interpretations. In fact, according to Perkins and Roe (2024), ChatGPT is found to generate a higher number of themes with more granularity than traditional methods. However, using ChatGPT has a few limitations and challenges. The tool might tend to produce 'hallucinations', or nonsensical responses or biases generating quotes or data that did not exist in the original data set and will necessitate the researcher to do a cross-referencing process with the original data to ensure the integrity of the findings (Bijker et al., 2024; Christou, 2024; Farber, 2025; Morgan, 2023; Perkins & Roe, 2024; Rudolph et al., 2023).

Creating the right prompts is important to produce the required outputs and this has to be done repeatedly to refine the instructions which requires substantial human involvement. According to Perkins and Roe (2024), GenAI tools are stochastic, and it is unlikely that repeating the prompts used in our analysis would result in obtaining the same outputs (p. 393). Additionally, ChatGPT are best used in research to facilitate, assist and expedite processes, but the role of the researcher in interpreting, contextualizing and providing depth to the findings leads to richer insights and more comprehensive interpretations (Perkins & Roe, 2024). Perkins and Roe (2024) also emphasized the transformative effect of GenAI in qualitative research but since they are considered as tools they are best as co-pilots, enhancing and complementing human capabilities rather than replacing them (Christou, 2024; Perkins & Roe, 2024). Qualitative research experts acknowledged that ChatGPT or any AI tools could prove useful to assist each phase of the qualitative data analysis, particularly the advantages addressed in this paper, but recognized that caution must be observed in the context of research (Bijker et al., 2024; Christou, 2023, 2024; Farber, 2025; Hill-Yardin et al., 2023; Morgan, 2023; Perkins & Roe, 2024; Qasem, 2023; Zheng & Zhan, 2023).

Given that the research was focused on advanced classroom technologies, using ChatGPT for thematic analysis proved to be an advantage by a meticulously analyzed process, but bearing in mind the weakness of such a tool, using manual notes is needed to double-check the themes. In employing ChatGPT, the researcher followed Perkins and Roe (2024) and Christou (2024) ChatGPT guidelines for thematic analysis (Christou, 2024; Perkins & Roe, 2024). The guidelines have compared the use of ChatGPT to traditional data analysis which was adopted in teaching and learning as suggested by Perkins and Roe (2024). The study has taken into consideration the steps in qualitative data analysis guide in using ChatGPT, which was specifically used in a teaching and learning related study as suggested by Perkins and Roe (2024). The authors have compared the steps in traditional analysis and the use of ChatGPT. Below are the steps suggested by the authors, which were diligently followed in this study (Perkins & Roe, 2024).

1. Data familiarization–Collection of data and re-reading of data, noting down initial ideas in a word.
2. Generating initial codes–Structuring data into a tabular form, suitable for importing into the GenAI tool.
3. Searching for themes–Writing and re-writing prompts to instruct the tool what is the required output.
4. Reviewing themes–Inspecting the themes given by the tools and cross-referencing themes with specific examples from the data for validation purposes.
5. Defining and naming themes–Re-running the analysis at different points in time to enhance validity of the themes.

To ensure appropriate human oversight in the analysis, AI-generated themes were systematically reviewed against manual notes and the original data. Any discrepancies resulting from the process were resolved through iterative comparison and refinement, ensuring contextual accuracy and participant narratives. Consistent with Perkins and Roe (2004), the processes of reviewing, defining, and naming themes were conducted rigorously, including cross-referencing themes with data excerpts and re-running the analysis at different stages to ensure consistency and validity.

Table 1. Negative and challenging experiences

No	Negative and challenging experience
1	Physical discomfort and technical limitations
2	Technical issues and malfunctions
3	Questioning the limitations of VR
4	Loss of focus during immersions
5	Difficulty connecting the VR experience to theoretical concepts
6	Challenges with applying skills
7	Limited hands-on control

FINDINGS

This section outlines the results of the analysis using ChatGPT. The prompts were carefully and clearly stated following the suggested steps from Perkins and Roe (2024). The author provides the definition of the four dimensions of Kolb's experiential learning model prior to the analysis. The prompts emphasized the research question and the requirement to categorize the key themes into four dimensions based on Kolb's ELT using the information from (a) to (d) in the succeeding paragraph. A summary of the key themes is shown in **Table 1**.

> Prompt 1: As noted above, please refer to the research question. Now, analyze the data using the four dimensions of Kolb's experiential learning model. Based on the students' feedback, examine whether their responses demonstrate each of the four dimensions: concrete experience, reflective observation, abstract conceptualization, and active experimentation. Under each dimension, identify and analyze key themes emerging from the feedback. Then, provide supporting quotes from the actual student responses to illustrate each theme. Using the gathered feedback, proceed with the analysis accordingly.

Key themes were drawn from the students' responses:

Concrete experience in this VR case session demonstrates students' direct participation in the activity, where they were immersed in a virtual environment and engaged with the course material. Each student must understand the different scenarios and then also interact with the group. Each group is required to reach a group decision. The following key themes were generated by both groups of students. According to students, they experience concrete experience the most on the following:

Immersion in learning and reality: Students consistently emphasized how the VR experience allowed them to "live" the project, making it feel more realistic and engaging than traditional methods.

> "With the VR, we managed to not just do the project but live the project, sitting around with astronauts and listening to them speaking about space."

> "… The technology allowed me to immerse myself in a virtual world, which made the learning process more interactive and fun …"

Engagement through novelty: The uniqueness of using VR increased students' engagement in the activity, with many noting that it felt like entering a new world and that they were "excited" to use VR for the first time. Students recognized and appreciated the interactive nature of the experience, which allowed them to engage deeply in the material.

> "It was my first time using this technology, and I was amazed by the level of how I am really involved it provided."

> "My VR interaction with the case study was incredibly dramatic and engaging. The VR platform gave me a realistic and interactive representation …"

Enhanced focus and involvement: VR helped students remain focused and engaged during the activity, in contrast to traditional learning methods, which often lead to distraction and loss of attention.

> "When we are just sitting and listening, we tend to lose focus quickly. But by doing the VR, I was more focused on the story together with the whole class."

Ability to transform learning: Most reported their first experience with VR and were impressed by the technology's potential to transform learning, rather than preparing reports, discussing among groups without any technological tools and relying on printed case studies.

> "It was my first-time using VR, and the simulation's remarkable degree that everything is so real and I totally forget I was still wearing a headset in a room."

> "I would say as my first ever experience with VR was fun and exciting. And I don't recall the last time I enjoyed myself this much doing a group project like I did this time."

Reflective observation involves students thinking critically about their VR experiences, analyzing what they learned, and considering alternative approaches. All throughout the virtual experience, students were exposed to the key major concepts in the course, such as reflecting on the way each of the characters in the virtual case interacts and behaves. The following key themes were generated in relation to how students experience reflective observation:

Critical reflection on decisions: Students reflected on their decisions and often considered their consequences in realistic settings. Others reflected that their decisions during the activity prompted deeper reflection on concepts like leadership, teamwork, and decision-making.

> "I felt like my decision was going to indicate what would happen in the mission, and that was challenging."

Learning through group interaction: Students reportedly recognized the importance of teamwork and how working with others enhanced their learning. Accordingly, group discussions helped them think critically about their actions in the VR scenario. The VR experience provided a unique opportunity to engage deeply with the material, enhancing their learning through reflection on the immersive environment.

> "When I worked with my team, I made better decisions because my team members were sharing the information with me."

> "It made it easier for me to actively participate in problem-solving and decision-making, allowing me to fully commit to the role of a team member."

Recognition of leadership and communication skills: Reflecting on their VR experience enabled them to link key organizational behavior principles such as leadership, communication, and collaboration.

> "I learned how to communicate well with the team and share my information clearly."

> "… because it's an important mission that we should make the best decision. I learned some skills like communicating with group member and leadership …"

Real-world application: The VR environment helped them understand complex, real-world concepts more clearly, especially when reflecting on the challenges faced by astronauts or mission controllers.

> "The VR allowed me to fully immerse myself in the real happenings of Mars research and gain valuable insights into organizational practices and what we have learned in the class."

Abstract conceptualization refers to the formation of broader ideas, theories, or generalizations based on the student's experiences in the VR activity. Both the VR session and the reflective assignments were reported as being able to enhance students' understanding of the key course concepts and highlighted how they experience abstract conceptualization:

Connection to course concepts: They connected the VR experience to organizational behavior theories, such as leadership, decision-making, and group dynamics, particularly under time pressure.

> "The VR mission provided me with a chance to observe important leadership qualities shown by the characters in the case and illustrated how they can be used in practical settings."

Developing theoretical insights: The VR experience enabled them to generate insights that extended beyond the immediate case study, thereby informing broader real-world applications.

> "I had a better understanding of the core concepts when it came to working in a team and making decisions. I noticed that it made it easy for students like myself to participate in class discussions."

Generalizing learning to future scenarios: A belief that lessons from the VR activity to future work situations, making generalizations about teamwork and decision-making.

> "This VR project gave me practical knowledge that I can use in my future profession."

> "… One of the great things about VR is that it allows me to be in reality and experience things that might not be possible in some situations. Things that might happen in the workplace."

Synthesis of theory and practice: The activity's immersive nature enabled them to apply theoretical knowledge in practice.

> "The VR experience helped me realize the importance of communication and leadership in a team, something we often study in theory but rarely get to practice in such a realistic scenario."

Active experimentation involves applying knowledge gained from their VR experience to evaluate alternative approaches and decisions, either in future learning or in real-life situations. In the VR session, the first part of the case requires each student to make an individual decision by experimenting with possible choices. The second part involves a group discussion and the presentation of their decision as a solution to the case. Students demonstrated active experimentation in the following scenarios:

Applying knowledge to real-life scenarios: Students expressed confidence in applying the skills and knowledge gained from the VR experience to future situations, both academically and professionally.

> "I feel like I can now approach real-world business problems with more confidence. I know how to test different leadership styles and see which works best for the situation."

Experimenting with decision-making: VR enabled students to practice decision-making in a safe, simulated environment, which many found valuable for testing different approaches without real-world consequences.

> "The best part of my VR experience was getting to practice making judgments in real life, which will be useful for my future profession."

Enhanced problem-solving abilities and confidence: Students reported that the VR experience helped them develop their problem-solving skills by allowing them to test different strategies and learn from outcomes. Students expressed confidence in applying the skills they practiced in the VR simulation to future scenarios, including both academic and professional settings.

> "I learned that in a real-world setting, you have to be ready to try different solutions and see what works."

To validate the information gathered, the author further analyzed the dataset to determine whether there were negative or challenging experiences based on these two groups.

Challenging Experience

Below are the key themes generated reflecting the negative impact and challenges, along with corresponding quotes.

Physical discomfort and technical limitations: Several reported experiencing physical discomfort, such as motion sickness, dizziness, or discomfort from prolonged VR headset use. A few have made similar observations and verbally expressed them to the lecturer at the end of the session.

> "Wearing the headset for an extended period of time did cause some discomfort, so I needed to take breaks."

> "Despite some minor inconveniences like foggy lenses and a heavy headset, the experience was still enjoyable."

Technical issues and malfunctions: A few encountered technical difficulties that hindered their immersion or engagement. This was felt during the first half of the VR session as some were new to the device although a considerable time was allocated for instructions on using the device.

> "I had trouble adjusting to the sound and buttons at first, which made it a bit awkward in the beginning."

> "Some of the interviews and CCTV camera voices were inaudible, even though the volume was maxed."

At times the session had to start late due to a connection error. Some students had to start later than the others because the technician had to manually reconfigure and connect the devices to the internet. However, over time, all of these were managed appropriately.

Questioning the limitations of VR: Feedback on VR's effectiveness as a learning tool was noted.

> "While VR is fun, I think it may not always be necessary for certain tasks, as it can be overcomplicated for simple projects."

Loss of focus during immersion: A few students reported that it felt overwhelming and distracted them from their focus on the actual learning objectives.

> "The environment was so immersive that sometimes I forgot to focus on the learning task, and I got caught up in exploring the virtual space."

Difficulty connecting VR experience to theoretical concepts: A few students struggled to connect the immersive experience to the academic theories they were supposed to apply, finding that the novelty of the technology sometimes overshadowed the educational content.

> "I enjoyed the experience, but sometimes I had difficulty relating it to the course material. The technology was great, but I wasn't sure how to apply what I was learning in a theoretical sense. So, I had to ask my group about it."

Challenges with applying skills: Some participants reported difficulty translating skills learned in the VR environment to real-world scenarios, suggesting that the virtual experience didn't always feel relevant or transferable.

> "I'm not sure how realistic the skills I used in VR will be for my future work. It was an exciting experience, but I don't know if I'll use the same decision-making techniques in real-life situations because this is all about Mars mission."

Limited hands-on control: The absence of physical interaction, such as the inability to manipulate elements with the hands, diminished the experience's realism and applicability.

> "It would be more fun if there were controllers, and I could touch the buttons like I'm using my hands. It felt a little limited without that tactile feedback."

DISCUSSION AND CONCLUSION

Embedding a VR case in a business course provides an innovative and exciting platform for experiential learning, enabling students to engage more deeply with theory-rich materials in ways that traditional methods cannot (Hubbard, 2025). Their use in undergraduate teaching and research remains underexplored (Baxter & Hainey, 2020; Radianti et al., 2020; Sinha, 2023). VR tools are believed to have significant potential to support the teaching-learning process and enhance student engagement, a claim which has not been empirically studied nor firmly grounded in a learning theory (Loureiro et al., 2021, 2020). While numerous studies discuss the experiential aspects of VR, this paper examines students' actual experiences and comprehensively demonstrates learning across the full cycle of Kolb's ELT.

The findings show that students acquired concrete experience through their first-hand involvement in the VR case study, which captured their focus and involvement, thereby translating the VR material into a concrete learning experience (Radianti et al., 2020; Sinha, 2023). Students demonstrated a high level of engagement, experienced a lifelike scenario of the activity, and were more focused on the task. They believed they were fully engaged and found the experience interactive as they were required to use the device individually with fewer distractions. This supports Kolb's view that learning, characterized as a "learning by doing" process, is effectively facilitated in VR environments that offer immersive and hands-on experiences (D. A. Kolb, 2014; Kolb & Kolb, 2005, 2017). Learners immerse themselves in meaningful situations within specific contexts, underscoring the significance of place and time (Morris, 2020). It also underscores students' involvement in social, spatial, and temporal frameworks, where knowledge is gained through direct interaction (Pipitone & Raghavan, 2017). By actively perceiving and engaging with objects and people, learners derive meaning from their experiences, which then leads to the development of questions or problems that interest them (Calvert et al., 2016; Henríquez et al., 2025).

Reflective observation was evident when students critically considered multiple perspectives on their decisions, analyzed and recognized their skills, learned from team members, and applied this knowledge in a real-life setting. These findings align with Kolb's study, demonstrating that reflective observation involves learners critically reflecting on their decisions through interaction with others. Learners were also deeply engaged, recognizing the task's real-world significance within the experiential learning process (Chiu, 2019; Gittings et al., 2020; Kolb & Kolb, 2005, 2017). The learner investigates, testing the fit of the interpretation with their concrete experience (Henríquez et al., 2025)

Students demonstrated abstract conceptualization by connecting the immersive VR case with core concepts learned in the course, as consistent with the experiential learning framework (Kolb & Kolb, 2017). In this context, abstract conceptualization was evident when students developed theoretical insights through visualization and active engagement with the case, enabling them to apply multiple key concepts to analyze and address the scenario. Each situation within the VR case was portrayed with a high level of realism, fostering deep engagement and requiring the application of organizational behavior concepts. These findings align with Kolb's discussion of abstract conceptualization; however, in this study, such conceptualization is facilitated in a distinct manner through immersive VR experiences (Calvert et al., 2016; D. A. Kolb, 2014; Kolb & Kolb, 2017).

Lastly, active experimentation was observed when students tested various decisions and simulated possible solutions to the problems they encountered in the VR case, improving their decision-making skills and helping them develop confidence in applying knowledge to real-world scenarios, as supported by Kolb's ELT (Kolb & Kolb, 2017). The individual dynamics and group interactions encouraged experimentation, allowing them to test ideas, reflect on outcomes and learn actively from the tasks. These findings align with the concept of active experimentation with previous studies on how learners apply and test their abstract conceptualizations in real-world contexts (Henríquez et al., 2025). In this stage of the cycle, learners reconnect with reality to deepen their understanding of concepts developed in earlier stages and to critically evaluate their adequacy in light of new concrete experiences.

The findings also show that students have a heightened sense of engagement, which contributed to deeper interaction and a more meaningful and impactful learning experience, consistent with Hubbard's (2025) claim. These results substantiate the effectiveness of VR as a tool to support experiential learning

(Askren & James, 2021; Baxter & Hainey, 2020; Loureiro et al., 2020; Pellas et al., 2020; Radianti et al., 2020; Sinha, 2023). However, while enhanced visual presence enriched learning experiences through high visual recall, it has also been associated with increased task load, which has negatively impacted students' ability to learn (Hubbard, 2025). As some students' negative experiences showed, the sensory stimulation and frequent digital engagement required to learn through the VR case study seemed to have increased their cognitive load and distracted them from the actual learning task. This suggests that instructors should intervene to minimize students' task load and refocus their attention on the learning task.

Similarly, students expressed doubts about their ability to transfer what they learned from the VR case study to the real world. The VR case scenario depicted managers navigating difficult and uncertain situations, which challenged students' ability to identify key managerial actions and connect them to concepts they learned in the course. Such a circumstance suggests educator's intervention. For instance, instructors can introduce post-VR discussion sessions in which key managerial actions and decisions from the VR case study are explicitly linked to concepts through active class discussion.

While few studies explore VR within the framework of ELT, this study provides a robust theoretical background for how the theory unfolds in an immersive context across the cycles. It has yielded consistent findings, based on actual classroom settings and supported by students' firsthand accounts of their learning experiences using VR in business education (Radianti et al., 2020; Wurdinger & Allison, 2017). However, notable limitations warrant consideration, as they may undermine its effectiveness. Common issues include the physical discomfort and technical limitations (Radianti et al., 2020); technical issues and malfunctions related to connections to the Wi-Fi, display resolution, cable disruptions, and other minor technical defects (Radianti et al., 2020); the distractions experienced by a few and their difficulty in focus or the struggle to adapt to VR use (Baxter & Hainey, 2020); these are a few associated limitations previously documented in VR-related studies. A significant challenge is that students often struggle to determine the most appropriate course of action, likely because VR scenarios are complex, realistic problems that involve ambiguous outcomes and demanding, unfamiliar decisions. In addition, cognitive overload or task overload from visuals, audio cues, time pressures and interactions also exist (Hubbard, 2025; Tafesse et al., 2024). These are important considerations for educators, as they can diminish the overall effectiveness of VR-supported experiential learning.

To conclude, VR or a similar technology has the potential to enhance students' learning. However, technology alone may not be sufficient to impact students' learning; rather, educators also have a crucial role. Educators need to have a better understanding of how to integrate technology into the teaching process (Loureiro et al., 2021). Gaining a deeper understanding of the effective implementation of teaching methods and pedagogical approaches is also important, alongside the use of technology. Moreover, motivation plays a significant role in shaping students' behavior and responses in a learning environment. Higher levels of motivation often lead to increased engagement and a stronger desire to learn (Skinner, 2014; Tafesse et al., 2024). And in today's context, students are generally tech-savvy and increasingly interested in technology. VR technology in the classroom mainly aligns with students' interests and can therefore boost motivation and engagement and is therefore highly recommended.

The use of VR in undergraduate business education presents multiple opportunities for further research. Future research could explore the long-term impact on student outcomes and conduct comparative studies between different learning models, such as online and traditional models. Studies could also examine the impact of VR on students' motivation and its effectiveness as an assessment tool. Furthermore, a study comparing students' experiences with the latest technologies, such as the metaverse versus VR, would also be invaluable.

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AI statement: While the authors used AI tools, specifically ChatGPT, to support and enhance the clarity and structure of the written manuscript and in the extraction of themes, as acknowledged in the methodology of the paper, the authors wish to emphasize that the rest of the paper was conducted entirely and independently by the authors.

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