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# Exploring Nursing Students' Perspectives of Using Virtual Reality in Oxygen Therapy Skills

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## Abstract

Problem statement: Immersive virtual reality is a technological advancement that has the potential to change the traditional approach to teaching nursing students. Virtual reality-based simulations allow nursing students to practice administering oxygen therapy in a controlled and safe environment while receiving immediate feedback on their performance. Aim of the study: This research aims to investigate the perceptions of nursing students who have taken oxygen therapy training using virtual reality simulations. Methodology: This descriptive qualitative study adopted a design utilizing in-depth interview research with 10 second-year nursing students. All interviews were recorded, transcribed verbatim, and analyzed using thematic analysis. Main Findings: Three themes emerged from this study: "positive experiences", "the learning process through virtual reality", and "benefit of using virtual reality". Participants highlighted the fun experiences and excitement they felt while using virtual reality. Virtual reality can also increase their confidence and ability in oxygen therapy skills. However, participants highlighted the need for adaptation, especially in their initial experiences with virtual reality. Conclusion: Participants had great experiences offering oxygen treatment using virtual reality. Although there are some early hurdles and adjustments necessary, virtual reality may help students grow more adept and confident in their skills. The outcomes of this study will assist nursing educators and professors in planning and developing training techniques for nursing skill development.

**Keywords**: Oxygen Therapy, Technology, Virtual Reality

## 1. Introduction

Nursing has always been a dynamic profession that follows technological developments and innovations. Nurse educators are continually motivated to provide accessible and innovative teaching and learning strategies that help students progress at every stage of their educational experience (Fealy et al., 2019; Saab et al., 2021). As healthcare adopts advanced technology, nursing students are given the opportunity to use technology that helps them improve their clinical skills and prepare for real-world patient care. Virtual reality (VR) is one of the new technologies that has the potential to change nursing education. Virtual reality is becoming increasingly popular and widely used in healthcare and education (Saab et al., 2022).

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Virtual reality is experiencing significant growth in the healthcare sector as VR applications save time, reduce training costs and improve the coordination of skills practice by healthcare professionals. (Y. M. Chang & Lai, 2021).

VR comprises a computer-generated simulation of a three-dimensional picture or environment that people may interact with as if it were real or tangible (Liu et al., 2023). VR provides a unique chance to develop realistic clinical settings for nursing students. VR technology offers a more immersive medium for transferring theoretical and clinical learning in nurse education (Foronda et al., 2016). The use of VR can promote cognitive and skill mastery among nursing students by enabling the option to practice skills in a safe setting without risk to patients (Chen et al., 2020). These advantages lead to a greater understanding of diverse clinical processes and increased student confidence in providing safe and effective patient care. Oxygen therapy is an essential skill for nursing students, as it plays a crucial role in many various scenarios and is one of the main therapies for patients with chronic respiratory distress (Mustafa, 2023).

Nursing students continue receiving oxygen treatment lessons based on conventional approaches. Simulation with a standardized patient or mannequin is seen to be the foremost viable way for improving their abilities (Shorey et al., 2020). However, several nursing courses are presently utilizing VR in their teaching strategies, particularly for teaching the delivery of oxygen therapy (Azimi et al., 2020; Smyth et al., 2023). VR-based simulations allow nursing students to practice giving oxygen in a controlled and safe setting while receiving immediate feedback on their performance. Learning using VR may be more beneficial in enhancing nursing students' knowledge, skill development, and confidence (Chao et al., 2021).

Currently, numerous studies showed the perspectives and views of nursing students regarding their experiences in using VR simulations to enhance their skills. Most of the studies explored the nursing students' experiences in general nursing skills. Limited research has explored nursing students' perspectives of using VR for in oxygen therapy skills. This qualitative descriptive study aims to investigate the perceptions of nursing students who have taken oxygen therapy training using VR simulations. Understanding the views of nursing students regarding the use of VR can provide insight to educators, curriculum developers and nursing institutions so that they can improve the quality of nursing education.

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## 2. Materials and methods

This study adopted a descriptive qualitative study design. This study utilized in-depth interview research methods to explore the perspectives of the participants.

### 2.1 Materials

This study was conducted at one of the universities in Probolinggo, Indonesia. The participants of this study were the second-year nursing students. The total number of the participants was 10. Purposive sampling was used to select the participants in this study. The inclusion criteria of participants were as follows: must be second-year students, in good physical and mental condition, must not have any hearing and visual impairments, must be willing to cooperate, and agree to participate in this study by signing the informed consent form.

### 2.2 Data collection procedures

Data collection held from nursing student The participants in this study are students who have received a lecture on the concept of oxygen therapy given by the teacher. After gaining the participants' consent to engage in the study, the participants practiced oxygen therapy skills with VR equipment. This intervention took place in a laboratory, and the participants were accompanied by an instructor. Following their VR experience, each participant was interviewed individually. The interviews took place in a quiet and comfortable environment. Sessions lasted an average of of 30 to 40 minutes, were audio-recorded, and were guided by a semi-structured guide that explored the participants' experiences, ideas, and perspectives on utilizing VR for oxygen therapy skills.

Clinical ethical permission for the study had been obtained from Health Research Ethics Committee Faculty of Health Universitas Nurul Jadid, under record reference number NJ.T06/KM/005/01.2021 The study adhered to the Declaration of Helsinki.

### 2.3 Data analysis

The contents of the recorded interviews were transcribed and compiled into a manuscript. The transcripts were read and reread, and the researchers' thoughts were written down. Relevant participant verbatims were retrieved and summarized into codes. Similar codes were gathered, compacted, and recorded as codes. Sub-themes connecting various codes were created and cross-checked with participant verbatims. A thematic map was built to highlight the relationship between codes and sub-themes. Finally, sub-themes were refined into themes. The first author conducted the data analysis, which was then cross-checked by the second and

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third authors to reduce errors and increase the study's credibility and confirmability. Inaccuracies were discussed, and sub-themes and themes were revised.

## 3. Results and discussion

### 3.1 Results and discussion

This study included a total of 10 second-year nursing students. The participants consisted of 7 Women and 3 Men. The mean participant age was 21. After analyzing the interview results, the nursing students' perceptions of using virtual reality in oxygen therapy skills were classified into three main categories: positive experiences, the learning process through Virtual Reality, and the benefits of using Virtual Reality (table 1).

Table 1. themes and subthemes of Nursing Students' perspectives of using Virtual Reality in Oxygen therapy skills.

| Nursing Students' perspectives of using Virtual Reality in Oxygen therapy skills | |
|---|---|
| **Themes** | **Subthemes** |
| Theme 1: positive experiences | ▪ Pleasurable experiences<br>▪ Excitements<br>▪ Increase interest in learning |
| Theme 2: the learning process through virtual reality | ▪ Adaptation required<br>▪ Skill enhancement<br>▪ Ease of use<br>▪ Confidence boost |
| Theme 3: benefits of using virtual reality | ▪ Immersion of reality<br>▪ Reusability<br>▪ Supported control<br>▪ detailed |

## 1. Theme 1: Positive experiences

Theme one, *positive experiences*, highlighted into three subthemes: pleasurable experiences, excitement and increase interest in learning. All the students reported positive experiences with using VR. They highlighted the pleasurable experiences and excitement they felt while using VR. Additionally, they mentioned that using VR helped increase their interest in learning.

a. Subtheme 1: Pleasurable experiences

The students said that practicing oxygen therapy in VR was "*pleasant*" (P5) and "*enjoyable*" (P7) since it provided a fresh method for improving skills. They were genuinely happy to practice oxygen treatment techniques in VR since it offered a lifelike simulation that was similar to real-world situations:

"…*The experience of using virtual reality in oxygen therapy skills is very pleasant; I learned how to install the oxygen, prepare the equipment, and approach the patient, all of which felt like in the real world."* (P1)

"*I always feel happy to try out new advanced technologies, especially when I can actually use them...*" (P3)

b.  Subtheme 2: excitement

During the VR learning process, the majority of participants were enthusiastic. They stated that learning in VR is characterized as more "*exciting*" (P3) and "*thrilling*" (P5) as VR looks very visually appealing and gamified approach, which makes learning more engaging:

"*...The experience of using VR in the context of healthcare is very exciting and intriguing..."* (P2)

"*VR is indeed more captivating because of its colorful and visually appealing elements. It's like playing a game, yet the learning process remains taken seriously."* (P8)

c.  Subtheme 3: Increase interest in learning

VR successfully increased interest in how nursing students learn oxygen therapy skills. They perceived that during the process of using VR, they felt a desire to continuously improve upon the mistakes they made during practice. Additionally, the instructions were easy to understand, making them feel more inclined to continue learning:

"*... Sometimes, after finishing practice, I still remember it at home and feel like I want to do it again to correct any mistakes from the previous VR practice…"* (P3

"*I find the material easier to understand, which motivates me to delve deeper…*" (P9)

**2.  Theme 2: The learning process through virtual reality**

Theme two, *the learning process through virtual reality*, divided into four subthemes: adaptation required, skill enhancement, ease of use and confidence boost. Most of the participants stated that they could significantly improve their confidence and ability in oxygen therapy skills through the learning experience provided by VR. The participants added VR to be user-friendly. However, the participants highlighted the need for adaptation, especially during their initial experiences with VR.

a.  Subtheme 1: adaptation required

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Adaptation using VR was required for the nursing students. The participants found "*difficult when first trying*" (P1), so they had to try multiple attempts to fully utilize VR. Even though training with VR was more enjoyable, the participants encountered some obstacles due to their lack of familiarity and were "*afraid*" (P9) of moving in the VR environment or selecting objects:

> "*...I encountered some initial difficulties in understanding how to use the VR device, but with time and practice, these skills became more honed…*" (P6)

> "*My practice in operating it was very enjoyable, even though I initially encountered some obstacles.*" (P7)

b.  Subtheme 2: skill enhancement

The participants stated that using VR to practice oxygen therapy skills could improve their skills. This is because the instructions and realism of VR help participants remember each phase of oxygen therapy, and participants are able to try repeatedly so that they can perform oxygen therapy skills more smoothly.

> "*The difference between the real world and virtual reality isn't much. This enhances knowledge and skills after using virtual reality.*" (P1)

> "*After trying several times, I understand and do oxygen therapy better…*" (P5)

> "*VR visualization and instructions always help me remember every phase of practicing oxygen therapy skill or theory included in it.*" (P4)

c.  Subtheme 3: Ease of use

Most participants reported that VR was simple to use. Despite the fact that mastering the VR environment and its features needs adaptation, using VR is still relatively easy to practice when compared to traditional ways because it requires less tools.

> "*As students, learning from the material in VR is easier than reading books or through conventional means.*" (P8)

> "*...and the installation is also easy like that. Here, I just use my hands, just look at the tools, and press the buttons...*" (P2)

d.  Subtheme 4: confidence boost

VR can increase the self-confidence of nursing students. Participants highlighted that VR could increase their self-confidence because participants did not need to perform procedures directly on real patients. They can master their skills with the help of VR technology before meeting patients during hospital practice.

> *"I can use the features of the tools inside VR, so there's no need to be afraid to try..."* (P7)

> *"...I'm a shy person, so using virtual reality makes me ready to perform oxygen therapy skill directly on patients later..."* (P6)

### 3. Benefits of using virtual reality

Theme three, *benefits of using virtual reality*, divided into four subthemes: immersion of reality, reusability, supported control and detailed. The majority of participants highlighted the immersion of VR and its detailed visualization. VR can be used multiple times, and participants can control what they want to do or try with VR.

### a. Subtheme 1: Immersion of reality

The participants pointed out that they felt like they were so "in the game" that they forget where they really were. The VR display resembles a real-world setting.

> *"...all oxygen therapy skills I perform in this virtual reality are like in the real world..."* (P2)

> *"... I felt like I was performing a real procedure, and at that moment, I tried to administer oxygen using a nasal cannula..."* (P10)

### b. Subtheme 2: reusability

Participants said that VR was very effective to utilize since they could reuse it for whichever purpose they wanted. Participants can use VR repeatedly to enhance their competence and nursing skills.

> *"...I can use it wherever and whenever I want to practice my skills. So, it's not just convenient to use, but also more practical, of course..."* (P8)

> *"...as students, we can do it anywhere and anytime we want. Not only oxygen therapy skills, but also other nursing skills."* (P3)

c.  Subtheme 3: Supported control

VR provides users the ability to decide on the actions they want to perform. The participants stated that VR offers a range of features and practice nursing skills, allowing them to pick based on their interests and preferences.

*"There are so many skills in VR that we can try. We can choose any skill we want."* (P9)

*"I can experience what it's like to directly interact with the patient. If I want to repeat, I just need to press the replay button."* (P2)

d.  Subtheme 4: detailed

Participants expressed that the features and explanations offered by VR were really detailed. Participants could follow VR direction while executing oxygen therapy procedures, helping them to complete the skill more efficiently.

*"I can feel as if I'm inside the practice, going through the process of understanding how to do oxygen therapy skills. This sensation is very detailed according to each phase..."* (P1)

*"The virtual world images of how to pick up the tools, then activate them, and how to install them feel very detailed and specific."* (P5)

The purpose of this study was to explore the nursing students' perspectives of using virtual reality in oxygen therapy skills. The result from in-depth interview emphasized three main themes: positive experiences, the learning process through virtual reality, and benefits of using virtual reality.

First theme, *positive experiences,* the participants expressed pleasurable experiences, excitement and VR utilization can increase interest in learning. Virtual reality offers nursing students a great and genuine learning experience. The VR circumstances were fun, realistic, captivating, and effective in helping the participants enhance their clinical thinking (Kiegaldie & Shaw, 2023). This is consistent with prior research showing that nursing students' satisfaction enhanced with VR simulation (Salameh et al., 2023). Since the participants had never used virtual reality for a nursing course previously, the VR system increased the learning motivation of the nursing students (Y. Y. Chang et al., 2024). In order to provide flexible learning opportunities for a range of learners and ultimately improve learning outcomes, virtual reality simulation should be viewed as an adjunct to traditional teaching approaches.

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Second theme, *the learning process through virtual reality*, the nursing students stated that VR is user-friendly, yet participants still require adaptation due to their lack of prior experience with the technology. A previous study discovered that although the majority of participants had never used VR technology before, it is easy to use and allows participants to quickly learn and master the usage of equipment and activities in a VR environment (Fontenot et al., 2023; Mäkinen et al., 2023). Nevertheless, despite VR's ease of use, research revealed that 70% of participants were first-timers. It's likely that this was due to their being too preoccupied with the new technology to fully concentrate on learning the technique, so they had to become used to the VR environment (Plotzky et al., 2023). It might be beneficial to give students the opportunity to use it frequently over an extended period of time so they can become used to it. Students learning nursing skills might improve their abilities and self-assurance by using virtual reality to administer oxygen treatment. The activity gives students immediate feedback on their clinical assessments, and use the tool repeatedly can help them advance their nursing knowledge and abilities (Hong & Wang, 2023; Singleton et al., 2021). The nursing students who used virtual reality simulations to study demonstrated enhanced decision-making skills, a greater knowledge of patient reactions, and more confidence in their ability to care for patients in the real world (Kim et al., 2024; Lee et al., 2023). Understanding that VR simulations can provide immediate feedback in addition to a more engaging and secure setting improves students' self-assurance and proficiency in executing nursing interventions, particularly oxygen therapy.

Third theme, *benefits of using virtual reality*. The participants highlighted the immersion of reality, reusability, supported controlled and detail provided by VR. Education using immersive VR offers nursing students authentic patient encounters in realistic simulated environments (Choi & Thompson, 2022). Although VR can be used many times, one research found that its reusability may be limited depending on the specific scenario and available resources (Pears et al., 2022). one study showed that VR supports students to control what they experience and explore related nursing skills. VR empowers students to control what they explore by helping students discover new boundaries and pushing what they want to know (Thompson et al., 2020). Despite the initial difficulties in using VR, VR is able to provide many benefits in improving nursing students' skills by displaying real-world situations and detailed instructions.

This study provides the nursing student's perspectives and experiences of using VR. Therefore, this research can provide new insights for nursing education regarding students' views regarding the use of VR, especially in oxygen therapy skills. However, there are some limitations in this study. Limitations related the small sample size and only focusing one specific nursing skill. Thus, this may provide other results for different nursing skills.

## 4. Conclusion

Nursing students had positive experiences administering oxygen therapy via virtual reality. While there are challenges at first and some adaption required, VR may help students become more competent and confident in their capabilities. This is because VR offers detail illustrations and instructions. The findings in this study will be helpful to educators and nursing faculty to plan and create instructional strategies for nursing skill acquisition. Instructors should think about the advantages of integrating virtual reality into nursing curriculum and assist in addressing any risks to actualization.

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