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Respiratory Therapy Students' Perception on Online Learning During COVID-19 in the Kingdom of Saudi Arabia

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Respiratory Therapy Students' Perception on Online Learning During COVID-19 in the
Kingdom of Saudi Arabia

By

Faisal Abdulrahman D. Alshehri, BSRT

A Thesis

Presented in Partial Fulfilment of Requirements for the

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Under the supervision of Dr. Lynda T. Goodfellow, EdD, RRT, FAARC

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Byrdine F. Lewis College of Nursing and Health Professions

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ACCEPTANCE

This thesis, RESPIRATORY THERAPY STUDENTS' PERCEPTION ON ONLINE LEARNING DURING COVID-19 IN THE KINGDOM OF SAUDI ARABIA by Faisal Alshehri, BSRT, was prepared under the direction of the Master's Thesis Advisory Committee of the Respiratory Therapy department at Georgia State University. It is accepted by the committee in partial fulfillment of requirements for the Master's of Science degree in Respiratory Therapy at Byrdine F. Lewis School of Nursing and Health Professions, Georgia State University.

The Master's Thesis Advisory Committee, as representatives of the faculty, certifies that this thesis has met all standards of excellence and scholarship as determined by the faculty.

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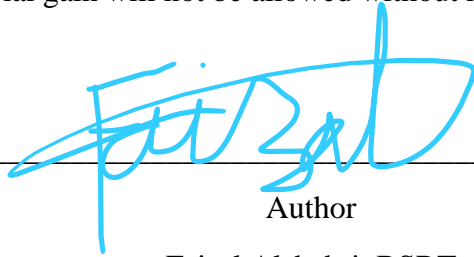
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Author

Faisal Alshehri, BSRT

DEDICATION

I dedicate this thesis to my father and mother, grandparents, brothers, sisters, and cousins for their endless love, support, and encouragement. I would like to express my full gratitude and thanks to Al Ittihad fans. A huge thanks also to my friends from the Kingdom of Saudi Arabia and from the United States of America. Finally, Alhamdulillah for every blessing in my life until I reached this moment of finishing my Master's degree in Respiratory Therapy.

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Respiratory Therapy Students' Perception on Online Learning During COVID-19 in the
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By

Faisal Alshehri

(Under the Advisement of Dr. Lynda Goodfellow)

ABSTRACT

Background: In response to the COVID-19 pandemic, electronic learning (E-learning) has emerged as the primary method for delivering educational materials, particularly within the scope of Saudi Arabian (SA) Respiratory Therapy (RT) education. **PURPOSE:** To evaluate the perception of E-learning among RT students in the Kingdom of Saudi Arabia (KSA) by comparing face-to-face learning to E-learning during the COVID-19 pandemic. **METHODS:** A cross-sectional survey to investigate the perception of E-learning was conducted and distributed using a convenience sample of RT students through an online platform (Google Forms) between September and November 2023. **RESULTS:** Overall, 221 RT students, with females accounting for 119 (53.8%), replied to the online survey. The study revealed several advantages of E-learning, including the ability to study at home (67.9%), access to online materials (64.7%), and learning at own pace (62.4%). The main disadvantages as indicated by most respondents were the lack of interactions with patients (70.1%), technical problems (56.6%), and reduced interaction with teachers (50.7%). No significant difference in the perceptions of knowledge enhancement between face-to-face and E-learning methods ($P=.32$). However, E-learning was considered a lower effective method than face-to-face learning for both clinical skill development ($P<.001$), and social competencies ($P<.001$). Additionally, respondents reported that they were less actively engaged during E-learning classes compared to face-to-face classes ($P<.001$). Nonetheless, a significant percentage of respondents (71.9%) claimed that E-learning was an enjoyable experience. **CONCLUSION:** This research emphasizes the potency of E-learning in terms of increasing knowledge as a valuable tool for educating Saudi RT students. Nevertheless, it highlights the need for a meticulously planned strategy and a proactive implementation approach to effectively implement clinical and social skills E-learning into the educational framework of RT students.

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Definitions of words and terms

AARC: American Association for Respiratory Care

RT: Respiratory Therapy

ER: Emergency Room

ICU: Intensive Care Unit

ITA: Inhalation Therapy Association

COVID-19: Coronavirus disease of 2019

E-learning: Electronic learning

ADAPT: Any Day Any Place Teaching

KSA: Kingdom of Saudi Arabia

RSP: Remote Standardized Patient

VP: virtual patient

CHAPTER 1

INTRODUCTION

According to the American Association for Respiratory Care (AARC), Respiratory therapists (RTs) are health professionals who care for and treat patients with acute or chronic respiratory diseases. Respiratory therapists assess, monitor, and treat a variety of patient categories, including adults, children, and neonates (American Association for Respiratory Care, n.d.-a). The American Association for Respiratory Care (AARC) has established responsibilities that cover many areas. Examples include airway and ventilator management, advising physicians during patient lung treatment and diagnosis, patient education, and not only limited to responding to emergency rooms (ER), intensive care units (ICU), wards or general care, and outpatient clinics (American Association for Respiratory Care, n.d.-b).

RT was introduced as a profession on July 13, 1946: As Dr. Levine established the Inhalation Therapy Association (ITA) along with his students and other interested physicians, nurses, and oxygen providers met at the University of Chicago Hospital ("Timeline and History of Respiratory Therapy - AARC", 2022). RTs work differently than they do now, they were working as oxygen technicians in charge of the hospital's oxygen supply. Over the years, the RT profession has evolved from an essential service to a variety of therapeutic and diagnostic roles for pulmonary disease in the ICU, including a big role in mechanical ventilation that was well developed through the years (Kacmarek, 2013).

RT was first introduced as a Saudi profession in a military hospital in Riyadh in the mid-1970s, and the Saudi crew was sent to the United States to study RT, later the first RT department was established in 1975. (Al-Otaibi and AlAhmari, 2016). Because of the huge demand and the

importance of RT in critical care, government healthcare association and private sector agencies have launched the “RT 2” program to meet the increasing demand for RT in Saudi Arabia. The establishment of the first pioneer RT program in KSA was in 1987 (Alotaibi G, 2015).

Globally, the COVID-19 pandemic has affected education, including traditional college learning methods, and has become significantly more dependent on electronic learning (E-learning) methods for sharing knowledge among college students. The face of higher education has also changed significantly over the last two decades. Higher education, science, and technology have always been an international effort, but it has taken on new dimensions and characteristics from the past. Internationally, many institutions offering higher education have made significant efforts to revise their academic direction and course-offering strategies in light of the interaction of these global changes and new challenges. (Rahm et al., 2021)

E-learning in higher education has gradually increased over the last two decades. (Jebraeily et al., 2020). E-learning or online learning can be defined as the use of electronic techniques and media to provide support and enhance both learning and education involving communication between learners and teachers using online content. (Howlett et al., 2009) Many undergraduate students’ courses now use online E-learning in combination with traditional teacher-led approaches, not just as a method. (Blissitt, 2016; Sadeghi, Sedaghat & Ahmadi, 2022)

Successful E-learning depends on several factors, including the ability to reach lectures, the use of suitable methods, course outline, and criteria. E-learning, like all the other teaching methods, has advantages and disadvantages for both learners and instructors. In addition to the epidemiological benefits of online e-learning during the COVID-19 pandemic, further advantages were noted, including increased suitability, reaching resources despite location and time, reducing

costs and air pollution, for instance, carbon dioxide emanations because of diminished traffic. (Cook & Triola, 2014; Salem, 2015)

As many teachers have never experienced online E-learning on their own, teachers considering developing E-learning materials face pedagogical challenges in transforming classroom teaching in an online environment. Not everyone can be in the same place at the same time to learn these new skills, so they face the technical and time challenges of learning new software. The goal of the “Any Day Any Place Teaching” (ADAPT) Teacher Development Program aimed to create an online experience where teachers can learn to generate E-learning materials. (Niebuhr, Niebuhr, Trumble & Urbani, 2014)

Online E-learning has grown to be an essential ground for training students in curriculum development, teaching, evaluation, interpretation, educational leadership, and scholarships. (Fowler, 2023) One of the most important aims of respiratory therapy (RT) programs was to prepare graduates for the involved demands at work. Implementing an alternative learning method was crucial for students to seek learning outcomes. RT students’ (RTs) perceptions would provide an exploration of this teaching modality and provide valuable information to RT programs. (Alhaykan, 2015)

E-learning enables ongoing learning (lifelong learning), allowing students to grow professionally and independently at their own pace, where and when they choose, with a variety of institutions and teachers individually. Where, students can choose from many subjects that are offered. Students read many learning materials whenever they like at their own pace. (Sinclair et al., 2015) Even though E-learning was sufficient for knowledge acquisition but not practical for clinical and technical skill acquisition, it was satisfactory for students to learn and improve in the learning methods employed in E-learning in more upcoming years. (Abbasi et al., 2020)

Statement of Problem

The use of online E-learning in RT has evolved significantly since the COVID-19 pandemic. Despite measurement of students' perception of E-learning no research was found on Saudi Arabian RT programs. The aim of the study to determine if the use of E-learning among RT undergraduate students was more beneficial than traditional face-to-face methods of learning during the COVID-19 pandemic.

Purpose of the Study

The purpose of this quantitative study was to determine the perception of E-learning among RT students (RTs) in Saudi Arabia (SA) and identify the differences in face-to-face learning associated with E-learning during the COVID-19 pandemic. Moreover, the study examines the association between E-learning and sociodemographic data. This study also reports the association between acceptance rates of E-learning during the COVID-19 pandemic among RT students in SA.

Research Questions

The following research questions were studied:

- 1- What was the perception of E-learning among Saudi Arabian RT students?
- 2- What were the advantages and disadvantages of E-learning among RT students?
- 3- What was the association between sociodemographic variables and perception of E-learning among undergraduate RT students in Saudi Arabia?
- 4- What were the differences between face-to-face learning and E-learning among Saudi Arabian RT students in terms of their ability to master learning objectives?

- 5- What was the rate of acceptance of E-learning during the COVID-19 pandemic among RT students?

Significance of the Study

The specific goal of this study was to advance RT programs by implementing an E-learning curriculum before clinical training. The perception and feedback on student use of E-learning alternative learning methods was essential for enhancing RT students' outcomes in the Kingdom of Saudi Arabia (KSA).

Assumptions

There are two main assumptions to this study. The first one is that the participants in this research will answer the questions honestly and freely. The second one is that all the participants are RT undergraduate students.

Summary

This chapter presents the research questions that were examined and evaluated. There was a need to learn how perceptions of E-learning among RT students in KSA with COVID-19 changed education. The use of E-learning has raised the importance to examine the perceptions of RT students during the COVID-19 pandemic and compare it to face-to-face learning. Comparing perceptions on E-learning to traditional face-to-face learning, is needed to understand knowledge, clinical skills, social competencies and the acceptance of E-learning during COVID-19 pandemic.

CHAPTER II

LITERATURE REVIEW

INTRODUCTION

The literature review was written by searching in PUBMED, Cochrane, CINAHL, and EBSCO, Google Scholar databases. The terms typed into the databases were “E-learning” or “Online learning” or “Perception” and “COVID-19”. Moreover, the terms “E-learning” or “Online learning” and “COVID-19” to determine the perception of Saudi Arabian Respiratory Therapists (RTs). Additionally, “E-learning” or “Online learning” and “Saudi Arabia” or “Kingdom of Saudi Arabia” or “KSA” were searched to measure the perception of E-learning at KSA in general, and in Saudi Arabian RTs specifically. Furthermore, the terms “E-learning” , “Online learning” “Perception of Students” or “Saudi Arabian RTs” and “Role of Online learning” were used to cover all the study aspects. The objective of this literature was to address the following questions:

This cross-sectional study explored the following questions:

- 1- What was the perception of E-learning among Saudi Arabian RT students?
- 2- What were the advantages and disadvantages of E-learning among RT students?
- 3- What was the association between sociodemographic variables and perception of E-learning among undergraduate RT students in Saudi Arabia?
- 4- What were the differences between face-to-face learning and E-learning among Saudi Arabian RT students in terms of their ability to master learning objectives?
- 5- What was the rate of acceptance of E-learning during the COVID-19 pandemic among RT students?

The COVID-19 pandemic has drastically shifted the conventional learning landscape. Moreover, learning methods such as online learning became prominent as a result of the COVID-19 pandemic, especially in Saudi Arabia. This literature review seeks to analyze the perception of adopting E-learning for Saudi Arabian RT students due to the COVID-19 pandemic. Through a thorough investigation of various research studies, this review explores the challenges and solutions in E-learning, the benefits of utilizing E-learning, and the recommendations made by studies to improve the effectiveness of E-learning. (Mojarad et al., 2023)

The Concept of Online Learning

The concept of online learning has been gaining traction in Saudi Arabia, especially when it comes to respiratory therapists. Moreover, with the emergence of new technologies and the ubiquity of the internet, online learning has become an increasingly popular way for respiratory therapists to expand their knowledge and skills. (Al Zahrani et al., 2021). Online learning presents several advantages for respiratory therapists in Saudi Arabia. It can provide more flexible learning opportunities, allowing students to study at their own pace and convenience. Additionally, online learning provides a broader range of course content, with access to information from all over the world. It can also be affordable for students, as online courses were sometimes cheaper than traditional learning methods. Finally, online learning can provide social networking opportunities that allow respiratory therapists to connect with other professionals and exchange ideas (Alshamrani et al., 2023).

Despite the advantages, there were some disadvantages to online learning for respiratory therapists in Saudi Arabia. For instance, face-to-face interaction can be a challenge for some students, as it can be difficult to build relationships with instructors and classmates. Additionally, online courses require a significant amount of self-discipline, as no one holds the student

accountable for completing coursework. Finally, there remains a certain stigma associated with online learning, as some employers may view it as disadvantage (AlZahrani et al., 2021).

In recent years, studies have suggested that online learning was an effective way for respiratory therapists in Saudi Arabia to gain knowledge and develop skills. A study by the World Health Organization found that online learning was an effective way for respiratory therapists to stay up-to-date on the latest developments in the field. Additionally, a study conducted by the Saudi Arabia Ministry of Health found that online learning was effective for respiratory therapists to develop their clinical skills (AlZahrani et al., 2021).

The Importance of Learning

The importance of learning in the context of respiratory care learners has been researched in previous studies. According to Almadni (2021), learning is essential for respiratory therapists in Saudi Arabia, as it allows them to stay up-to-date on the latest field developments and provide the best possible care to their patients. Learning ensures that they were familiar with the latest treatments and technologies and enables them to stay ahead of the competition. Learning also allows respiratory therapists in Saudi Arabia to stay abreast of the best practices in the field and become well-versed in the latest research and trends (Almadni, 2021). This ensures that they can provide the most up-to-date care to their patients.

Furthermore, learning allows respiratory therapists in Saudi Arabia to stay in compliance with the regulations set by the Saudi Commission for Health Specialties, which were designed to ensure that respiratory therapists were knowledgeable and competent in their field. By staying in compliance with these regulations, respiratory therapists in Saudi Arabia can help to ensure that their patients receive the highest quality of care possible (Almadni, 2021). Learning is essential for respiratory therapists in Saudi Arabia because it allows them to develop their skills and

knowledge. This is essential for job effectiveness and provide better patient care (Brands, et al., 2021).

Perception of E-learning

A study conducted to investigate the learner's perceptions of adopting online learning for students pursuing healthcare-related programs in Saudi Arabia during the COVID-19 period established that E-learning had significantly increased in Saudi. However, it had many challenges (Alblihed et al., 2021). The strategies that faculty members and programs have adopted to respond to those challenges include providing support services and resources, such as orientation sessions, drop-in advice clinics, and online tutorials, as well as creating incentives to motivate students' participation in their studies. Many changes were implemented in response to the pandemic, such as adopting new platforms, technologies, flexible timelines, and even more discussion forums.

History of Face-to-Face Learning

Furthermore, prior research concerning traditional face-to-face learning suggests that the teaching approach ensured a trustworthy interaction between students and tutors, which played a crucial role in effectively imparting knowledge. Face-to-face learning was essential for respiratory therapists in Saudi Arabia to build their skills and knowledge (Al Zahrani et al., 2021). Many times this learning method that takes place, without the use of technology, such as computers or the internet. Face-to-face learning allowed learners to interact with their instructor and other students in real-time, allowing them to ask questions and receive feedback immediately.

Advantages and Disadvantages of Face-to-Face Learning

The advantages of face-to-face learning were improvement, comprehension and retention, increased motivation, increased learner engagement, and enhanced interpersonal communication

skills. (Al Zahrani et al., 2021) Emphasize on face-to-face learning was more effective than online learning for complex topics that required a high degree of critical thinking and problem-solving. It also allowed learners to practice their skills and receive feedback from their instructor in real-time.

Though the emergence of E-learning has been lauded by scholars globally, face-to-face learning was still more effective for complex topics requiring a high degree of critical thinking and problem-solving (Al Zahrani et al., 2021). Additionally, face-to-face learning has been shown to increase motivation and engagement. Besides, face-to-face learning has been used for centuries to teach various topics to students of all ages. In recent years, face-to-face learning has become more popular for respiratory therapists as it allows them to practice their skills in real time and receive feedback from their instructor.

History and Statistics of Face-to-Face Learning

The Ministry of Health in Saudi Arabia reported that in 2018, over 2,000 respiratory therapists were employed nationwide. Over 1,500 were trained in face-to-face learning (Al Zahrani et al., 2021). Studies have shown that face-to-face learning was more effective than online learning for complex topics, such as those related to RT. Additionally, surveys have shown that respiratory therapists who have received face-to-face training have better communication and problem-solving skills than those who have received online training.

The Role of Teacher in the Concept of E-learning

The Role of the teacher in E-learning among RT learners was vital to ensure that the material was communicated effectively and efficiently. In E-learning, teachers guide learners during their online learning experience (Baoum et al., 2022). In particular, teachers provide

specific guidance, which reduces ambiguity and confusion that may arise from complex material. Furthermore, teachers provide feedback and advice to learners, thus helping them to understand and master the material in a timely fashion.

Teachers also introduce learning objectives and objectives-oriented teaching, which helps learners to effectively structure their learning sessions. According to Baoum et al. (2022), teachers create interactive exercises and activities that maximize student engagement, motivation, and participation. Teachers leverage personal relationships to ensure tailored, individualized, and customized learning experiences for learners (Rajeh, et al., 2021). Besides, teachers monitor student progress and serve as a point of contact and support for learners in need of assistance, providing the necessary guidance and advice to ensure their success (Baoum et al., 2022). By providing learners with a comprehensive, individualized learning experience, teachers can quickly help to create and maintain a thriving E-learning atmosphere.

The Role of Student in the Concept of E-learning

Students play a critical role in the concept of E-learning among RT learners in Saudi Arabia. According to Qanash et al. (2020), learners have an active part in adopting and adapting new technologies in the field. In order to make sure RT learners were using E-learning technologies, students must be willing to engage with the technologies. This means becoming familiar with the technology and using it to engage with the course material and with their peers.

Students must also have a say in the development and implementation of E-learning technologies, as they have a unique perspective on technology (Qanash et al., 2020). Students must be willing to learn and adapt to new technologies continuously. This ongoing effort will ensure that E-learning technologies in Saudi universities are used effectively for maximum benefit for RT learners.

COVID-19 and E-learning

Before the start of COVID-19, RT students in Saudi Arabia were primarily taught through traditional, in-person education. This would have included lectures, demonstrations, and practical experience in on-campus medical laboratories (AlAteeq et al., 2020). Digital technologies, while present in the education system, have yet to play a significant role in day-to-day learning. Due to Covid, many education facilities had to rely solely on E-learning to ensure the safety of students and faculty (AlAteeq et al., 2020). This meant a switch from traditional teaching methods to using digital platforms and virtual classrooms for teaching RT. This transition has allowed students to maintain their studies, interact with the instructors, and complete their clinical practices and certifications through E-learning. It has also allowed for more flexibility in terms of learning environments and made the transition from in-person to virtual education smoother for all involved.

Perception of E-learning among Health Care Providers

The perceptions of e-learning among RT students and healthcare providers are generally positive. Qanash et al. (2020) found that over 90% of students and healthcare providers involved in the study viewed E-learning as an effective way to learn and felt it was as practical or more effective as traditional in-person or lecture-based learning. Also, Khasawneh (2021) established that E-learning was beneficial for both student and provider learning, as well as helping to standardize educational programs. Additionally, most participants reported that the online format was more convenient and allowed them to learn and practice at their own pace.

Perception of E-learning among College Students in Saudi Arabia

King Khalid College students in Saudi Arabia have a positive attitude towards E-learning. They perceive it as being effective and advantageous, with the convenience of online learning being a significant factor in this positive perception (Khasawneh, 2021). Moreover, E-learning has the potential to augment traditional classroom-based learning. It can allow for real-time feedback and ongoing assessment and provide a way to give students personalized learning experiences. Additionally, E-learning facilitates communication between students and instructors and increases access to new technologies. Furthermore, it enables the use of digital resources and the ability to track individual progress. These features help to create a greater sense of autonomy, providing RT students and healthcare providers with more control over their learning journey. (Qanash et al., 2020).

The Prevalence of E-learning Globally and in Saudi Arabia

Globally, E-learning has seen an increase in popularity over the last decade, and most studies suggest that it was growing at an impressive rate. According to a Harvard Business School Online survey, 77% of U.S. employers reported using at least one form of E-learning in 2018 (Qanash et al., 2020). In the European Union, E-learning has experienced significant growth, particularly among those from 16 to 24. In 2021, 39% of young Europeans reported participating in online courses, while 49% utilized online learning materials, compared with 23% and 27% among adults aged 25 to 34, and 20% and 23% among adults aged 35 to 44. (Eurostat, 2022).

In Saudi Arabia, E-learning has been a part of the education landscape for many years. According to a survey of Saudi business professionals, 95% have used E-learning for professional development, with 82% indicating high satisfaction (Khasawneh, 2021). Among respiratory

therapy learners in Saudi Arabia, E-learning courses have been used to supplement traditional education and provide an additional pathway for specialist training.

In summary, the growing adoption of E-learning globally highlights its potential to reduce educational costs, increase access to education, and improve learning outcomes. With the potential for substantial cost savings, enhanced accessibility, and boosting student performance, E-learning continues to be popular among educational stakeholders (Almadni, 2021). In Saudi Arabia, the use of E-learning has been associated with better employability, increased flexibility for students, and improved learning outcomes. While there are still areas to be improved, such as the need for more quality assurance and regulatory processes, the rapid growth of the E-learning industry in both the global and Saudi Arabian markets suggest a promising future (Islam, et al., 2021).

CHAPTER III

METHODS

A cross-sectional study was used to investigate the perception of online learning “E-learning” among undergraduate RT students during COVID-19 in the Kingdom of Saudi Arabia (KSA). This study was a self-report study, using a validated instrument and published by Bączek et al. (2021) in Poland. The study structure was selected for its potential to provide convenient answers to the research questions while reducing costs and time. This chapter includes the procedures and criteria used to carry out this research.

This cross-sectional study explored the following questions:

- 1- What was the perception of E-learning among Saudi Arabian RT students?
- 2- What were the advantages and disadvantages of E-learning among RT students?
- 3- What was the association between sociodemographic variables and perception of E-learning among undergraduate RT students in Saudi Arabia?
- 4- What were the differences between face-to-face learning and E-learning among Saudi Arabian RT students in terms of their ability to master learning objectives?
- 5- What was the rate of acceptance of E-learning during the COVID-19 pandemic among RT students?

Study Instrument

The instrument used in this study was designed and structured by Dr. Michał Bączek et al., (2021) in Poland. The study assessed and measured the perception of online learning among medical students in Poland during COVID-19. Despite the fact that the study instrument was published, permission to use this survey was not granted even after e-mails were sent, yet all the credit goes to Bączek et al. (2021). The questionnaire included 17 questions, and four sections: 1)

basic demographics, 2) advantages and disadvantages of E-learning, 3) comparison between face-to-face learning and E-learning in terms of ability to master learning objectives: knowledge, clinical skills, and social competencies. Student's activity during face-to-face learning and E-learning, 4) acceptance of E-learning.

Study Design and Setting

The study was carried out through a cross-sectional survey to assess the perception of online learning E-learning among undergraduate RT students in Saudi Arabia during COVID-19. In Saudi Arabia, twenty-three departments of RT were detected, four of which claimed to be inactive (Almeshari et al., (2022)). The study included 17 educational institutions offering a five-year bachelor's degree program. The first year was pre-medical, which requires the study of basic sciences and the English language. The following second to fourth years involves studying RT courses in anatomy, physiology, and mechanical ventilation. The fifth year, the internship year, is clinical training without receiving theoretical classes in depth.

Study Population and Sampling Technique

The study used a convenient sample of RT students from Saudi Arabian public and private universities. According to a recent study conducted by Al-Mashari et al. (2022), 1297 students were enrolled in RT programs. However, the percentage of first-year students in the overall study population was unknown. Assuming a thousand students in their second and fourth academic years, it was expected to enroll two-hundred and eighty-seven students with a 95% confidence interval and a 5% margin of error. Students in their internship year were included in the study because they did participate in online learning classes during COVID-19.

Data Collection

Data collection began after obtaining Institutional Review Board (IRB) approval. The questionnaire was created electronically via google forms and distributed via RT students' university email. The researcher supervised the process of distribution in order to minimize bias. Participants had the right to withdraw from the study at any time.

Protection of Human Subjects

The Georgia State University Institutional Review Board (IRB) approved this research proposal. Moreover, since confidentiality was essential in data collection, the researcher informed the participants that the information they provided will be secured. The rights of the participants were reserved and protected. This survey's respondents were kept anonymous.

Ethical Consideration

A password-protected Excel file was used to guarantee the confidentiality of the participants' data on a secure server where only the lead researcher and the student investigator had access to it. Since confidentiality was essential in data collection, the investigator assured the participants that the information they provided was safe. The rights of the participants were secured and protected. This survey's respondents remained confidential.

Invitation Letter and Informed Consent

In addition to the survey, every participant in this study received an invitation letter. The invitation letter was visible on the survey's first page. Before getting started with the questionnaire, participants were prompted to provide informed consent. The participants were asked to give their agreement before moving ahead to the questionnaire. When a participant refused to participate in the study, the survey closed prior to any further steps being taken.

Data Analysis

In this research, information was entered using Microsoft Excel and coded to perform statistical analyses. Following collection, the raw data were examined, edited, and analyzed using Statistical Package for the Social Sciences (SPSS) version 28.0, SPSS Inc. Chicago, IL. Descriptive statistics such as mean, standard deviation, and frequency were calculated in order to describe the age and demography of the population. All descriptive and inferential statistics of the respondents were presented in frequencies, percentages, means, and standard deviations for a categorical profile of the respondents. Perception about online learning was compared using one-way ANOVA Analysis of variance (ANOVA) was used to compare the RT students' mean scores on the perception of online learning acceptance. One-way ANOVA test and t-test were used as appropriate to evaluate the statistical significance of the differences between the responses of the participants. The Chi-square test was used as appropriate to evaluate the statistical relationship between two qualitative variables. A p -value < 0.05 was considered significant.

Summary

This study was conducted among undergraduate RT students in SA, and it included students in their first through internship years. A convenient sample was taken from public and private universities, with data collection involving a Google Forms questionnaire distributed via university email. The study adhered to ethical standards, with IRB approval, confidentiality, and informed consent for participants. Data analysis utilized SPSS software, encompassing descriptive statistics, one-way ANOVA, t-tests, and Chi-square tests to assess the significance of various findings, with a p -value of < 0.05 considered significant.

Chapter IV

RESULTS

This chapter delves into the experiences and viewpoints of RT students, shedding light on their impressions of E-learning as a mode of education, particularly in the context of a global health crisis. By addressing critical research questions, valuable insights into how students in the field of RT navigated the transition to E-learning and the associated challenges and advantages they encountered. The outcomes discussed and provide an understanding of the impact of the pandemic on education and contribute to the ongoing dialogue surrounding the effectiveness and acceptance of E-learning within this specific academic domain.

This cross-sectional study explored the following questions:

- 1- What was the perception of E-learning among Saudi Arabian RT students?
- 2- What were the advantages and disadvantages of E-learning among RT students?
- 3- What was the association between sociodemographic variables and perception of E-learning among undergraduate RT students in Saudi Arabia?
- 4- What were the differences between face-to-face learning and E-learning among Saudi Arabian RT students in terms of their ability to master learning objectives?
- 5- What was the rate of acceptance of E-learning during the COVID-19 pandemic among RT students?

Demographic Characteristics of Respondents

A total of 221 questionnaires were collected from RT students. Among the 221 RT students, n=119 (53.8%) were females and n=102 (46.2%) were males. The age of the respondents ranged from 18 to 33 years ($M=21.50$, $SD=2.10$). Most of RT students' geographical region was located in the Eastern region n=67 (30.3%), while n=59 (26.7%) were from the Western region. A total of n=144 (65.2%) respondents had no previous experience with E-learning before the COVID-19 pandemic, whereas n=77 (34.8%) had experience. The majority of students n=65 (29.4%) were in the fourth academic year, while a number of RT students were in the third academic year n=54 (24.4%) and fifth year (internship) n=54 (24.4%). A total of n=101 (45.7%) respondents described their IT skills as moderate, n=93 (42.1%) as high, and n=27 (12.2%) as low. See Table 1 below.

Table 1. Demographic characteristics of study respondents (n= 221).

Variables		Frequency, Percent %
Age (mean \pmSD)	18 – 20	73 (33.0%)
	21 - 30	147 (66.5%)
	31 - 33	1 (0.5%)
Gender	Male	102 (46.2%)
	Female	119 (53.8%)
Academic Year	First-year	14 (6.3%)
	Second-year	34 (15.4%)
	Third-year	54 (24.4%)
	Fourth-year	65 (29.4%)
	Fifth-year (internship)	54 (24.4%)
Geographical Region	Central	52 (23.5%)
	Western	59 (26.7%)

	Northern	4 (1.8%)
	Eastern	67 (30.3%)
	Southern	39 (17.6%)
Describe your IT skills	High	93 (42.1%)
	Moderate	101 (45.7%)
	Low	27 (12.2%)
Participated in any type of e-learning before the COVID-19 pandemic	Yes	77 (34.8%)
	No	144 (65.2%)

Advantages and disadvantages of E-learning

The most common advantages of E-learning chosen by respondents were the ability to stay at home $n=150$ (67.9%), access to online materials $n=143$ (64.7%), learning at your own pace $n=138$ (62.4%), and comfortable surroundings $n=124$ (56.1%). The majority of respondents chose lack of interactions with patients $n=155$ (70.1%) and technical problems with IT equipment $n=125$ (56.6%) as the main disadvantages. (Table 2). RT Students' most common disadvantages through first to fifth year were lack of interaction with patients ($P=.003$), and social isolation ($P<.001$).

Table 2. Advantages and disadvantages of E-learning.

Variables	Total n= 221 (100%)			
	n, %	Mean, SD	<i>P</i> between academic years 1-5	Rank
Advantages of online learning				

Ability to stay at home	150 (67.9%)	0.68 (0.47)	0.79	1
Access to online materials	143 (64.7%)	0.65 (0.48)	0.41	2
Learning on your own pace	138 (62.4%)	0.62 (0.49)	0.45	3
Comfortable surrounding	124 (56.1%)	0.56 (0.50)	0.86	4
Ability to record a meeting	79 (35.7%)	0.36 (0.48)	0.28	5
Classes interactivity	26 (11.8%)	0.12 (0.32)	0.64	6
Disadvantages of online learning				
Lack of interactions with patients	155 (70.1%)	0.70 (0.46)	0.03	1
Technical problems	125 (56.6%)	0.57 (0.50)	0.22	2
Reduced interaction with teacher	112 (50.7%)	0.51 (0.50)	0.94	3
Lack of self-discipline	91 (42.6%)	0.41 (0.49)	0.92	4
Social isolation	89 (40.3%)	0.40 (0.49)	<0.001	5
Poor learning conditions at home	41 (18.6%)	0.19 (0.39)	0.97	6

**p*-value <0.05 is considered significant.

Comparison between face-to-face and online learning

Nonparametric Wilcoxon Signed Ranks Test revealed that there was no statistical difference between face-to-face (M=3.20) and online learning (M=3.31) in terms of opinions on the ability of the learning method to increase knowledge (P=0.33). E-learning was considered less effective than face-to-face learning in terms of increasing skills (M=2.05, M=4.25, respectively) (P<0.001) and social competences (M=2.07, M=4.04, respectively) (P<.001) (Table 3) & (Figure1). Students assessed that they were less active in terms of daily activity during online classes (M=2.75) compared with traditional classes (M=3.75) (P<0.001) (Table 3) & (Figure2).

Table 3. Comparison between face-to-face and online learning.

Variables

	Mean, SD	<i>P</i> value for significance between face-to-face and E- learning	Rank
Rate the effectiveness of e-learning in terms of increasing knowledge	3.20 (1.14)	0.32	2
Rate the effectiveness of traditional face-to-face learning in terms of increasing knowledge	3.31 (1.05)		1
Rate the effectiveness of e-learning in terms of increasing clinical skills	2.05 (1.00)	<0.001	2
Rate the effectiveness of traditional face-to-face learning in terms of increasing clinical skills	4.25 (0.89)		1
Rate the effectiveness of e- learning in terms of increasing social competences	2.07 (1.06)	<0.001	2
Rate the effectiveness of traditional face-to-face learning in terms of increasing social competences	4.04 (0.96)		1
Describe your activity during e-learning	2.75 (1.17)	<0.001	2
Describe your activity during face-to-face learning	3.75 (0.98)		1

**p*-value < 0.05 is considered significant.

Figure 1.

RT students' perception on the ability to increase knowledge (A), clinical skills (B), and social skills (C) during face-to-face and E-learning. Responders used the Likert scale where 1=Extremely Ineffective, 5=Extremely Effective.

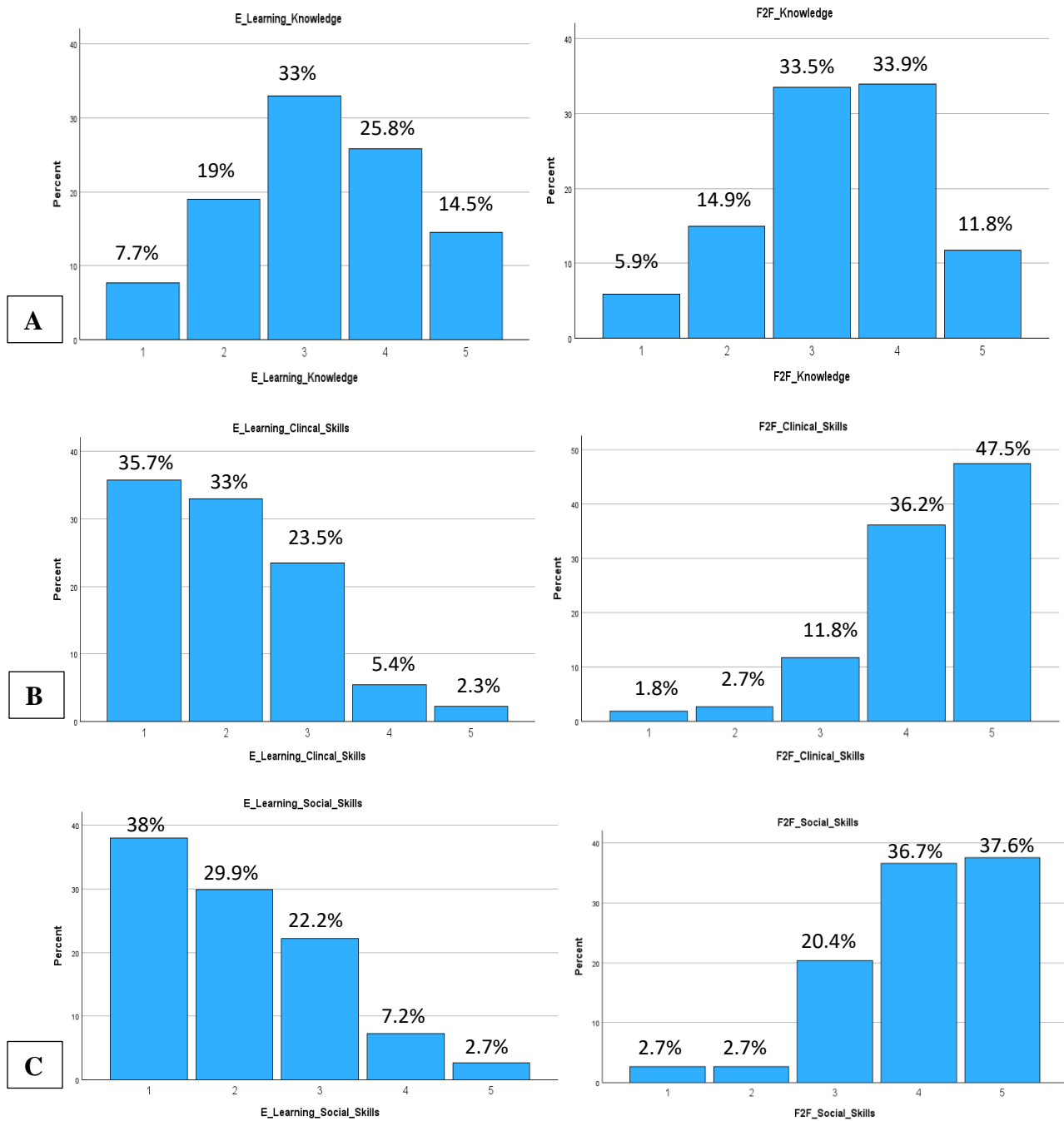
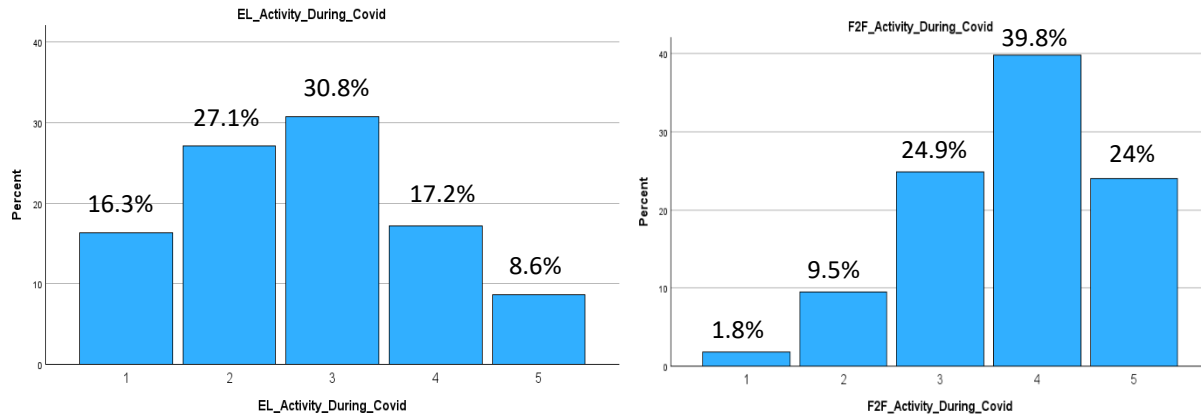


Figure 2.

Activity during face-to-face and E-learning, where 1=Extremely Inactive, 5=Extremely Active.



Impact of academic level between face-to-face and online learning

One-way ANOVA revealed that the effectiveness in terms of increasing knowledge of E-learning ($P=0.03$) was more impactful than face-to-face learning ($P=0.88$). Face-to-face learning ($P=0.01$) was considered more effective than E-learning ($P=0.53$) in terms of increasing clinical skills through all academic levels. The effectiveness of E-learning in terms of increasing social competences ($P=0.06$) revealed no statistical significance than in face-to-face traditional learning ($P=0.16$). Students assessed that there were no significant statistics in terms of daily activity during online classes ($P=0.55$) compared with traditional classes ($P=0.30$) (Table 4).

Table 4. Comparison between face-to-face and online learning by academic level.

Variables

Academic level	
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	Mean, SD					<i>P</i> value by academic level
	1 st year	2 nd year	3 rd year	4 th year	5 th year	
1. Rate the effectiveness of e-learning in terms of increasing knowledge	3.64 (1.08)	2.76 (1.25)	3.48 (1.04)	3.15 (1.00)	3.15 (1.25)	0.03
2. Rate the effectiveness of e-learning in terms of increasing clinical skills	2.29 (0.99)	2.12 (0.97)	2.19 (1.04)	1.92 (0.97)	1.98 (1.03)	0.53
3. Rate the effectiveness of e-learning in terms of increasing social competences	2.86 (1.35)	3.21 (1.00)	3.39 (0.99)	3.37 (1.11)	3.24 (1.11)	0.88
4. Rate the effectiveness of traditional face-to-face learning in terms of increasing knowledge	3.21 (0.89)	1.94 (1.09)	2.06 (1.07)	1.97 (0.95)	2.07 (1.04)	0.06
5. Rate the effectiveness of traditional face-to-face learning in terms of increasing clinical skills	3.79 (0.97)	3.88 (1.14)	4.39 (0.89)	4.42 (0.65)	4.26 (0.87)	0.01
6. Rate the effectiveness of traditional face-to-face learning in terms of increasing social competences	4.00 (0.78)	3.85 (1.13)	4.20 (0.89)	4.17 (0.84)	3.83 (1.07)	0.16
7. Describe your activity during e-learning	3.07 (1.20)	2.85 (1.25)	2.67 (1.31)	2.60 (1.10)	2.85 (1.05)	0.55
8. Describe your activity during traditional face-to-face learning	4.07 (0.91)	3.56 (1.02)	3.78 (1.11)	3.63 (0.91)	3.89 (0.92)	0.30

**p*-value < 0.05 is considered significant.

Impact of gender between face-to-face and online learning

Table 5 shows that one-way ANOVA revealed no significant difference ($p > 0.05$) in comparison between face-to-face learning and E-learning due to gender. To explain further, gender did not manifest to make variation between face-to-face learning and E-learning. See Table 5.

Table 5. Comparison between face-to-face and online learning by gender.

Variables	Gender		
	Male	Female	<i>P</i> value by
	Mean, SD	Mean, SD	gender
1. Rate the effectiveness of e-learning in terms of increasing knowledge	3.11 (1.17)	3.29 (1.10)	0.24
2. Rate the effectiveness of e-learning in terms of increasing clinical skills	2.08 (1.10)	2.03 (1.00)	0.74
3. Rate the effectiveness of e- learning in terms of increasing social competences	2.01 (1.02)	2.12 (1.10)	0.45
4. Rate the effectiveness of traditional face-to-face learning in terms of increasing knowledge	3.39 (1.12)	3.24 (0.98)	0.27
5. Rate the effectiveness of traditional face-to-face learning in terms of increasing clinical skills	4.36 (0.80)	4.15 (0.96)	0.08
6. Rate the effectiveness of traditional face-to-face learning in terms of increasing social competences	4.05 (0.95)	4.03 (0.97)	0.85
7. Describe your activity during e-learning	2.85 (1.12)	2.66 (1.21)	0.21
8. Describe your activity during traditional face-to-face learning	3.79 (0.94)	3.71 (1.02)	0.50

**p*-value < 0.05 is considered significant.

Acceptance of E-learning

A total of 159 (71.9%) respondents rated E-learning as enjoyable. Of these, 29 (13.1%) found it extremely enjoyable, 67 (30.3%) found it very enjoyable, and 63 (28.5%) found it somewhat enjoyable. A total of 62 (28.1%) students did not enjoy online learning. Of these, 26 (11.8%) students found it extremely unenjoyable, and 36 (16.3%) very unenjoyable (Figure 3). There was a statistically significance difference between answers given by students in the first year through the fifth year of academic years ($P=0.01$), as first year was the highest ($M=4.14$) then,

fifth year (internship) (M=3.22). (Table 6). There was no statistical difference between female and male students ($P=0.50$). Regarding geographical region, there was no significant difference ($P=0.66$).

Table 6. Acceptance of E-learning by sociodemographic: academic level, gender, and geographical region.

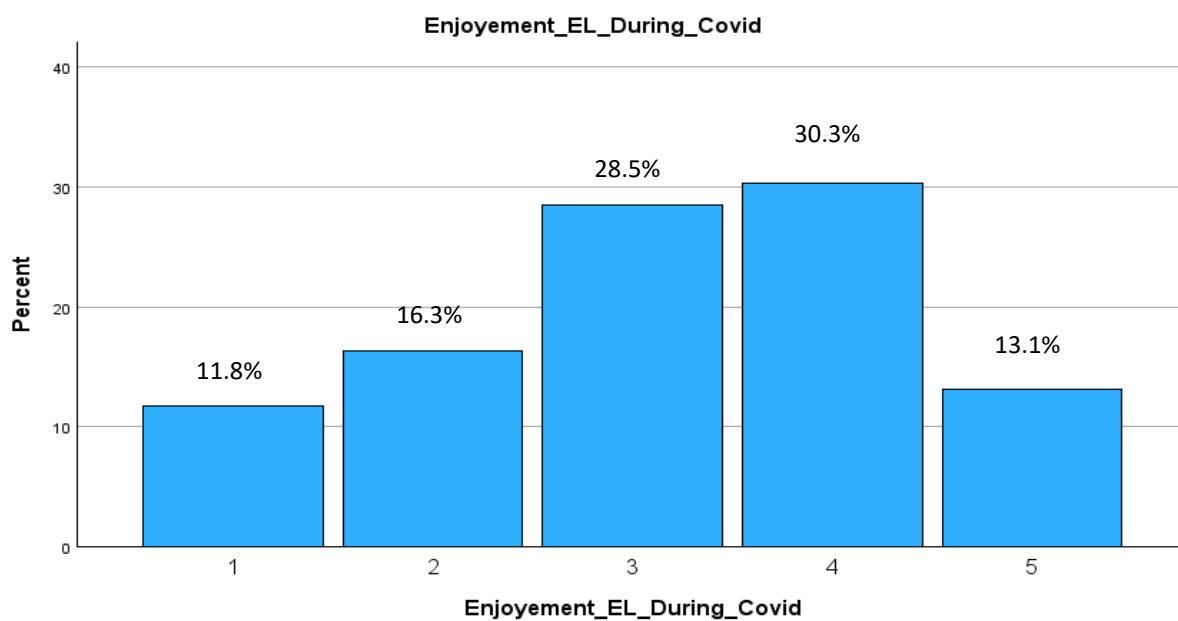
Variables	Total n= 221 (100%)			
	Enjoyment of E-learning during COVID-19 pandemic n=Respondents	Mean, SD	P value by sociodemographic	Rank
Academic Level			0.016	
First year	14	4.14 (0.77)		1
Fifth year	54	3.22 (1.28)		2
Third year	54	3.20 (1.17)		3
Second year	34	3.06 (1.18)		4
Fourth year	65	2.94 (1.16)		5
Gender			0.50	
Female	119	3.22 (1.12)		1
Male	102	3.11 (1.29)		2

Geographical Region			0.66	
Central	39	3.31 (1.28)		1
Western	59	3.25 (1.32)		2
Northern	67	3.18 (1.16)		3
Eastern	4	3.00 (0.81)		4
Southern	52	2.96 (1.06)		5

**p*-value < 0.05 is considered significant.

Figure 3.

Level of acceptance of e-learning, where 1=extremely unenjoyable, 5=extremely enjoyable.



Summary

This chapter provided a comprehensive analysis of the experiences and perspectives of RT students in the context of E-learning during the COVID-19 pandemic in Saudi Arabia. The results reveal that the majority of respondents were female (53.8%), with an age range of 18 to 33 years. Notably, 65.2% of the students had no prior experience with E-learning before the pandemic. Geographically, the Eastern region was the most represented (30.3%). In terms of academic year, the fourth year had the highest respondents (29.4%). Most students rated their IT skills as moderate (45.7%). The study also explored the advantages and disadvantages of E-learning, with students primarily appreciating the ability to stay at home, access to online materials, and the flexibility to learn at their own pace. The main disadvantages included the lack of interactions with patients and technical problems with IT equipment. A comparison between face-to-face and online learning showed no statistical difference in terms of increasing knowledge. However, E-learning was considered less effective in increasing skills and social competencies, and students were less active during online classes compared to traditional ones. The analysis by academic year demonstrated significant differences in students' enjoyment of E-learning, with first-year students being the most satisfied. No notable gender or geographical region differences in E-learning acceptance.

CHAPTER V

DISCUSSION

This chapter provides an in-depth exploration of the results pertaining to the research questions. Additionally, this chapter encompasses limitations and final conclusions. This cross-sectional study explored the following questions:

- 1- What was the perception of E-learning among Saudi Arabian RT students?
- 2- What were the advantages and disadvantages of E-learning among RT students?
- 3- What was the association between sociodemographic variables and perception of E-learning among undergraduate RT students in Saudi Arabia?
- 4- What were the differences between face-to-face learning and E-learning among Saudi Arabian RT students in terms of their ability to master learning objectives?
- 5- What was the rate of acceptance of E-learning during the COVID-19 pandemic among RT students?

The findings presented in Chapter IV provide evidence on how students pursuing RT in Saudi Arabia perceived and acclimated to E-learning during the COVID-19 pandemic. By addressing a spectrum of questions, this study provides insights into the lived experiences and perspectives of these students. The merits and demerits of E-learning, the influence of sociodemographic variables on students' perceptions, and the comparative analysis between E-learning and traditional face-to-face learning are discussed. Furthermore, the acceptance rate of E-learning during the COVID-19 pandemic offers a snapshot of the challenges and opportunities engendered by the abrupt transition to online education. These results make a contribution to the ongoing discourse regarding the efficiency and embracement of E-learning within the domain of

RT and educators and to provide valuable insights educational quality under demanding conditions and in the future.

Perception of E-learning

Study findings reveal that, according to Stain et al. (2005) and Amesse (2008), the surveyed students highly valued online E-learning for its ease of access to educational materials and the flexibility it provides in terms of study time and location. These advantages were especially beneficial during the COVID-19 pandemic, enabling students to remotely access their coursework and yielding cost savings related to accommodation and transportation.

Additionally, as highlighted in Zehry et al.'s research from 2011, E-learning provides advantages such as swift content delivery, uniformity, and the ability to easily update educational materials. This mode of learning can be put into practice via two distinct methods: self-guided and instructor-led learning. Self-guided E-learning, as exemplified by the findings of Peine et al. in 2016, grants learners the autonomy to self-manage their educational pursuits. Recent studies indicate that in specific situations, this approach might surpass traditional in-person learning.

Advantages and Disadvantages of E-learning among Saudi Arabian RT Students

E-learning, while advantageous, comes with its own set of limitations. This survey regarding the Perception of E-learning among Saudi Arabian RT students highlighted a significant concern: the absence of patient interactions. This observation is consistent with recent studies examining students' perspectives on online education during the COVID-19 pandemic in India, the USA, and Vietnam (Thomas et al., 2020; Qarajeh et al., 2020; Nguyen Tran Minh D. et al., 2020). Notably, the suspension of clinical internships and clerkships in various regions of Saudi Arabia has deprived RT students of the invaluable experience of learning from real patients in a

clinical setting. This hands-on experience was an indispensable component of RT students' clinical skills development, one that cannot be entirely replaced by distance or E-learning methods (Gaman et al., 2020). According to Urresti-Gundlach et al. (2017), partially addressing this challenge may involve the utilization of virtual patients (VPs). VPs are specifically created to replicate authentic clinical situations, affording learners the opportunity to adequately equip themselves in anticipation of genuine patient interactions.

Remarkably, survey respondents, (n=144), representing 65.2% of the total, had no prior experience with E-learning before the onset of the COVID-19 pandemic. This lack of prior exposure may help explain why technical issues emerged as the second most prominent drawback of E-learning, as reported by n=125 respondents, accounting for 56.6% of the total. Effective E-learning requires having a reliable internet connection as well as essential hardware and software components (Frith & Kee, 2003; Lu et al., 2009). Insufficient engagement between students and instructors, coupled with an absence of well-defined learning objectives and intentions, can obstruct educational advancement (Docherty, A. & Sandhu, H., 2006; Gagnon et al., 2007).

Differences between Face-to-Face learning and E-learning

The outcomes reported by respondents in the study indicated that E-learning (M=3.20) was nearly as effective in enhancing knowledge as conventional face-to-face learning (M=3.31), as no statistically significant difference exists. Conversely, participants' perception of E-learning was significantly less effective in terms of improving their clinical and social competence skills than in traditional face-to-face learning. Notably, the research indicated that the most effective approach for teaching clinical skills was a combination of E-learning and traditional face-to-face instruction. Within this context, video-based instruction, as supported by Buch et al.'s research from 2014, emerges as a superior method for imparting practical skills.

A compelling approach to enhance social competence skills involves the employment of remote standardized patients (RSPs) who engage with students through online platforms. RSPs were not only capable of depicting precise clinical scenarios but also of evaluating learners and furnishing immediate feedback. Langenau et al. (2014) investigated the utilization of RSPs in conjunction with Skype and its impact on the social skills of residents. Their research reported that 90% of participants concurred that this method was efficacious in imparting communication skills.

One observation of note was that Saudi Arabian RT students were notably lower in terms of activity in E-learning during the COVID-19 pandemic compared to traditional face-to-face learning. One possible explanation might stem from the absence of an interactive approach in the creation of E-learning courses. Interestingly, only 11.8% of the participants recognized interactive features as a benefit of E-learning, particularly during the COVID-19 pandemic. According to Cook & Steinert (2013), methods of E-learning with low or diminished interaction were perceived less favorably.

To enhance the interactivity of E-learning it is highly recommended to look for an innovative approach which is gamification. This involves incorporating "game design elements into non-game contexts." (Deterding et al., 2011). A systematic review carried out by Hamari et al. (2014), has demonstrated the effectiveness of gamification particularly in education with other numerous fields. Another method involves social and interactive learning, enabling students to engage with both their peers and instructors, fostering a collaborative environment where they can exchange thoughts and advance their knowledge within open platform activities. Another method to highlight involves branching scenarios, allowing students the chance to apply their skills in a practical context. This learning approach requires learners to make decisions and subsequent outcomes. Each decision leads to fresh challenges and additional options, and this method was

correlated with elevated educational achievements, primarily in terms of knowledge enhancement and clinical reasoning. (Cook et al., 2010)

Limitations

The study's limitations encompass the response rate, with the participation of only 221 RT student respondents, which constitutes a relatively modest sample when considering the total population of RT students in KSA. To safeguard the participants' anonymity and maintain the voluntary nature of the study, the questionnaire refrained from inquiring about the specific universities attended by each student. Consequently, the potential for institutional bias remains an aspect that cannot be disregarded. Students from the first through third years study theoretical subjects only, without clinical rotations, unlike students in the fourth and fifth years. For that, clinical bias cannot be disregarded.

Recommendations for Future Studies

A more extensive study involving a larger sample of RT students to assess their perceptions of E-learning and traditional face-to-face learning is needed. This should include evaluations of knowledge acquisition, clinical skill development, and the enhancement of social competencies among RT students following the COVID-19 pandemic. Such an undertaking has the potential to enhance the overall educational quality of RT students in KSA. Furthermore, it is highly recommended that future research implement gamification as an interactive approach of E-learning among RT students in SA.

Conclusion

This study provides a comprehensive exploration of the research questions, shedding light on the perceptions and experiences among Saudi Arabian RT students of E-learning during the

COVID-19 pandemic. The findings illuminate the advantages and disadvantages of E-learning, underlining its merits in terms of accessibility and flexibility, while also highlighting challenges related to a lack of patient interaction and technical issues. The comparisons between E-learning and traditional face-to-face learning have demonstrated that E-learning can be as effective in enhancing knowledge but less so in developing clinical and social competence skills. The study also noted a need for increased interactivity in E-learning course design. Acknowledging the limitations and considering the modest sample size, future research is recommended, involving a larger and more diverse sample of RT students to further explore and enhance the educational quality of E-learning in KSA. Effectively incorporating E-learning into the educational framework of RT students necessitates a well-designed strategy and a proactive plan for implementation.

References

- American Association for Respiratory Care. (n.d.-a). What Is An RT? <https://www.aarc.org/careers/what-is-an-rt/>
- American Association for Respiratory Care. (n.d.). WHERE RTs WORK. <https://be-an-rt.org/what-is-respiratory-therapy/where-rts-work/>
- Abbasi, M. S., Ahmed, N., Sajjad, B., Alshahrani, A., Saeed, S., Sarfaraz, S., Alhamdan, R. S., Vohra, F., & Abduljabbar, T. (2020). E-Learning perception and satisfaction among health sciences students amid the COVID-19 pandemic. *Work (Reading, Mass.)*, 67(3), 549–556. <https://doi.org/10.3233/WOR-203308>.
- AlAteeq, D. A., Aljhani, S., & AlEesa, D. (2020). Perceived stress among students in virtual classrooms during the COVID-19 outbreak in KSA. *Journal of Taibah University Medical Sciences*, 15(5), 398–403. <https://doi.org/10.1016/j.jtumed.2020.07.004>
- Alblihed, M. A., Aly, S. M., Albrakati, A., Eldehn, A. F., Ali, S. A. A., Al-Hazani, T., ... & Elmahallawy, E. K. (2021). The effectiveness of online education in basic medical sciences courses during the COVID-19 pandemic in Saudi Arabia: Cross-sectional study. *Sustainability*, 14(1), 224. <https://doi.org/10.3390/su14010224>
- Al-Otaibi, H. M., & AlAhmari, M. D. (2016). The respiratory care profession in Saudi Arabia: Past and present. *Annals of thoracic medicine*, 11(4), 237–242. <https://doi.org/10.4103/1817-1737.191872>
- Alotaibi G. (2015). Status of respiratory care profession in Saudi Arabia: A national survey. *Annals of thoracic medicine*, 10(1), 55–60. <https://doi.org/10.4103/1817-1737.146878>

- Almadni, R.M., & Almadni, R.M. (2021). Attitudes, Practices, and Perceptions towards Covid-19 Patients among Respiratory Therapists in Saudi Arabia. <https://api.semanticscholar.org/CorpusID:246940937>
- Almeshari, M. A., Alshehri, Z., Alqahtani, J. S., Alasmari, A. M., Alzahrani, A. A., Alahmadi, F. H., Alsulayyim, A. S., Alenezi, F. K., & Alwadeai, K. S. (2022). The status of respiratory care education in Saudi Arabia: A national survey of program directors. *Advances in Medical Education and Practice, Volume 13*, 619–628. <https://doi.org/10.2147/amep.s360658>
- Alshamrani, K. M., Ghulam, E. M., Alattas, M., Aljaddani, H., Alhakami, M., Al Nufaiei, Z. F., & Althaqafy, M. S. (2023). Transition to remote/hybrid learning during the COVID-19 pandemic among Saudi students of the College of Applied Medical Sciences: A cross-sectional study. *Frontiers in Medicine*, 10. <https://doi.org/10.3389/fmed.2023.1257589>
- Al Zahrani, E. M., Al Naam, Y. A., AlRabeeah, S. M., Aldossary, D. N., Al-Jamea, L. H., Woodman, A., Shawaheen, M., Altiti, O., Quiambao, J. V., Arulanantham, Z. J., & Elsafi, S. H. (2021). E- learning experience of the medical profession's college students during COVID-19 pandemic in Saudi Arabia. *BMC Medical Education*, 21(1). <https://doi.org/10.1186/s12909-021-02860-z>
- Alhaykan, A. (2015). Students' perceptions of using simulation in respiratory therapy ... (n.d.). <https://www.semanticscholar.org/paper/Students%E2%80%99-Perceptions-of-Using-Simulation-In-Alhaykan/ed1afb4876593cf334f018807139cdd9b7efbfc7>.
- Amesse, L. (2008). Evaluation of computer-aided strategies for teaching medical students prenatal ultrasound diagnostic skills. *Medical Education Online*, 13. <https://doi.org/10.3885/meo.2008.res00275>

- Bączek, M., Zagańczyk-Bączek, M., Szpringer, M., Jaroszyński, A., & Wożakowska-Kapłon, B. (2021). Students' perception of online learning during the COVID-19 pandemic: A survey study of Polish medical students. *Medicine*, 100(7), e24821. <https://doi.org/10.1097/MD.00000000000024821>
- Baoum, A. J., Hadidi, E. A., Alharbi, R. F., Hakami, A. Y., & Khan, M. A. (2022). *The Impact of COVID-19 Pandemic on Respiratory Therapy Students' Clinical Practice: A Cross-Sectional Study*. <https://doi.org/10.21203/rs.3.rs-2193369/v1>
- Blissitt A. M. (2016). Blended Learning Versus Traditional Lecture in Introductory Nursing Pathophysiology Courses. *The Journal of nursing education*, 55(4), 227–230. <https://doi.org/10.3928/01484834-20160316-09>.
- Brands, B., Tran, N. N., Baudendistel-Happ, E., Sanchez-Garcia, M., Fischer, M. R., & Koletzko, B. (2021). Global e-learning in early nutrition and lifestyle for international healthcare professionals: design and evaluation of the Early Nutrition Specialist Programme (ENS). *Nutrients*, 13(3), 775. <https://www.mdpi.com/2072-6643/13/3/775>
- Buch, S. V., Treschow, F. P., Svendsen, J. B., & Worm, B. S. (2014). Video- or text-based e-learning when teaching clinical procedures? A randomized controlled trial. *Advances in Medical Education and Practice*, 257. <https://doi.org/10.2147/amep.s62473>
- Cook, D., & Triola, M. (2014). What is the role of e-learning? Looking past the hype. *Medical Education*, 48(9), 930-937. doi: 10.1111/medu.12484.
- Cook, D. A., & Steinert, Y. (2013). Online learning for faculty development: A review of the literature. *Medical Teacher*, 35(11), 930–937. <https://doi.org/10.3109/0142159x.2013.827328>

- Cook, D. A., Erwin, P. J., & Triola, M. M. (2010). Computerized virtual patients in Health Professions Education: A systematic review and meta-analysis. *Academic Medicine*, 85(10), 1589–1602. <https://doi.org/10.1097/acm.0b013e3181edfe13>
- Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness. *Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*. <https://doi.org/10.1145/2181037.2181040>
- Docherty, A., & Sandhu, H. (2006). Student-perceived barriers and facilitators to e-learning in continuing professional development in primary care. *Education for primary care : an official publication of the Association of Course Organisers, National Association of GP Tutors, World Organisation of Family Doctors*, 17(4), 343–353. <https://doi.org/10.1080/14739879.2006.11864084>
- Eurostat. (2022, January 24). Interest in online education grows in the EU. Eurostat. <https://ec.europa.eu/eurostat/web/products-eurostat-news/-/edn-20220124-1#:~:text=In%20the%20EU%2C%20young%20people%20aged%2016%20to,and%2023%25%20among%20adults%20aged%2035%20to%2044.>
- Fowler, K. R. (2023). Death of the discussion board: Integration of online competency-based assessment in Graduate Nursing Programs. *Nurse Education Today*, 124, 105776. <https://doi.org/10.1016/j.nedt.2023.105776>
- Frith, K. H., & Kee, C. C. (2003). The effect of communication on nursing student outcomes in a Web-based course. *The Journal of nursing education*, 42(8), 350–358. <https://doi.org/10.3928/0148-4834-20030801-06>

- Gagnon, M. P., Légaré, F., Labrecque, M., Frémont, P., Cauchon, M., & Desmartis, M. (2007). Perceived barriers to completing an e-learning program on evidence-based medicine. *Informatics in primary care*, 15(2), 83–91. <https://doi.org/10.14236/jhi.v15i2.646>
- Găman, M.-A., Ryan, P. M., & Bonilla-Escobar, F. J. (2020). To stay at port or to go to sea: Are clinical clerkships a double-edged sword during the covid-19 pandemic? where do we go from here? *International Journal of Medical Students*, 8(2), 92–95. <https://doi.org/10.5195/ijms.2020.715>
- Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? -- A literature review of empirical studies on Gamification. 2014 47th Hawaii International Conference on System Sciences. <https://doi.org/10.1109/hicss.2014.377>
- Howlett, D., Vincent, T., Gainsborough, N., Fairclough, J., Taylor, N., Cohen, J., & Vincent, R. (2009). Integration of a Case-Based Online Module into an Undergraduate Curriculum: What is Involved and is it Effective? *E-Learning and Digital Media*, 6(4), 372–384. <https://doi.org/10.2304/elea.2009.6.4.372>.
- Islam, M. A., Nur, S., & Talukder, M. S. (2021). E-learning in the time of COVID-19: Lived experiences of three university teachers from two countries. *E-learning and Digital Media*, 18(6), 557-580. <https://journals.sagepub.com/doi/epub/10.1177/20427530211022924>
- Jebraeily, M., Pirnejad, H., Feizi, A., & Niazkhani, Z. (2020). Evaluation of blended medical education from lecturers' and students' viewpoint: a qualitative study in a developing country. *BMC Medical Education*, 20(1). doi: 10.1186/s12909-020-02388-8.
- Kacmarek R. M. (2013). Mechanical ventilation competencies of the respiratory therapist in 2015 and Beyond. *Respiratory care*, 58(6), 1087–1096. <https://doi.org/10.4187/respcare.02546>

- Khasawneh, M. A. S. (2021, August 1). Challenges resulting from simultaneous online education during the “covid-19” pandemic: The case of king khalid university, Saudi Arabia – doaj. Science and Education. <https://doaj.org/article/8314671d90ee4a26aa5a18d276d70650>
- Lu, D.-F., Lin, Z.-C., & Li, Y.-J. (2009). Effects of a web-based course on nursing skills and knowledge learning. *Journal of Nursing Education*, 48(2), 70–77. <https://doi.org/10.3928/01484834-20090201-10>
- Sinclair, P., Kable, A., & Levett-Jones, T. (2015). The effectiveness of internet-based e-learning on clinician behavior and patient outcomes: A systematic review protocol. *JBIR Database of Systematic Reviews and Implementation Reports*, 13(1), 52–64. <https://doi.org/10.11124/jbisrir-2015-1919>
- Mojarad, F. A., Hesamzadeh, A., & Yaghoubi, T. (2023). Exploring challenges and facilitators to e-learning based education of nursing students during covid-19 pandemic: A qualitative study. *BMC Nursing*, 22(1). <https://doi.org/10.1186/s12912-023-01430-6>
- Nguyen Tran Minh, D., Pham Huy, T., Nguyen Hoang, D., & Quach Thieu, M. (2020). Covid-19: Experience from Vietnam Medical Students. *International Journal of Medical Students*, 8(1), 62–63. <https://doi.org/10.5195/ijms.2020.505>
- Niebuhr, V., Niebuhr, B., Trumble, J., & Urbani, M. J. (2014). Online faculty development for creating E-learning materials. *Education for health (Abingdon, England)*, 27(3), 255–261. <https://doi.org/10.4103/1357-6283.152186>.

- Peine, A., Kabino, K., & Spreckelsen, C. (2016). Self-directed learning can outperform direct instruction in the course of a modern German medical curriculum - results of a mixed methods trial. *BMC medical education*, 16, 158. <https://doi.org/10.1186/s12909-016-0679-0>
- Qanash, S., Al-Husayni, F., Alemam, S., Alqublan, L., Alwafi, E., Mufti, H. N., & Ghabashi, A. A. (2020). Psychological effects on health science students after implementation of COVID-19 quarantine and distance learning in Saudi Arabia. *Cureus*, 12(11). <https://doi.org/10.7759/cureus.11767>
- Qarajeh, R., Tahboub, F., Rafie, N., Pirani, N., Jackson, M. A., & Cochran, C. D. (2020). The effect of covid-19 pandemic on US medical students in their clinical years. *International Journal of Medical Students*. <https://doi.org/10.5195/ijms.2020.508>
- Rahm, A.-K., Töllner, M., Hubert, M. O., Klein, K., Wehling, C., Sauer, T., Hennemann, H. M., Hein, S., Kender, Z., Günther, J., Wagenlechner, P., Bugaj, T. J., Boldt, S., Nikendei, C., & Schultz, J.-H. (2021). Effects of realistic e-learning cases on students' learning motivation during COVID-19. *PLOS ONE*, 16(4). <https://doi.org/10.1371/journal.pone.0249425>
- Rajeh, M. T., Abduljabbar, F. H., Alqahtani, S. M., Waly, F. J., Alnaami, I., Aljurayyan, A., & Alzaman, N. (2021). Students' satisfaction and continued intention toward e-learning: A theory-based study. *Medical education online*, 26(1), 1961348. <https://www.tandfonline.com/doi/epdf/10.1080/10872981.2021.1961348?needAccess=true&role=button>
- Sadeghi, R., Sedaghat, M. M., & Sha Ahmadi, F. (2014, October). Comparison of the effect of lecture and blended teaching methods on students' learning and satisfaction. *Journal of*

advances in medical education & professionalism.

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4235559/>

Salem, A. H. (2015). Randomized controlled trial of simulation - based teaching versus traditional clinical instructions in nursing: A pilot study among critical care nursing students. *International Journal of Nursing Education*, 7(1), 274. <https://doi.org/10.5958/0974-9357.2015.00055.0>

Stain, S. C., Mitchell, M., Belue, R., Mosley, V., Wherry, S., Adams, C. Z., Lomis, K., & Williams, P. C. (2005). Objective assessment of videoconferenced lectures in a surgical clerkship. *The American Journal of Surgery*, 189(1), 81–84. <https://doi.org/10.1016/j.amjsurg.2004.04.012>

Timeline and History of Respiratory Therapy - AARC. (2022). <https://www.aarc.org/aarc/timeline-history/>

Thomas, A., Shenoy, M. T., K. T., S., Suresh Kumar, S., Sidheeque, A., C. Khovidh, Pillai, J. P., Pillai, P. M., CH, S. S., Mathew, A., Zakkir, T., Dileep, S., Mekha, V., Raju, S., Junaid K., M., & P., S. (2020). Survey among medical students during COVID-19 lockdown: The online class dilemma. *International Journal of Medical Students*. <https://doi.org/10.5195/ijms.2020.571>

Urresti-Gundlach, M., Tolks, D., Kiessling, C., Wagner-Menghin, M., Härtl, A., & Hege, I. (2017). DO virtual patients prepare medical students for the real world? development and application of a framework to compare a virtual patient collection with population data. *BMC Medical Education*, 17(1). <https://doi.org/10.1186/s12909-017-1013-1>

Zehry, K., Halder, N., & Theodosiou, L. (2011). E-learning in medical education in the United Kingdom. *Procedia - Social and Behavioral Sciences*, *15*, 3163–3167.

<https://doi.org/10.1016/j.sbspro.2011.04.265>

APPENDIX A: IRB APPROVAL



INSTITUTIONAL REVIEW BOARD

Mail: P.O. Box 3999
Atlanta, Georgia 30302-3999
Phone: 404/413-3500

In Person: 3rd Floor
58 Edgewood
FWA: 00000129

September 13, 2023

Principal Investigator: Lynda T Goodfellow

Key Personnel: Alshehri, Faisal A; Goodfellow, Lynda T

Study Department: Georgia State University, Respiratory Therapy

Study Title: Respiratory Therapy Students' Perception on Online Learning During COVID-19 in the Kingdom of Saudi Arabia

Submission Type: Exempt Protocol Category 2

IRB Number: H24120

Reference Number: 376312

Determination Date: 09/11/2023

Status Check Due By: 09/10/2026

The above-referenced study has been determined by the Institutional Review Board (IRB) to be exempt from federal regulations as defined in 45 CFR 46 and has evaluated for the following:

1. Determination that it falls within one or more of the eight exempt categories allowed by the institution; and
2. Determination that the research meets the organization's ethical standards

If there is a change to your study, you should notify the IRB through an Amendment Application before the change is implemented. The IRB will determine whether your research continues to qualify for exemption or if a new submission of an expedited or full board application is required.

A Status Check must be submitted three years from the determination date indicated above. When the study is complete, a Study Closure Form must be submitted to the IRB.

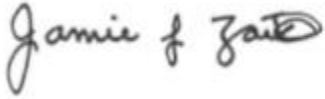
This determination applies only to research activities engaged in by the personnel listed on this document.

It is the Principal Investigator's responsibility to ensure that the IRB's requirements as detailed in the Institutional Review Board Policies and Procedures For Faculty, Staff, and Student Researchers (available at gsu.edu/irb) are

observed, and to ensure that relevant laws and regulations of any jurisdiction where the research takes place are observed in its conduct.

Any unanticipated problems resulting from this study must be reported immediately to the University Institutional Review Board. For more information, please visit our website at www.gsu.edu/irb.

Sincerely,

A handwritten signature in black ink that reads "Jamie f Zaikov". The signature is written in a cursive style with a large, stylized initial "J" and a small "f" between the first and last names.

Jamie Zaikov, IRB Member

APPENDIX B: INFORMED CONSENT AND INVITATION LETTER

Georgia State University
Informed Consent

Title: Respiratory Therapy Students' Perception of Online Learning During the Covid-19 Pandemic

Principal Investigator: Lynda Goodfellow

Student Principal Investigator: Faisal Alshehri

Dear Respiratory Therapy Student:

You are invited to participate in a research study that aims to assess your perception of E-learning during the COVID-19 pandemic among RT students in SA.

E-learning platforms are online learning web spaces that provide online classes through pre-recorded videos, live videos, or any means of communication virtually.

The questionnaire will take 3 minutes to complete. By answering the first question, you voluntarily agree to participate in this study and give your consent to use your anonymous data for research purposes only.

"You do not have to be in this study. You may skip questions or stop participating at any time".

For any additional inquiries regarding the study, you can contact the principal investigator, Dr. Lynda Goodfellow, via e-mail: ltgoodfellow@gsu.edu.

Please indicate that you agree to participate in this study.






I Agree to participate in this study. I was informed that participation in this study is voluntary.

I Disagree to participate in this study.


APPENDIX C: PERMISSION

Permission to use survey

ترجمة الرسالة إلى: العربية | عدم الترجمة من: الإنجليزية

...     

الجمعة 10:51 07/04/2023 صباحا




Faisal Alshehri 
إلى: michal.baczek@ujk.edu.pl
نسخة: Lynda Goodfellow

Greetings,

This is Faisal Alshehri a master's degree in respiratory therapy from Georgia State University. I want your permission to use the following survey and modify it.
Thank you in advance for your hard work and your great research.

The research:
- Bączek, M., Zagańczyk-Bączek, M., Szpringer, M., Jaroszyński, A., & Wozakowska-Kapłon, B. (2021). Students' perception of online learning during the COVID-19 pandemic: A survey study of Polish medical students. *Medicine*, 100(7), e24821. <https://doi.org/10.1097/MD.0000000000024821>

Email: Falshehri1@student.gsu.edu

إعادة توجيه  الرد على الكل  رد 

APPENDIX D: SURVEY QUESTIONNAIRE

I Basic demographics

1. What is your age?

2. What is your gender?

Male Female

3. What is your academic year are you in?

1st year 2nd year 3rd year 4th year 5th year (internship)

4. How would you describe your IT skills?

High Moderate Low

5. Have you ever participated in any type of e-learning before the COVID-19 pandemic?

Yes No

II Advantages and Disadvantages of e-learning

6. What are the advantages of e-learning? Pick all that you consider true.

- Access to online materials
- Learning on your own pace
- Ability to stay at home
- Classes interactivity
- Ability to record a meeting
- Comfortable surrounding

7. What are the disadvantages of e-learning? Pick all that you consider true.

- Reduced interaction with the teacher
- Technical problems
- Lack of interactions with patients
- Poor learning conditions at home
- Lack of self-discipline
- Social isolation

III Comparison between face-to-face learning and e-learning in terms of ability to master learning objectives: knowledge, clinical skills and social competences. Student's activity during face-to-face learning and e-learning

8. Using a five-point scale (where 1-extremely ineffective, 5-extremely effective) rate the effectiveness of e-learning in terms of increasing knowledge

1 2 3 4 5

9. Using a five-point scale (where 1-extremely ineffective, 5-extremely effective), rate the effectiveness of e-learning in terms of increasing clinical skills

1 2 3 4 5

10. Using a five-point scale (where 1-extremely ineffective, 5-extremely effective), rate the effectiveness of e-learning in terms of increasing social competences

1 2 3 4 5

11. Using a five-point scale (where 1-extremely ineffective, 5-extremely effective) rate the effectiveness of traditional face-to-face learning in terms of increasing knowledge

1 2 3 4 5

12. Using a five-point scale (where 1-extremely ineffective, 5-extremely effective) rate the effectiveness of traditional face-to-face learning in terms of increasing clinical skills

1 2 3 4 5

13. Using a five-point scale (where 1-extremely ineffective, 5-extremely effective) rate the effectiveness of traditional face-to-face learning in terms of increasing social competences

1 2 3 4 5

14. Using a five-point scale (where 1-extremely ineffective, 5-extremely effective) rate the effectiveness of traditional face-to-face learning in terms of increasing social competences

1 2 3 4 5

15. Using a five-point scale (where 1-extremely inactive, 5- extremely active) describe your activity during traditional face-to-face learning

1 2 3 4 5

16. Using a five-point scale (where 1-extremely inactive, 5- extremely active) describe your activity during traditional face-to-face learning

1 2 3 4 5

IV Acceptance of e-learning

17. Using a five-point scale (where 1- extremely unenjoyable, 5- extremely enjoyable) rate how much did you enjoy e-learning classes during the pandemic

Extremely Unenjoyable	Very Unenjoyable	Somewhat Enjoyable	Very Enjoyable	Extremely Enjoyable
<input type="radio"/> 1	<input type="radio"/> 2	<input type="radio"/> 3	<input type="radio"/> 4	<input type="radio"/> 5