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The effects of radiation infographics video to the perception regarding radiation among first-year nursing students of De La Salle Medical and Health Sciences Institute

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THE EFFECTS OF RADIATION INFOGRAPHICS VIDEO TO THE PERCEPTION REGARDING RADIATION AMONG FIRST-YEAR NURSING STUDENTS OF DE LA SALLE MEDICAL AND HEALTH SCIENCES INSTITUTE

An Undergraduate Thesis Presented to
the Faculty of the College of Medical Imaging and Therapy
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Dasmariñas City, Cavite

In Partial Fulfillment
of the Requirements for the Degree
Bachelor of Science in Nuclear Medicine Technology

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ABSTRACT

The purpose of this study was to determine how a radiation infographics video would affect the perception of thirty-two first-year volunteer nursing students from DLSMHSI about radiation. These thirty-two (32) individuals were divided into treatment and control groups. Using a validated self-made questionnaire with nine (9) questions whose scope revolves around sources of radiation exposure in the radiology and nuclear medicine department, exposure and its potential harms and risks, and radiation protection and safety precautions, data were gathered by the researchers during the COVID-19 pandemic. Data collection was made possible by using Google Forms and ZOOM Cloud Meetings, and was treated by using standard deviation, mean, independent *t*-test, and paired *t*-test.

The results of this study demonstrate that before watching the radiation infographics video, the participants' perceptions of radiation in all areas that the researchers were interested in were neither positive nor negative. The radiation infographics video was then shown to the treatment group, and the researchers discovered a significant shift in perception among the participants from a "neither positive nor negative" perception to a "positive" perception. The change from the treatment group's perception to the "positive perception" suggests that the radiation infographics video had a beneficial impact on first-year nursing students' perceptions of radiation. The positive shift in perception among the participants affirms previous studies stating the effectiveness of videos for relaying information and changing perception.

APPROVAL SHEET

This undergraduate thesis entitled, ***The Effects of Radiation Infographics Video to the Perception Regarding Radiation Among First-Year Nursing Students of De La Salle Medical and Health Sciences Institute,*** prepared and submitted by Nicole Marjorie C. Gabriel, Chris Mathew D. Go, Ephraim Job O. Lapak, Arth David Anthony T. Padua, and Neil Patrick Jose L. Samson, in partial fulfillment of the requirement for the degree of Bachelor of Science in Nuclear Medicine Technology has been examined and is recommended for acceptance and approval for final oral defense.

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The Researchers

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1

THE PROBLEM AND ITS BACKGROUND

Background of the Study

Radiation has long been a controversial topic, particularly when it comes to using it in a medical setting for diagnostic and therapeutic purposes. When it comes to radiation, most people have demonstrated a lack of awareness, and their perception is primarily formed through media content (Shaaban & Shaikh, 2018). According to Merriam-Webster (n.d.), perception is a result of perceiving—to attain awareness or understanding. This is the result when someone thinks after analyzing a concrete, logical fact (Otwori, 2018). Given the definition of perception, there are also what we refer to as misperceptions which are false beliefs. What contributes to the formation of these inaccurate or unsupported beliefs is what is referred to as misinformation. People are asked if they agree with or believe certain factual claims, or they are asked to choose their stance on disputed factual questions, to assess the prevalence of misperception (Nyhan, 2020).

Here in the Philippines, Canlas (2016) conducted a study on the radiation risk perception of university students from Leyte Normal University which revealed that students have several misconceptions about radiation, such as associating radiation exposure in general with acquiring infertility, baldness, and cancer. Moreover, Ibanez, Manaois, Soledad, and Bracil (2016) conducted a similar study in the Davao Doctors College, exploring how radiation effects are portrayed in movies, games, and the news, and how such portrayal impacts how people perceive radiation. For instance, the media depicts extraordinary powers or green-colored skin to be effects of radiation. Consequently, students appeared to believe that radiation would cause physical, behavioral, and mental changes, as depicted in the entertainment media (Ibanez et al., 2016). Furthermore, the atomic bombs dropped on Japan, as well as the Fukushima Daiichi and Chernobyl nuclear powerplant incidents, all contributed to the negative perception people had regarding radiation because of the harm that affected people and its land (Canlas, 2016).

Only to a limited extent can radiation exposure, at a certain dose rate, lead to diseases including infertility, alopecia, and cancer. A dose excess of three hundred (300) rad would be required to cause baldness or other radiation-related problems on the skin and hair, and a dose to the reproductive organs of four hundred (400) rad would be required to increase the chance of infertility in both men and women. Both doses are extremely high, and a patient must be exposed to at least a thousand chest x-rays in a single day in order for baldness and infertility to develop. The main concern of radiation workers and the general public is cancer. Although epidemiologic studies estimate the risk of dying from radiation induced cancer is extremely low (Garg et al., 2022), there are many protocols prepared by several international organizations in which countries strictly adhere to further lower the likelihood of this happening.

As for mutations depicted by science fiction, the USNRC (n.d.). states that while radiation can cause mutations to cells due to cells being highly radiosensitive, the public must be informed that the way science fiction literature and cinema depict mutation in the form of hideous creatures, no such transformation have been observed in humans. Individuals should also know that the reason why genetic effects of radiation exposure from low dose exposures, such as medical diagnostic exposure, is not observed in human studies is because that the mutations in the reproductive cells have caused significant changes in the fertilized egg to the point that it has either underwent cellular repair or correction or has been aborted during the early stages of fertilization.

While there are a variety of sources people could turn to in order to gain more understanding of radiation risks and their effects, patients still prefer to receive radiation information from healthcare practitioners given that they are expected to be more knowledgeable about the topic (Evans et al., 2015). Unfortunately, misconceptions about radiation also come from healthcare professionals themselves (Evans et al., 2015; Goula et al., 2021; Hesse et al., 2012). For instance, some healthcare professionals have been found to exaggerate the risks of exposure to ionizing radiation in terms of diagnostic and interventional procedures (Hesse et al., 2012), and some medical students and physicians lacked awareness of various radiation procedures and the use of ionizing and non-ionizing radiation in radiologic examinations (Goula et al., 2021). Abeulhia (2017) also found that junior doctors and medical students had a poor understanding of diagnostic radiological procedures. Due to this, previous literature emphasizes the importance of further educating healthcare professionals across different medical specialties about basic principles of radiation, radiation exposure, and risk (Evans et al., 2015; Zaorsky et al., 2016), especially since patients tend to seek counsel from medical healthcare practitioners regardless of what field of medicine they specialize in (Zaorsky et al., 2016).

Nurses, specifically, are allied health workers whom patients and families get in touch with when they feel vulnerable and seek answers and are one of the most trusted professionals (INSCOL Philippines, 2018). As such, nurses should also be educated about radiation not only because they are occupationally exposed to it, but also because they must guide and thoroughly explain radiological procedures to their patients. However, nurses are academically uninformed and unaware of radiation risks and protective measures related to the use of radiation in medical imaging (Anim-Sampong et al., 2015).

With this, the researchers believe that nurses need to have a positive perception and a good understanding of radiation to be able to provide accurate information to their patients regarding radiological procedures. One way to improve their understanding of radiation would be through video learning, which has been shown to be an effective mode of communication, increasing a person's interest, comprehension, and retention of knowledge (Vanichvasin, 2021) contrary to the traditional way of learning. In a classroom learning setting, previous studies have shown the effectiveness of using infographics and videos as learning materials in various medical courses, such as anatomy and nursing (Ozdamla et al., as cited in Maguire, n.d.; Salina et al., 2012). Infographics, compared to other visuals, allowed students to visualize key information
(Ozdamla et al., as cited in Maguire, n.d) while videos helped students understand processes and techniques (Jeong, 2017; Salina et al., 2012).

As such, by combining the visual elements of infographics with the interactivity and auditory elements of a video, infographics videos can convey a large amount of information and can be an effective educational tool (Boateng et al., 2016). An infographics video is a visual representation of data and knowledge that incorporates both visuals and voice to educate and broaden the perspective of viewers about a certain topic and to effectively communicate the intended message to its viewers.

With this, the researchers would like to explore the effectiveness of infographics videos in providing accurate information about radiation, radiation protection, and risks associated with radiation exposure. This would help the researchers to examine the effect of radiation infographics video to the perception regarding radiation among first-year nursing students from De La Salle

Medical and Health Sciences Institute. This study will benefit first-year nursing students as well, especially those who are considering careers in the field. It would introduce them to many facets of the industry and help them better grasp how safe it is to deal with radiation, how it is utilized for therapeutic and diagnostic purposes, etc.

Statement of the Problems

The purpose of this study was to see the effects of radiation infographics video on the perception regarding radiation among first-year nursing students of De La Salle Medical and Health Sciences Institute during the second semester of the academic year 2021-2022.

Specifically, this study answered the following research questions:

1. What is the perception of the participants of both the treatment and control groups on radiation before and after the radiation infographics video?

2. Is there a significant difference in the participants' perception regarding radiation before and after the radiation infographics video in the treatment and control groups?

3. Is there a significant difference in the participants' perception regarding radiation between the treatment and control groups before and after the radiation infographics video?

Hypotheses of the Study

The research study tested the following hypotheses:

1. There is no significant difference in the participants' perception regarding radiation before and after the radiation infographics video in the treatment and control groups.

2. There is no significant difference in the participants' perception regarding radiation between the treatment and control groups before and after the radiation infographics video.

Conceptual and Theoretical Framework

The concept of knowledge influencing perception was based on a study by Rock (2002) on the correlation between perception and knowledge. Learning is defined as the gain of knowledge; however, it allows recognition and interpretation leading to perceptual enrichment. This implies that knowledge as a representation of experience does affect perception, and the matter of negative or positive perception is mainly derived from the source of gained knowledge.

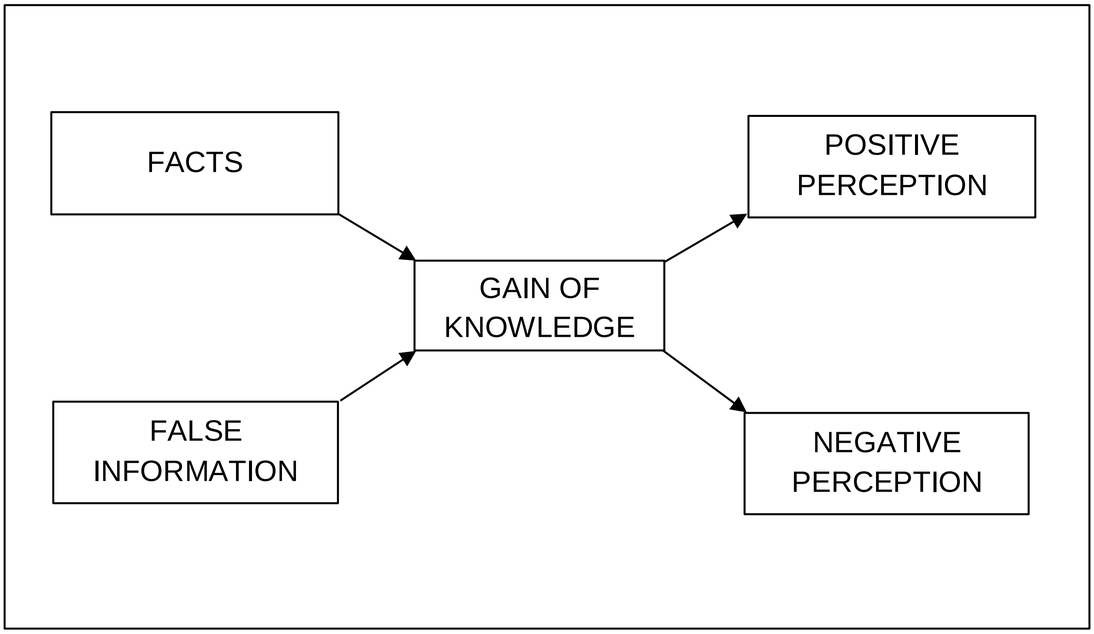

Figure 1. Perceptual *enhancement* by Irvin Rock (2002).

This study was also guided by Mayer's cognitive theory of multimedia learning (2001). Mayer's theory mainly focused on the gain and retention of knowledge through the mode of video-based learning and the factors necessary for ideal knowledge gain and retention for the viewer. To develop an effective infographics video, it is necessary to organize the content accordingly following Mayer's theory through four (4) organizational channels divided into two parts, the gain of knowledge and the retention of knowledge. The first channel is (1) multimedia presentation which is the general design of the video. This channel focuses on the way information is presented to the viewer and is organized into a verbal and pictorial modality. The second channel is (2) sensor memory, which makes use of the visual and auditory senses of the viewer to process information, in turn, gain knowledge through the video. The third and fourth channels then focus on the retention of knowledge through (3) working memory and (4) long-term memory. These two channels process information by allowing an intellectual organization of new information and memory or prior information.

The cognitive theory of multimedia learning developed by Mayer served as a guide for the production of the video. To help viewers understand, whether they are visual or auditory learners, various forms of multimedia were used, including images, video clips, and voiceovers. In order to assess whether the viewers gained information that could be perceived as positive or negative, facts were stated, and false information was explained during the video production.

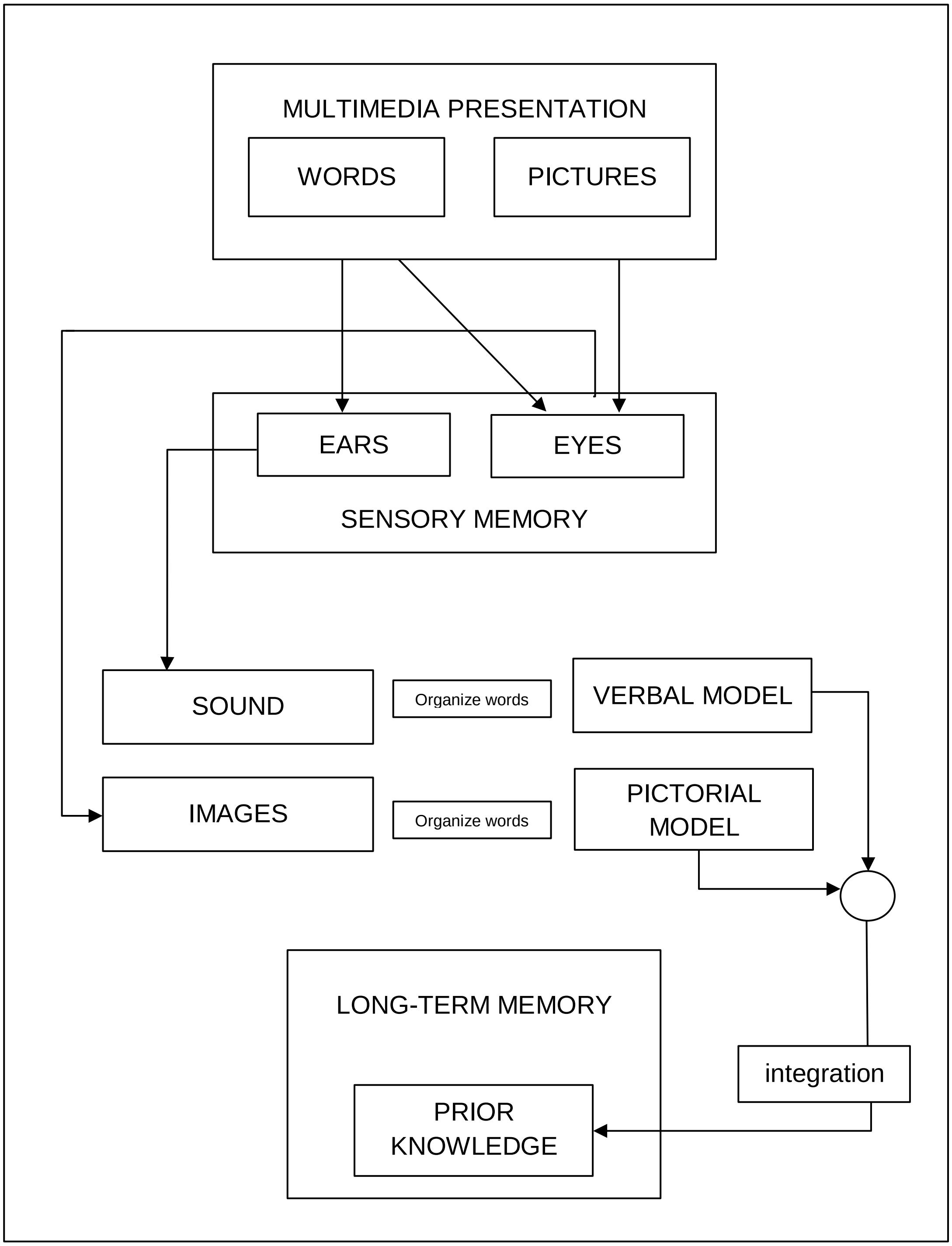

Figure 2. Mayer's cognitive theory of multimedia learning (2001)

The researchers determined that Mayer's cognitive theory of multimedia learning (2001) was knowledge bound yet can be adapted through the concept of Rock (2002) on the correlation of perception and knowledge. With this, the researchers have considered both the theory of multimedia learning and the concept of the correlation of perception and knowledge throughout the development of this study.

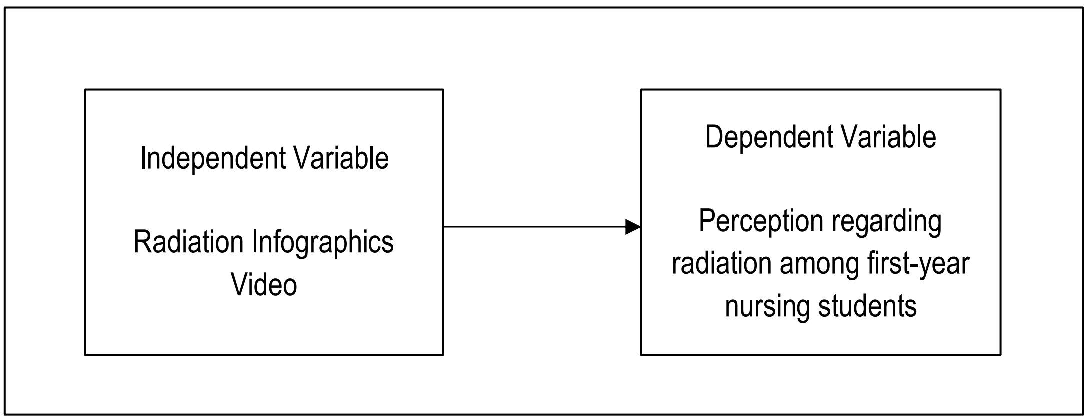

Figure 3. The paradigm of the study.

Figure 3 shows the paradigm of the study which investigated the effects of a radiation infographics video on the perception of radiation among first-year nursing students. The radiation infographics video is the independent variable and the perception regarding radiation is the dependent variable.

Scope and Limitation of the Study

The purpose of this study was to determine the effect of an infographics video on the perception regarding radiation among first-year nursing students from De La Salle Medical and Health Sciences Institute (DLSMHSI). This study covered the population of first-year nursing students enrolled in the Bachelor of Science in Nursing program of DLSMHSI during the second semester of the academic year 2021-2022.

The independent variable of this study is the infographics video, while the dependent variable is the perception regarding radiation of first-year nursing students. The study had a sample size of thirty-four (34) students, two (2) of which opted out and did not give consent. Data gathering occurred from February 2022 to March 2022 during the second semester of the academic year 2021-2022.

The researchers chose first-year nursing students as the study's participants as they have not been extensively exposed to courses dealing with radiation and their future line of work encompasses interaction with the patients. Unfortunately, the researchers were unable to examine the effects of demographic profiles on the study, and due to the COVID-19 pandemic, this study was confined to the use of online modalities such as Zoom Cloud Meetings and Google Forms.

Chapter 2

METHODOLOGY

This chapter deals with the discussion of the methodologies utilized in this study. It consists of the (a) research design; (b) sources of data; (c) population and sampling; (d) research instrument; (e) data gathering; and (f) statistical treatment of data.

Research Design

The research applied a true experimental design. This experimental design was utilized since it can establish a causal relationship (Salkind, 2010). True experimental designs include three distinct components: independent and dependent variables, pretesting and post-testing, and experimental and control groups. The effect of the intervention is tested in a true experimental research design by comparing the experimental group with the control group. The experimental group will receive the intervention, while the control does not, but will receive a different activity not related to nor close to the intervention for the experimental group.

More importantly, participants in a true experimental design must be allocated to either the control or experimental groups at random. A random technique was used to divide individuals, such as a random number generator, into experimental and control groups (Decarlo, 2018). In this study, randomization was accomplished through the random assignment of participants to their respective breakout rooms - a function available in Zoom Cloud Meetings when dividing a session into two or more equal groups.

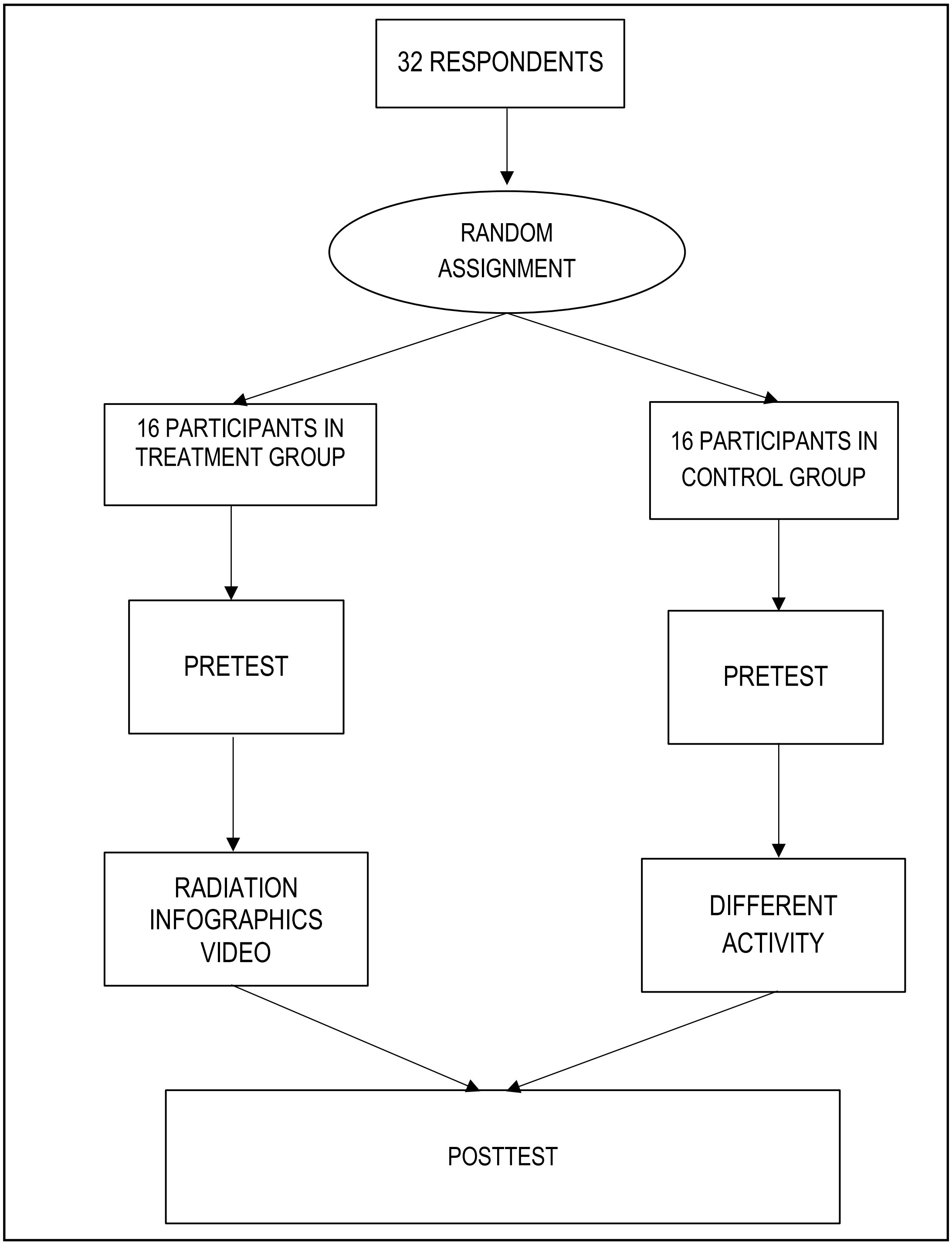

Figure 4. Randomized pretest-posttest design and flow of the study.

Figure 4 illustrates the suitable research design and the flow of the study. Since the researchers wanted to examine the effect of radiation infographics video to the perception regarding radiation among first-year students enrolled in the Bachelor of Science in Nursing program at De La Salle Medical and Health Sciences Institute, they adopted a randomized pretest-posttest control group design. According to Dugard and Todman (2006), a pretest-posttest control group design is ideally suited for examining the effects of an educational intervention and is frequently used in educational research.

Sources of Data

The data were gathered from first-year students of the Bachelor of Science in Nursing from De La Salle Medical and Health Sciences Institute during the second semester of the academic year 2021-2022. The schedules of the Zoom Cloud Meeting Sessions were also sent so that they could voluntarily participate in their free time. A total of thirty-four (34) voluntary participants attended the three (3) sessions of data gathering. There were, however, two (2) students that did not finish nor did they give consent to participate in the study. The researchers specifically chose first-year nursing students because of two reasons. First, nurses are particularly diverse healthcare workers that could be deployed to work in radiology or nuclear medicine, hence the need to have a sound understanding of the risks and benefits of radiation. They also advocate for the patient, wherein they may be asked questions regarding the patient's concerns. Second, the researchers chose first-year nursing students because it would be best to educate them at the beginning of their education. They are not yet exposed to any radiation science since the DepEd’s spiral progression curriculum only covers sciences such as Integrated Science, Physics, Chemistry, and Biology (Adanza and Resurreccion, 2015). Their level of perception regarding radiation is the ideal data for this study since the researchers wanted to know the effectiveness of an infographics video on their perception.

Population and Sampling

Based on the data provided by the registrar of De La Salle Medical Health and Sciences Institute, there are a total of three hundred and eighty-one (381) first-year nursing students. Participants were chosen using a non-probability volunteer sampling technique in which a letter to the respondents was disseminated across sections by class presidents to encourage participation, and participants willing to participate in the study voluntarily reached out to the researchers.

This study was able to gather 34 out of 381 volunteering first-year nursing students. Among those responses from the thirty-four (34) volunteering first-year students, one student did not give their consent to participate in the study from the treatment group. That student, therefore, was not included in the data-gathering activity, while another student from the control group asked the researchers to revoke and delete the information and data they had input.

A total of thirty-two (32) 1st year nursing students completed the activity, with 16 responses from the treatment group and sixteen (16) responses from the 16 students of the control group.

Table 1

Frequency Distribution of the Population of the Study

Program	*n*	%
Consented	32	8.39 %
No reply	347	91.0 %
Did not consent	1	0.3 %
Withdrew	1	0.3 %

Note. N = 381.

Research Instrument

The researchers developed a self-made questionnaire to determine the perception regarding radiation of first-year nursing students. The questionnaire consists of nine (9) questions that explore how the participants feel and believe about certain scenarios, sources of radiation exposure and its potential harms and risks, and radiation protection and safety precautions to follow.

The researchers also created a self-produced radiation infographics video that included short clips from previous nuclear accidents from 0:00 to 0:49 of the video to show more about the risks associated with radiation exposure if mishandled or involved in an accident. Facts about how scientists have conducted extensive research to ensure that medical radiation use, nuclear energy use, etc. are practically safe to use when radiation safety protocols are being observed and followed can be seen in the video from 0:47 to 1:06. It also provides a brief overview of the various radiation-caused conditions or diseases, their corresponding equivalent doses, and the corresponding number of chest x-ray scans in a single day. The researchers also covered numerous sources of radiation exposure in radiology and nuclear medicine in the video. Towards the end of the video, the participants watched an explanation of the three protective measures in radiation safety: time, distance, and shielding discussed from 1:55 up to 3:00

In creating the infographics video and questionnaires, the researchers used the Radiation Safety Handout for Nurses by Kaiser Permanente, Southern California Region for reference, as it discusses the essential information, such as sources of radiation exposure in the radiology and nuclear medicine department, its potential harms and risks, and radiation protection and safety precautions to follow ("Radiation Safety for Nurses", n.d.). This section elaborates on a brief summary of the video's contents to explain what the participants have seen.

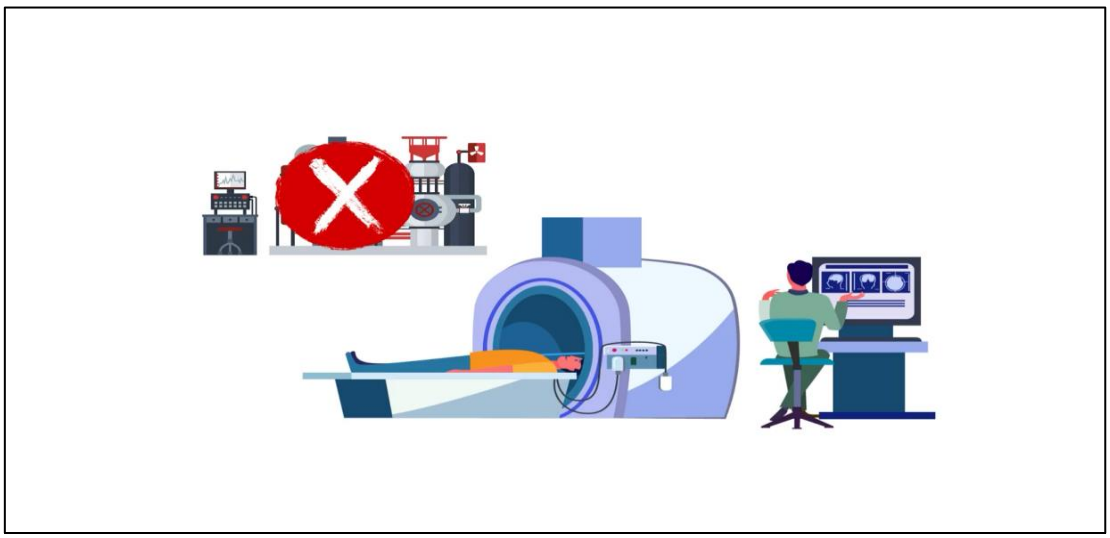

Figure 5. Safe use of radiation in the medical field.

The video from 1:07 to 1:35 demonstrated that low doses of ionizing radiation are typically used in medical procedures so that patients and staff are not immediately at risk for side effects.

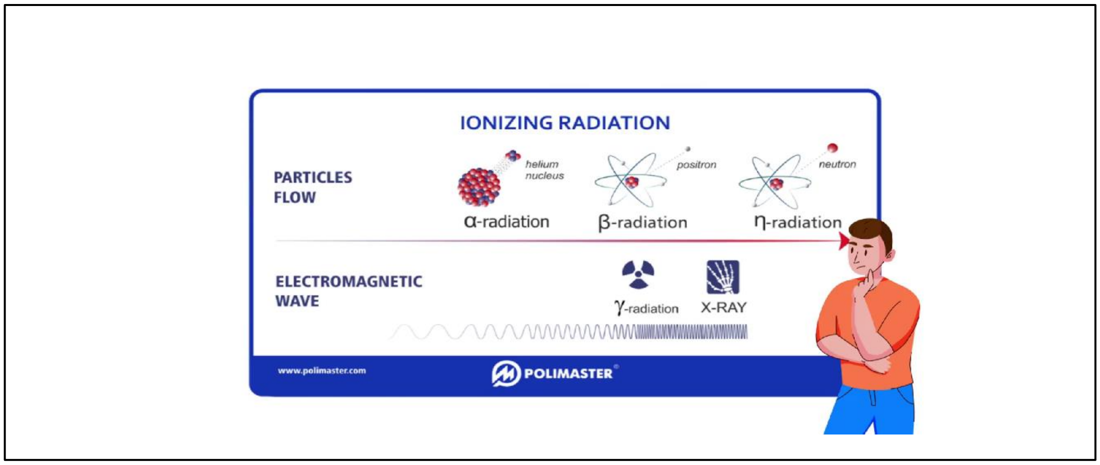

Figure 6. Types of radiation and doses discussed.

The three measures that the medical imaging department is currently using to ensure that the exposure to radiation and the risk being imposed are significantly minimized were introduced in the video from 1:36 to 1:55.

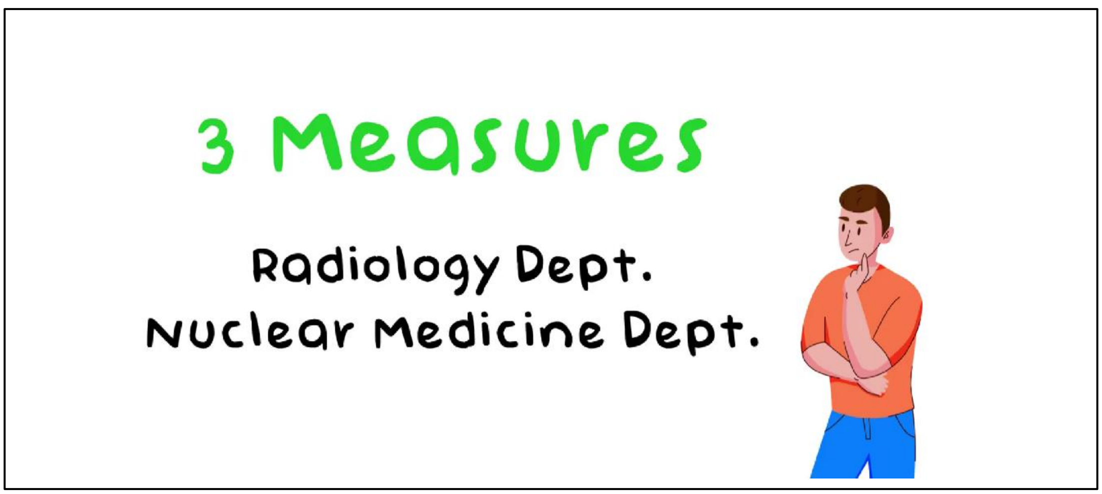

Figure 7. Three measures of radiation safety.

In the video, from 1:55 to 3:00, the three key ideas of time, distance, and shielding were explained. The specific details of how each idea helps to lower the risk were thoroughly explained.

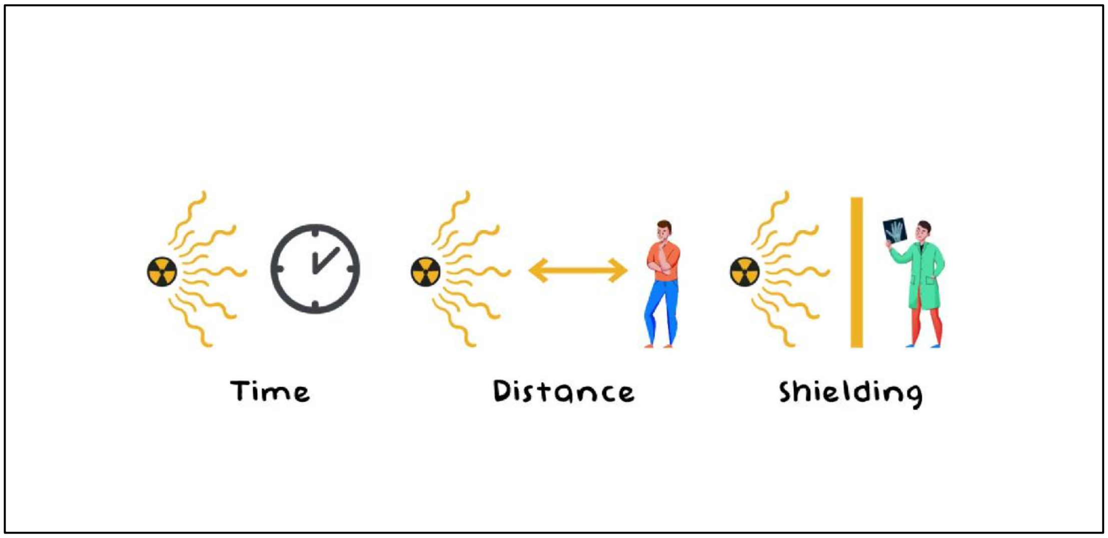

Figure 8. Time, distance, and shielding discussed.

The video's focus from 3:00 to 3:10 emphasizes that medical radiation use can be viewed as non-lethal because trained professionals are knowledgeable about the three key principles.

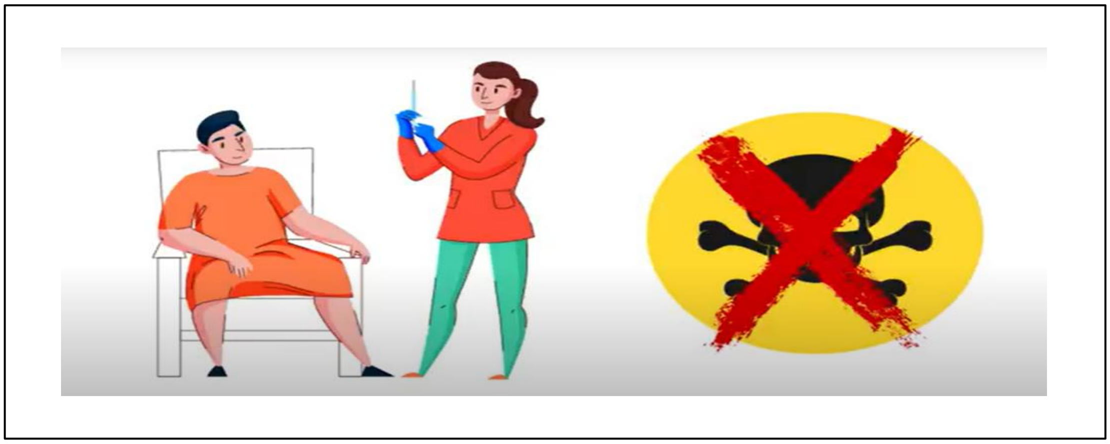

Figure 9. Importance of the three principles of radiation safety.

The difference in the source of radiation exposure between conventional radiography and nuclear medicine, which account for the majority of medical radiation exposure, was explained in the video from 3:11 to 3:45.

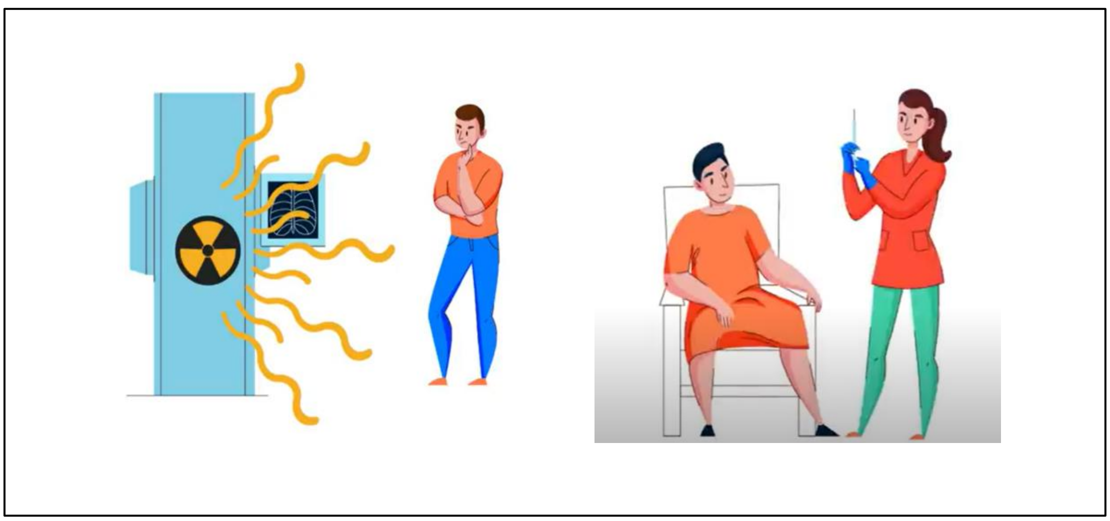

Figure 10. Sources of radiation in radiology versus nuclear medicine.

From 3:45 to 4:17 in the video, images of radiation exposure sources are displayed, and examples of the procedures and their doses are also explained. The misconception that radiation causes infertility, cataracts from epilation, and cancer was explained in the video from 4:18 to the very end.

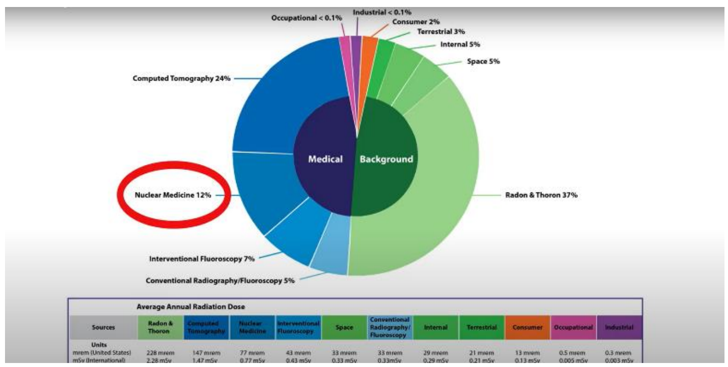

Figure 11. Sources of radiation exposure.

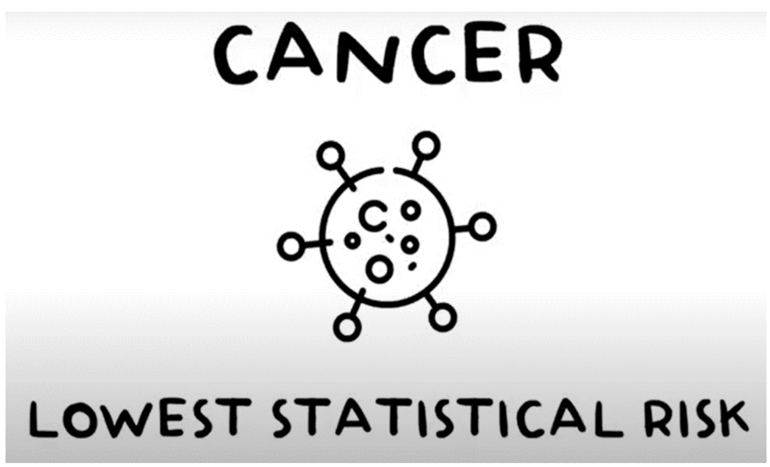

Figure 12. Risks of radiation exposure and associated dose.

To help the audience understand that such illnesses and diseases do not develop immediately after exposure to the radiation used for medical purposes, doses and an estimated number of procedures are elaborated.

For the scoring protocol of the questionnaire, all nine (9) questions are negative items wherein on the Likert scale, where 1 means “Strongly Disagree”, 2 means “Disagree”, 3 means “Not Sure”, 4 means “Agree”, and 5 means “Strongly Agree”. The following are the interpretations for each point and its corresponding mean range used in determining the center point or the “response” of the participants for each item found in the questionnaire: A range of 1.00-1.49 is considered a “High Positive Perception” or the responses to the item were leaning towards “Strongly Disagree”, 1.50-2.49 is considered a “Positive Perception” or responses to the item were leaning towards “Disagree”, 2.50-3.49 is considered a “Neither Positive nor Negative” nor responses to an item were leaning towards “Not Sure”, 3.50-4.49 is considered as “Negative Perception” or responses are leaning towards “Agree”, and 4.50-5.00 is considered as “High Negative Perception” or responses are leaning towards “Strongly Agree”.

The self-made questionnaire and infographics video was duly validated by a senior nuclear medicine technologist, junior nuclear medicine technologist, and a registered nurse stationed in the Nuclear Medicine Department of Makati Medical Center.

After validation, the instrument was pilot tested to 30 college students from various schools via Zoom Cloud Meeting. This was done on February 12, 2022. The researchers follow the same procedures as the actual data gathering during the pilot test.

Table 2

Cronbach's Alpha Reliability Statistics Result

Cronbach's Alpha	Cronbach's Alpha based on Standardized Items	N of items
.839	.855	9

The nine-item survey questionnaire had a Cronbach's Alpha of .839, showing the high reliability of the self-made questionnaire.

Data Gathering Procedures

Data gathering was done during the second semester of the academic year 2021-2022. Due to the COVID-19 pandemic, data gathering took place digitally via internet-based modalities such as Zoom Cloud Meetings and Google forms, ensuring the safety of both participants and researchers.

At the start of data gathering, the researchers requested permission to conduct the study to the College Dean of Nursing at De La Salle Medical and Health Sciences Institute. Upon receiving approval from the College Dean, the Dean along with the Level 1 Chair of the College of Nursing communicated with the volunteering first-year batch representative and class presidents to assist the researchers in recruiting volunteers. Additionally, the College Dean and Chair requested that the researchers relay the instructions to the participants The researchers asked them to send the invitation letter to the participants provided to them and allowed the participants to choose their own schedule based on their availability. Additionally, they were informed that informed consent would be obtained prior to answering the pretest question and that they are free to consent or not. The participants were given the following schedule: From 6:30 to 7:30 p.m. on February 18, 2022, February 19, 2022; February 25, 2022.; and February 26, 2022. Only the session on February 19, 2022, had no attendees.

On February 18, 2022, twelve (12) volunteer participants were randomly divided into two groups and distributed uniformly. On February 25, 2022, sixteen (16) students initially attended; however, two participants were unable to complete the session. Fourteen (14) students agreed to take part in the study that day. Finally, six (6) students agreed to participate in the study on February 26, 2022. The researchers introduced themselves and the research during the Zoom Cloud data-gathering sessions with the participants. Since the country is still dealing with the pandemic, Zoom Cloud Meeting is the ideal online mode of communication, as it ensures the safety of participants and researchers.

The following is the session flow for all scheduled dates: Participants were asked to arrive at or before the start time of the session, waiting lobby is provided by the Zoom Cloud Meeting. During the wait, the researchers reminded the participants to follow the instructions provided ahead of time, especially when entering the session with the specific username they were instructed to use. Participants were instructed to join the session using the last four digits of their ID number as their profile name and removing their profile picture or to join as a guest while using the last four digits of their ID number as their profile name. The participants were then permitted to arrive between 6:30 and 6:40 p.m. and all were admitted at exactly 6:40 p.m. The researchers introduced themselves to the participants and went over the rules and reminders as the session began.

The rules and reminders provided to them were to keep their camera off and microphones always muted, to utilize the chat box if they had any questions or concerns if they were disconnected from the session, and they were asked to rejoin immediately or to inform their class president that they were disconnected. They were also reminded that they are free to opt out of the study but must inform the researchers through their contact information that was provided in the "Letter to the Respondents".

Furthermore, throughout the session, the researchers reiterated and reassured them about the confidentiality and anonymity of their data, that access to data was strictly for researchers only, and that they were free to withdraw their participation if they felt the need to. The researchers also went over the session flow with them, informing them that they would be assigned to their breakout sessions at random and that the facilitators would go over the instructions and what to expect during the session with them again. Randomization is ensured because the Zoom Cloud Meeting has an automatic function for determining where the participants will be distributed. Each breakout room had two facilitators who would oversee and guide the participants throughout their session, as well as one facilitator who would oversee the two sessions in case of technical errors. During the breakout session, these facilitators provided them with instructions and reminders, such as reconnecting to the Zoom Cloud Meeting in the incident of a disconnection.

After randomly assigning participants to their breakout sessions and providing them with instructions, participants from both the treatment and control groups began reading and answering the informed consent at the same time through google forms, prior to taking the pretest. The informed consent form included information about the benefits of the study to participants. The benefits are as follows: (1) Participants and future nursing students will gain a better understanding of radiation. It will dispel any preconceived notions the participant may have about radiation. (2) Researchers and future readers will be able to determine whether an infographics video is not only an effective tool for influencing perception but also an excellent educational tool that should be used more frequently in schools. While the participants were answering the informed consent, the researchers reminded the participants that they were free to opt out of the study and free to not give their consent and leave but were asked to directly message us through the contact information provided to them in the "Letter to the Respondents" or by directly messaging us that they did not consent.

The researchers believe that a breach of data privacy would be a problem to encounter. As such, the researchers assured the participants that their information would be handled with the highest care and protection and that taking part in the study would not harm them. The researchers have clarified to them that they may notify the researchers using the provided contact information if they wish to withdraw from the study or have any concerns. To avoid a breach of confidentiality, data collected via Google forms were handled solely by the researchers and were not shared with anyone else. The data were retained just for the length of this research and were deleted after the study. Upon finishing the pretest questionnaire, the participants were asked to type "Done" in the chat box or to press the raise hand button to notify the facilitators. Both treatment and control groups completed the pretest concurrently for about 4-5 minutes.

Afterward, the two groups received distinct instructions following the pretest. The treatment group was notified that they would be watching the self-made infographics video regarding radiation for 6 minutes prior to taking the post-test, while the control group participated in a separate activity which was a Kahoot session that would last for 6 minutes as well to minimize the retention of the questions and their answers. Questions used in Kahoot tackled topics ranging from general science to mathematics, and topics related to nursing fundamentals. Questions were all irrelevant and did not contain any topic related to radiation sciences.

After the intervention, the participants were asked to answer the posttest questionnaire. The researchers instructed the participants to type “Done” in the chat box or to raise their hands to notify us that they are finished answering the questionnaire. The researchers asked the participants to return to the main room for closing remarks after waiting for everyone to finish. During the closing remarks, the researchers discussed the goals of this research and, to be fair to everyone, the self-made radiation infographics video was shared with everyone.

Statistical Treatment of Data

The researchers used the following statistical methods in this study to aid in the analysis of the data collected from the participants:

Cronbach's Alpha. Cronbach's alpha is a measure of internal consistency, or how closely a group of things or questions are connected to one another (University of California, Los Angeles, n.d.). This was calculated to determine the reliability of the self-made questionnaire.

Standard Deviation. The standard deviation is a measurement of how varied or distributed the data is relative to its mean. This statistical tool was used to ascertain participants' responses to each perception questionnaire item varied.

Mean. The center or average of the acquired data was established using the mean or arithmetic average. The researchers used this to calculate the mean or common point of the result – their perception towards the different perception questions – for interpretation ("Averages, Means, Medians and Modes," n.d.).

Independent *t*-test. The analysis of data between experimental and control groups, or the analysis between pretest scores and posttest scores, is another frequent application of it. In this study, the pretest and posttest scores of the treatment and control group were compared and used to determine whether there were any significant differences in the participants' perceptions of radiation before and after viewing the radiation infographics video.

Paired *t*-test. The researchers used this test to see if the questionnaire responses' means for the two population sets differ significantly from one another (Shier, 2004). This statistical tool was used to compare the pretest and posttest scores between the treatment and control groups and to establish the difference between the treatment and control groups in terms of the pretest and posttest scores before and after the radiation infographics video.

Chapter 3

FINDINGS OF THE STUDY

This chapter presents the findings, conclusions, and recommendations of the study.

Results and Discussions

Problem 1. What is the perception of the participants of both the treatment and control groups on radiation before and after the radiation infographics video?

TABL

Table 3 discusses the mean pretest scores of the treatment and control group. Starting with radiation exposure, which was measured in item 3, the control group had a "negative perception" (*M* = 3.75; *SD* = 1.00) while the treatment group had a "neither positive nor negative perception" (*M* = 3.31; *SD* = 1.20) about the source of radiation exposure (i.e., how one gets exposed to radiation). The findings reveal that the treatment group may be uncertain or lack adequate knowledge about radiation exposure, causing them to have such perceptions about the topic. The control group, on the other hand, has a negative perception of the topic, implying that they have the misperception that machines used in nuclear medicine emit radiation, rather than people who come in contact with radioactive material (patients and medical staff). This poses a problem because allied health workers, especially those who will be assigned to work in either of the two departments, should know that sources of radiation exposure from nuclear medicine and radiology are different.

In nuclear medicine, exposure can occur when the staff (1) is working with vials and syringes containing the radioactive material and (2) when they are in direct contact or in close contact with patients injected with the radiopharmaceutical or patients coming from radioiodine therapy ("Radiation Safety for Nurses", n.d.). This is in contrast with the source of radiation exposure in the radiology department, in which the machines used for diagnosis (e.g., x-rays, CT scanners, etc.) are the ones that emit radiation. Second, perceptions regarding radiation protection were also measured in items 1, 2, 8, and 9. The data show that both groups have an overall perception that is neither positive nor negative in all four (4) items, with the control group having a mean pretest score of 3.13, 2.88, 2.56, and 2.56 with a standard deviation of 1.31, 1.20, 1.50 and 1.26, respectively. The treatment group, on the other hand, has a mean pretest score of 3.00, 2.81, 2.81, and 2.56, with a standard deviation of 1.37, 1.42, 1.11, and 0.96, respectively This means that the participants may be uncertain or lack adequate knowledge about the principles of radiation protection, causing them to have such perception about the topic. This poses a problem because radiological workers, including allied health students and practitioners, should know the cardinal principles of radiation protection (time, distance, and shielding) to reduce radiation exposure levels to as low as reasonably achievable (ALARA). Knowing these principles will allow future radiological workers in the radiology and nuclear medicine department to avoid the risks and harms caused by ionizing radiation (Kaiser Permanente Radiation Safety Training, n.d.).

Lastly, perceptions regarding the harms and risks of radiation exposure were also measured in items 4, 5, 6, and 7. These items include what the participants perceived would be the harms and risks of radiation exposure including cancer, infertility, epilation, and cataracts. The data show that both groups have an overall perception that is neither positive nor negative in all four (4) items with the control group having mean pretest scores of 3.31, 3.13, 3.31, and 3.25, with a standard deviation of 1.35, 1.09, 1.25, and 1.16. The treatment group, on the other hand, has a mean pretest score of 3.00, 3.19, 3.06, and 2.94, with a standard deviation of 1.45, 1.38, 1.06, and 1.29. This means that the participants may be uncertain or lack adequate knowledge about how radiation exposure can impact them.

Overall, the findings of the study affirm previous literature, showing that students lack adequate knowledge about radiation, including radiation exposure, radiation protection, as well as its harms and risks it may cause (Canlas, 2016; Ibanez et al., 2016). Such misconceptions have been found to have been caused by the various sources that provide misinformation about radiation, including the movies which depict different kinds of mutations and damages caused by radiation (Ibanez et al., 2016). People rarely tune into credible documentaries or science programs on television such as National Geographic Channel and Discover Channel that could provide accurate information about radiation (Ibanez et al., 2016).

TABLE 4

Table 4 shows the posttest scores of the control and treatment groups on their perception regarding radiation. The findings reveal that the overall perception on each item among the participants of the control group remained “neither positive nor negative”. However, there is a change in perception from “neither positive nor negative to positive” in item #9 which tackles a topic on radiation protection, specifically “shielding”, with a mean posttest score of 2.44 and a standard deviation of 1.26. This means that many participants from the control group do not feel insecure just wearing a lead gown to protect themselves when dealing with a radioactive patient.

Starting with radiation exposure, which was measured in item 3, the control group retained their perception that is “neither positive nor negative” (*M* = 3.56; *SD* = 1.41) while the treatment group shifted to having a “positive perception” (*M* = 1.69; *SD* = 0.95) about the source of radiation exposure (i.e., how one gets exposed to radiation).

Second, perceptions regarding radiation protection were also measured in items 1, 2, 8, and 9. Contrary to the previous findings, the posttest results show that there were differences in the perceptions of the participants. For the control group, minimal changes were observed, with only item 9 changing from a “neither positive nor negative perception” to a positive one (*M* = 2.44; *SD* = 1.26). The treatment group’s perceptions, on the other hand, shifted from a “neither positive nor negative perception” to positive perceptions for items 1 (*M* = 2.31; *SD* = 1.40) and 2 (*M* = 1.63; *SD* = 0.96), and a high positive perception for item 9 (*M* = 1.38; *SD* = 0.72). Their response for item 8 remained to be a “neither positive nor negative perception” (*M* = 2.88; *SD* = 1.50). Lastly, perceptions regarding the harms and risks of radiation exposure were measured in items 4, 5, 6, and 7. These items include what the participants perceived would be the harms and risks of radiation exposure including cancer, infertility, epilation, and cataracts. Contrary to the previous findings, the posttest result shows that there were differences in the perceptions of the participants. For the control group, they retained perceptions that are “neither positive nor negative” in all items (respectively, *M* = 3.17; *SD* = 1.41) while the treatment group’s perception shifted from “neither positive nor negative” to positive perceptions for items 4 (*M* = 1.88; *SD* = 1.26), 5 (*M* = 1.75; *SD* = 1.30), 6 (*M* = 1.44; *SD* = 0.63); and 7 (*M* = 1.63; *SD* = 1.20).

Overall, the participants of the control group maintained a perception that is “neither positive nor negative”, indicating that they are still unsure as to whether they are afraid and worried or not of the effects of radiation exposure as the participants of the treatment group have a more positively assured response to the effects of radiation exposure. The shift from the treatment group’s perceptions to a “positive” and “high positive perception” of the effects of radiation indicates that the participants of the treatment group are less afraid and worried about the effects of exposure to radiation after receiving proper information on the topic through the intervention in the form of an infographics video.

The use of videos as a modality of relaying information and knowledge development is found to be significantly more effective in comparison to traditional learning for relaying information as the use of visual cues along with audio shows an improvement on the viewer’s knowledge retention and attention span according to Carimichael et al. (n.d.). Though videos focus more on knowledge gain, a study by Rock (2002) iterates the correlation between knowledge and perception. Knowledge is solely based on the gain of new information; it can change how someone interprets a certain topic, thus affecting their perception as well.

Table 5

Overall Mean Pretest Scores of the Control and Treatment Groups on the Perception of First-Year Nursing Students of De La Salle Medical and Health Sciences Institute

Verbal Interpretation	Control		Treatment	
	n	%	*n*	%
High Positive Perception	1	6.25	1	6.25
Positive Perception	2	12.50	3	18.75
Neither Positive nor Negative Perception	9	56.25	9	56.25
Negative Perception	4	25.00	3	18.75
High Negative Perception	0	0.00	0	0.00

Note. Interpretation for the Response: 1.00-1.49 = Strongly Disagree (High Positive Perception), 1.50-2.49 = Disagree (Positive Perception), 2.50-3.49 = Not sure (Neither Positive nor Negative Perception), 3.50-4.49 = Agree (Negative Perception), 4.50-5.00 = Strongly Agree (High Negative Perception)

Table 5 shows the overall pretest scores of participants from treatment andp control groups on the perception of first-year nursing students regarding radiation and their verbal interpretation. Based on the findings of the study, there are sixteen (16) participants for both groups that completed both pretest and posttest. In the control group, there is 1 (6.25%) participant that has a “high positive perception” of radiation, 2 (12.50%) participants who have a “positive perception” of radiation, and 4 (25.00) participants who have a “negative perception” on radiation. More than half of the participants from the control group have “neither positive nor negative perception” regarding radiation (56.25%). The same can be said with more than half of the participants from the treatment group (56.25%) that have a perception that is “neither positive nor negative”, 3 (18.75%) who have a “negative perception” of radiation, 3 (18.75%) who have a positive perception on radiation, and 1 (6.25%) who has a “high positive perception” on radiation.

The reason for the “negative perception” of both control and treatment groups is because of the lack of radiation-focused subjects for the participants. It can be seen in the curriculum of 1st year nursing students of De La Salle Medical and Health Sciences Institute that there is no subject that gives a brief introduction or even a small amount of information for the students to acquire. Having prior knowledge is important according to Sharna (2019). When students have prior knowledge about a topic, they understand it better. A lot of students use it in their lives, especially at school. If they do not know anything about the subject, they have a difficult time understanding the text. The results of the pre-tests reflect that having limited knowledge about radiation protection is one factor causing the “negative perception” of students regarding radiation.

Table 6

Overall Mean Posttest Scores of the Control and Treatment Groups on the Perception of First Year Nursing Students of De La Salle Medical and Health Sciences Institute

Verbal Interpretation	Control		Treatment	
	n	%	*n*	%
High Positive Perception	0	0.00	5	31.25
Positive Perception	3	18.75	8	50.00
Neither Positive nor Negative Perception	9	56.25	3	18.75
Negative Perception	3	18.75	0	0.00
High Negative Perception	1	6.25	0	0.00

Note. Interpretation for the Response: 1.00-1.49 = Strongly Disagree (High Positive Perception), 1.50-2.49 = Disagree (Positive Perception), 2.50-3.49 = Not sure (Neither Positive nor Negative Perception), 3.50-4.49 = Agree (Negative Perception), 4.50-5.00 = Strongly Agree (High Negative Perception)

Table 6 shows the overall posttest scores of participants from treatment and control groups on the perception of first-year nursing students and its verbal interpretation. Based on the findings of the study, there are sixteen (16) participants for both groups that completed both the pretest and posttest. In the control group, there is 1 (6.25%) participant that has a “high negative perception” of radiation, 3 (18.75%) participants who have a “negative perception” of radiation, and 3 (18.75%) participants who have a “negative perception” on radiation. More than half of the participants from the control group had “neither a positive nor negative perception” regarding radiation (56.25%).

On the other hand, the treatment group has shown more participants that have a positive or high positive perception of radiation, and a significant reduction in those who have a perception that is neither positive nor negative. After the intervention, there were 5 (31.25%) participants who now have a high positive perception regarding radiation, 8 (50.00%) participants who now have a positive perception of radiation, and 3 (18.75%) participants who still have a perception that is “neither positive nor negative.”

The introduction of the infographics video was the main factor for the improvement of the scores of the treatment group. The infographics video contained information that was beneficial for the improvement of the participant's perception regarding radiation. A study by Salina et al. (2012) supports that videos are an effective tool as the paper mentions that videos add to learning as a potent tool for teaching and the development of clinical competencies, bridging the gap between theory and practice. Also, in terms of effectiveness and facilitation of learning, the introduction of video streaming in schools has been very beneficial. On the other hand, the control group had no intervention which led to similar scores as to their pre-test.

Problem 2. Is there a significant difference in the participants' perception regarding radiation before and after the radiation infographics video in the treatment and control groups?

Hypothesis: There is no significant difference in the participants' perception regarding radiation before and after the radiation infographics video in the treatment and control groups.

Table 7

Comparison of the Pretest and Posttest Scores of the Control and Treatment Groups on the Perception Regarding Radiation Among First Year Nursing Students

Groups	PRETEST		POSTTEST			
	M	*SD*	*M*	*SD*	*t*	*p*
Control	3.10	1.26	3.09	1.24	-0.552	0.585
Treatment	3.09	1.38	1.84	1.19	-5.342*	<.001

Note. df = 15. *Significant at .05 level.

The comparison of the pretest and posttest scores in the treatment and control groups is shown in table 7. The findings show that participants from the control group have a mean pretest score of 3.10 with a standard deviation of 1.26 and a mean posttest score of 3.09 with a standard deviation of 1.38. The paired *t-ratio* of -0.033 with a *p*-value of .974 is not significant using .05 level of significance with 15 degrees of freedom for the control group. Therefore, the null hypothesis stating that there is no significant difference in the perception of the participants in the control group in the pretest and posttest is not rejected.

On the other hand, the participants from the treatment group have a mean pretest score of 2.97 with a standard deviation of 1.24, and a mean posttest score of 4.16 with a standard deviation of 1.19. The paired *t*-ratio of -4.791* with a *p*-value of <.001 is significant using .05 level with 15 degrees of freedom for the treatment group. Therefore, the null hypothesis that there is no significant difference in the perception of participants in the treatment group is rejected and the alternative hypothesis is accepted. In addition, the researchers calculated Cohen's d value to determine the size effect of an intervention vs. the ones that did not receive the intervention. The result was the researchers achieved a Cohen's D value of 1.73, which was greater than 0.8. This means that the average posttest score of first-year nursing students that received the radiation infographics video is 1.73 standard deviations greater than the average posttest score of first-year nursing students that did not receive the video. The results of this study demonstrate the potential of a radiation infographics video in influencing first-year nursing students' perceptions of radiation in a positive direction by demonstrating a significant increase in positive perception and a significant decrease in perception that is neither positive nor negative.

Here in the Philippines, there are studies that explored the perception regarding radiation among local university students and have been suggesting the need to educate students regarding radiation to improve their knowledge and perception (Ibanez et al., 2016; Canlas, 2016). As a solution, the researchers have decided to use an infographics video to fill in the gaps and follow the recommendations of previous studies. While there are studies that have researched on the effects of video or educational videos to the perception and knowledge of students, the researchers were unable to find studies that explore the effects of a radiation infographics video, specifically to the perception regarding radiation.

Problem 3. Is there a significant difference in the participants' perception regarding radiation between the treatment and control groups before and after the radiation infographics video?

Hypothesis: There is no significant difference in the participants' perception regarding radiation between the treatment and control groups before and after the radiation infographics video.

Table 8

Groups	CONTROL		TREATMENT			
	M	*SD*	*M*	*SD*	*t*	*p*
Pretest	3.10	1.26	3.09	1.24	-0.552	0.585
Posttest	3.09	1.38	1.84	1.19	-5.342*	<.001

Comparison of the Control and Treatment Groups Before and After Radiation Infographics Video
Note. df = 30. *Significant at .05 level.

The comparison of the pretest and posttest scores of the control and treatment groups on the perception regarding radiation is shown in Table 8. The control group has a mean score of 3.10 with a standard deviation of 1.26 in the pretest and a mean score of 3.09 with a standard deviation of 1.38 in the posttest. Meanwhile, the treatment group had a mean score of 3.09 with a standard deviation of 1.24 in the pretest, and a mean score of 1.84 with a standard deviation of 1.19 in the posttest.

In the pretest, the control group had a mean score of 3.10 with a standard deviation of 1.26 while the treatment group had a mean score of 3.09 with a standard deviation of 1.24. The computed *t* of -0.552 with a *p*-value of .585 shows no significant difference in the participants' perception regarding radiation in the control and treatment groups prior to the radiation infographics video. The null hypothesis is not rejected.

For the posttest, the control group has a mean score of 3.10 with a standard deviation of 1.26 while the treatment group had a mean score of 1.84 with a standard deviation of 1.19. Results of the independent samples t-test, as seen in Table 8, shows that the mean difference of –5.342 with a *p*-value of <.001 is significant at .05 level using 30 degrees of freedom.

This finding, therefore, allows the researchers to reject the null hypothesis that there is no significant difference in the participants' perception regarding radiation after introducing the radiation infographics video between the treatment and control groups. This finding implies that there is significant difference in the participants' perception regarding radiation after the radiation infographics video was introduced to the treatment group. This also shows that an infographics video or an educational video can be an effective intervention in improving the perception regarding radiation of first-year nursing students.

Using videos as a helpful tool in assisting students in their studies for improving student engagement, critical thinking skills, and learning has been explored in numerous studies. Videos are mediums of communication that share information presented in a visual format and combined with different audio formats. Combining both auditory and visual

formats can improve the comprehension and retention of information in an individual (Boateng et al., 2016). There are also studies that show that, by integrating videos into the curriculum, students can improve their learning outcomes. To explain the findings of this study wherein the perception of the participants from the treatment group has shifted from "neither positive nor negative" to mostly "positive," the Cognitive Theory of Multimedia Learning by Mayer (2009) will best explain this. Mayer argues that using multimedia instructions or videos leads to better learning outcomes than just using words alone. It has been suggested that multimedia materials accomplish this by assisting the sense-making process through the activation of verbal and visual cognitive processes concurrently (Mayer, 2009). Multimedia can stimulate higher cognitive activity that also results in better retention and understanding because of its multiple delivery channels, representation of ideas, and sensory stimulation. (Fee and Budde-Sung, 2014; Mayer, 2009).

Conclusions

Based on the findings of the study, the following conclusions are drawn:

1. First-year nursing students in the treatment and control groups had the same perception of radiation before watching the infographics video. However, the treatment group had a more "positive perspective" of radiation after watching the infographics video, whereas the participants in the control group continued to have a "neither positive nor negative" perception.

2. There was no significant difference in the participants' perceptions prior to the intervention. However, the findings of the study also revealed that there was a significant difference in the perception after the intervention among the participants.

3. There was no significant difference between the perception regarding radiation between the treatment and control groups before the intervention. However, after the intervention for the treatment group, there was a significant difference in perception wherein, the treatment had an overall "positive perception" versus an overall perception that is "neither positive nor negative" from the participants of the control group.

Recommendations

Considering the conclusions of the study, the researchers recommend the following:

1. With the results of this study, wherein there is a significant change in the perception of the participants regarding radiation before and after viewing the radiation infographics video, the researchers would like to highlight that incorporating video to introduce oneself in the medical use of radiation or in other topics is found effective and affirms previous studies stating that found incorporating videos in learning is significantly more effective in comparison to traditional learning for relaying information. As such, the researchers recommend incorporating the radiation infographics video into their learning module when introducing topics concerning radiation, especially in the medical field.

2. The findings of the study revealed that the use of the radiation infographics video shifted the perception of first-year nursing students regarding radiation to a more positive perception. The researchers would also recommend that not only teachers and nursing students use the infographics video, but as well as medical professionals to give them information about radiation, radiation protection, and risks associated with radiation exposure, in the event these individuals are involved in dealing with radiation.

REFERENCES

Abuelhia, E. (2017). Awareness of ionizing radiation exposure among junior doctors and senior medical students in radiological investigations. *Journal of Radiological Protection*, 37 (1). https://doi.org/10.1088/1361-6498/37/1/59

Anim-Sampong, S., Opoku, S., Addo, P., Benard, O., & Botwe, B. (2015). Nurses' knowledge of ionizing radiation and radiation protection during mobile radio diagnostic examinations. *Educational Research, 6: 2141–5161*. https://doi.org/10.14303/er.2015.020

Bailey, D. L., Humm, J. L., Todd-Pokropek, A., & Aswegen, A. van. (2014). Nuclear medicine physics. A handbook for teachers and students. *Medical Physics*, 38 (8).

Boateng, R., Boateng, S. L., Awuah, R. B., Ansong, E., & Anderson, A. B. (2016). Videos in learning in higher education: assessing perceptions and attitudes of students at the University of Ghana. *Smart Learning Environmen*ts, 3 (1). https://doi.org/10.1186/s40561-016-0031-5

Canlas, I. P. (2016). Pre-Service teachers' perception on radiation and radiation risk *[Electronic Version]. Asian Journal of Multidisciplinary Studies, 4, 136-137.*

Carmichael, M., Reid, A. K., Karpicke, J. D., & Bradley, J. v. (2018). Assessing the impact of educational video on student engagement, critical thinking and Llearning. Retrieved October 13, 2022, from https://us.sagepub.com/sites/default/files/hevideolearning.pdf

DeCarlo, M., (2018). Experimental design: What is it and when should it be used?. Retrieved March 17, 2022, from https://scientificinquiryinsocialwork.pressbooks.com/chapter/12-1-experimental-design-what-is-it-and-when-should-it-be-used/

Dugard, P., & Todman, J. (1995). Analysis of pre-test-post-test control group designs in educational research. *Educational Psychology*, 15 (2). https://doi.org/10.1080/0144341950150207

Evans, K. M., Bodmer, J., Edwards, B., Levins, J., O'Meara, A., Ruhotina, M., Smith, R., Delaney, T., Hoffman-Contois, R., Boccuzzo, L., Hales, H., & Carney, J. K. (2015). An exploratory analysis of public awareness and perception of ionizing radiation and guide to public health practice in Vermont. *Journal of Environmental and Public Health*, 2015. https://doi.org/10.1155/2015/476495

Fee, A., & Budde-Sung, A. E. K. (2014). Using video effectively in diverse classes: What students Want. *Journal of Management Education*, 38 (6), p. 843–874. https://doi.org/10.1177/1052562913519082

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2012). *How to design and evaluate research in education* (8th ed.). McGraw-Hill.

Garg, M., Karami, V., Moazen, J., Kwee, T., Bhalla, A. S., Shahbazi-Gahrouei, D., & Shao, Y. J. (2022). Radiation exposure and lifetime attributable risk of cancer incidence and mortality from low- and standard-dose CT chest: Implications for COVID-19 pneumonia subjects. Diagnostics (Basel, Switzerland), 12(12), 3043. https://doi.org/10.3390/diagnostics12123043

Goula, A., Chatzis, A., Stamouli, M. A., Kelesi, M., Kaba, E., & Brilakis, E. (2021). Assessment of health professionals' attitudes on radiation protection measures. *International Journal of Environmental Research and Public Health*, 18 (24). https://doi.org/10.3390/ijerph182413380

Hesse, C., Ball, K., & Schenk, T. (2012). Visuomotor performance based on peripheral vision is impaired in the visual form agnostic patient DF. *Neuropsychologia*, 50 (1). https://doi.org/10.1016/j.neuropsychologia.2011.11.002

Ibañez, D. D., Manaois, R. A. B., Soledad, M. D., & Bracil, K. G. F. (2016). Radiation scare: An analysis of students' perception to risks of ionizing radiation. *International Conference on Advances in Medical and Health Sciences, Thailand.*

INSCOL Philippines. (2018, June 29). Being a registered nurse in Philippines: Scope & Prospects. Retrieved April 17, 2022, from https://www.inscol.com/philippines/blog/being-a-registered-nurse-in-philippines-scope-prospects/

International Atomic Energy Agency. (n.d). Radiation in everyday life. Retrieved March 30, 2022, from https://www.iaea.org/Publications/Factsheets/English/radlife

Jeong, H. S. (2017). Effects of nursing students' practices using smartphone videos on fundamental nursing skills, self-efficacy, and learning satisfaction in South Korea. *Eurasia Journal of Mathematics, Science and Technology Education*, 13 (6). https://doi.org/10.12973/eurasia.2017.01229a

Kaiser Permanente. (n.d.) Radioiodine Therapy. In *Radiation Safety for Nurses.* (pp.6). Southern California Region. https://kpnursing.org/_SCAL/professionaldevelopment/orientation/LAMC/rs_nurse.pdf

Lenhard, W., & Lenhard, A. (2017). Computation of effect sizes. *In Psychometrica* (Issue 2016). http://doi.org/10.13140/RG.2.2.17823.92329

Maguire, C. (n.d.). Radiation and its communication to the public. Retrieved March 30, 2022, from https://orise.orau.gov/resources/stem/documents/scholarships/cole-maguire.pdf

McGraw Hill. (2019). Richard Mayer's cognitive theory of multimedia learning. Retrieved March 30, 2022, from https://www.mheducation.ca/blog/richard-mayers-cognitive-theory-of-multimedia-learning

Miriam Webster (n.d). Perception. Retrieved March 30, 2022, from https://www.merriam webster.com/dictionary/perception

National Library of Medicine. (n.d.). Standard Deviation. In *Finding and Using Health Statistics*. The University of North Carolina. https://www.nlm.nih.gov/nichsr/stats_tutorial/section2/mod8_sd.html

Nyhan, B. (2020). Facts and myths about misperceptions. *Journal of Economic Perspectives*, *34*(3), 220-236. https://doi.org/10.1257/jep.34.3.220

Oakley, P. A., & Harrison, D. E. (2020). X-Ray hesitancy: Patients' radiophobic concerns over medical x-rays. *Dose-Response: A Publication of International Hormesis Society*, *18*(3)*, 1559325820959542*. https://doi.org/10.1177/1559325820959542

Ong, J., Miller, P. S., Appleby, R., Allegretto, R., & Gawlinski, A. (2009). Effect of a preoperative instructional digital video disc on patient knowledge and preparedness for engaging in postoperative care activities. *In Nursing Clinics of North America* (Vol. 44, Issue 1). https://doi.org/10.1016/j.cnur.2008.10.014

Otwori, E. (2018). Attitudes vs. perceptions: Can these 2 terms be used interchangeably?. Retrieved March 30, 2022, from https://www.researchgate.net/post/Attitudes_vs_Perceptions_Can_theses_2_terms_be_used_interchangeably

Rock, I. (2002). Perception and knowledge. *Acta Psychologica*, *59(1)*, p.3–22. https://doi.org/https://doi.org/10.1016/0001-6918(85)90039-3

Salina, L., Ruffinengo, C., Garrino, L., Massariello, P., Charrier, L., Martin, B., Favale, M. S., & Dimonte, V. (2012). Effectiveness of an educational video as an instrument to refresh and reinforce the learning of a nursing technique: a randomized controlled trial. *Perspectives on Medical Education, 1*(2), p. 67–75. https://doi.org/10.1007/s40037-012-0013-4

Salkind, N. J. (2010). The SAGE encyclopedia of Research Design. SAGE Publications, Inc.

Shaaban, H., & Shaikh, M. B. (2018). Radiation and its associated health risks: assessment of knowledge and risk perception among adolescents and young adults in Saudi Arabia. *International Journal of Adolescent Medicine and Health,* 33 (1). https://doi.org/doi:10.1515/ijamh-2018-0056

Sharna, K. (2019). Importance of knowledge in learning. Retrieved December 2, 2022, from https://www.theasianschool.net/blog/importance-of-knowledge-in-learning/

Shier, R. (2004). Paired *t*-tests. Mathematics learning support centre, statistics 1.1. Retrieved December 2, 2022, from https://www.statstutor.ac.uk/resources/uploaded/paired-t-test.pdf

Stina, A., Zamaraioli, C., Carvalho, E. (2015). Effect of educational video on the student's knowledge about oral hygiene of patients undergoing chemotherapy. 19 (2), p. 220-225. https://www.scielo.br/j/ean/a/HYX8hMtmsjvJTRBzG5JPwHn/?format=pdf&lang=en

Tsai, J., Huang, M., Wilkinson, S. T., & Edelen, C. (2020). Effects of video psychoeducation on perceptions and knowledge about electroconvulsive therapy. *Psychiatry Research*, 286. https://doi.org/10.1016/j.psychres.2020.112844

United States Environmental Protection Agency. (n.d). Radiation health effects. Retrieved from https://www.epa.gov/radiation/radiation-health-effects#:~:text=sources%20and%20doses.-,Radiation%20Exposure%20and%20Cancer%20Risk,fatal%20cancers%20(mortality%20risk)

United States Nuclear Regulatory Commission. (n.d). Frequently asked questions (FAQ) about radiation protection. Retrieved from https://www.nrc.gov/about-nrc/radiation/related-info/faq.html\

United States Nuclear Regulatory Commission. (2009). Biological effects of radiation. *Reactor Concepts*, (2). Retrieved February 5, 2023, from https://www.nrc.gov/reading-rm/basic-ref/students/for-educators/09.pdf

University of California, Los Angeles (n.d). What does cronbach alpha mean?. Retrieved April 20, 2022, from https://stats.oarc.ucla.edu/spss/faq/what-does-cronbachs-alpha-mean/

Vanichvasin, P. (2020). Effects of visual communication on memory enhancement of Thai Undergraduate Students, Kasetsart University. *Higher Education Studies*, 11 (1). https://doi.org/10.5539/hes.v11n1p34

Warner, R. (2020). Applied statistics I. In *The Independent-Samples t Test,* Research situations where the Independent-Samples *t* test is used (pp. 329-331). SAGE Publications, Inc.

World Nuclear Organization. (n.d) Is radiation safe?. Retrieved April 17, 2022, from https://world-nuclear.org/nuclear-essentials/is-radiation-safe.aspx

Zaorsky, N. G., Shaikh, T., Handorf, E., Eastwick, G., Hesney, A., Scher, E. D., Jones, R. T., Showalter, T. N., Avkshtol, V., Rice, S. R., Horwitz, E. M., Meyer, J. E. (2016). What are medical students in the United States learning about radiation oncology? Results of a multi-institutional survey. *International Journal of Radiation Oncology Biology Physics*, 94 (2). https://doi.org/10.1016/j.ijrobp.2015.10.008

Zekioğlu, A., & Parlar, Ş. (2021). Investigation of awareness level concerning radiation safety among healthcare professionals who work in a radiation environment. *Journal of Radiation Research and Applied Sciences*, *14*(1), p. 1–8. https://doi.org/https://doi.org/10.1080/16878507.2020.1777657