Radiography Faculty Perceptions and Comfort Levels in Medical Education Modeling with Correlation to Role Modeling

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Abstract

COOK, JOY A., Doctor of Education in Educational Leadership, August 2022.

Radiography Faculty Perceptions and Comfort Levels in Medical Education Modeling with Correlation to Role Modeling

Chair of Dissertation Committee: Dr. Bonnie L. Beach

Teaching by doing is one pedagogical practice used in medical education to provide future health care professionals the necessary skills needed for their careers. Medical Education Modeling (MEM) is a common model for peer practice where students practice modeled skills in a classroom environment on their peers. When using this training method, instructors are often found using those same peer models for demonstration of proper practice. While research exists about the benefits and concerns of this practice perceived among students, little to no research exists regarding faculty perceptions and comfort levels in their role. The purpose of this quantitative study was to examine radiography faculty perceptions and comfort levels with the pedagogical practice of MEM and correlate those perceptions and comfort levels to self-efficacy of radiography educators who have taught at least one radiographic procedures course in a Joint Review Committee on Education in Radiologic Technology (JRCERT) accredited associate or bachelor's radiography program. Results of this study indicated that faculty find the pedagogy important to learning and overall are comfortable with the practice. While numerous benefits of MEM were reported by radiography educators, a consistent theme of the intentions in MEM being misunderstood did emerge. Adding this fear to the finding that male faculty are uncomfortable in MEM compared to female faculty, radiography programs, educators and administrators need to evaluate the specific procedures and policies regarding the pedagogy within their own program. Reflection on the pedagogical practice can benefit programs by strengthening practices in use, modifying concerning practices, or identifying other methods to replace or supplement current practices.

Dedication

This dissertation is dedicated to my family, who has always supported me. For my husband John, who will not have to hear the "D" word again, thank you for your love and support through this journey. To my mother, JoAnn, as I wouldn't be the woman I am today without her aspirations for all her daughters. To my children, Madison, Nicholas, William, and Elijah, never be afraid to accomplish your dreams; they are waiting to be seized.

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Thank you to my cohort members, specifically my colleagues Heather Schmuck and Kathy Peak, who survived this journey with me. It was a privilege to have you as consultants, advisors, and mental health advisors as our near four-year journey was filled with new and exciting assignments, questionable artworks, and periods of “this is never going to happen”. I could not have imagined how I would have survived if I didn’t have you both to hear my successes and grievances.

Finally, I am grateful to the University of Southern Indiana for supporting my educational endeavors. Your investment in my education will be repaid through the knowledge and skills I have gained to improve the education of current and future USI students.

Chapter 1: A Problem of Practice

Health profession programs, including medical schools and nursing, teach skills that will be used to take care of patients in professional practice (Chinnah et al., 2011; Hendry, 2013; McLachlan et.al., 2010; & Wearn et al., 2013). These professional skills require students to physically touch patients. These skills must be practiced by future health professionals and honed before being applied to actual patients. While hands-on clinical practice with patients (Wearn et al., 2013), simulation (Chinnah et al., 2011; Chunharas et.al., 2013; Wearn et al., 2013), and standardized professional patients (Chang & Power, 2000; Hendry, 2013; Rees et al., 2009a) are options for skills practice, students practicing on peers has seen an increase in use because of the changing healthcare system (Hendry, 2013; Rees et al., 2009a & 2009b). This increase in use is a result of the decrease in the number of clinical practice facilities; a decrease in the number of clinical preceptors to watch over students; an increase in the number of health care students; and an increase in the severity of patient illness that cannot tolerate student practice (Hendry, 2013; Rees et al., 2009a & 2009b).

Background and Significance

Faculty have the responsibility to choose the pedagogical methods for classroom instruction. Teaching by doing is one pedagogical practice that has been used in medical education to provide future health care professionals the necessary skills needed for their careers (Grace et al., 2019; Rees et al., 2009a). Medical Education Modeling (MEM), also referred to as peer physical examination (PPE), is a common model for peer practice that is used for honing these skills (Braunack-Mayer, 2001; Chinnah et al., 2011; Hendry, 2013; O'Neill et al., 2013; Wearn et al., 2013). In MEM, students practice modeled skills in a classroom environment on their peers that are studying the same academic content (Braunack-Mayer, 2001; Chinnah et al., 2011; Hendry, 2013; O'Neill et al., 2013; Wearn et al., 2013). When using the MEM method, instructors are often found using those same peer models for

demonstration of proper practice. Additionally, when providing feedback and in practical examinations, faculty review the work of their students, which requires the touching of the peer model.

Many studies have identified several benefits and concerns with this pedagogical practice. The practice of MEM has overall shown to be acceptable by students and beneficial to their learning (Chang & Power, 2000; Grace et al., 2019; Metcalf et al., 1982; O'Neill et al., 1998; Rees et al., 2005; Wearn & Bhoopatkar, 2006; Wearn et al., 2008; Wearn & Vnuk, 2005). Students report that this pedagogy is beneficial to learning by hands-on application of the skills they have studied in their didactic coursework (McLachlan et al., 2010; Rees et al., 2005). Additionally, when practicing with peers, students have the opportunity to learn together and gain feedback from each other in their experiences (Grace et al., 2019; Rees et al., 2005; Wearn & Bhoopatkar, 2006; Wearn et al., 2008). These experiences allow students to learn necessary communication skills, professionalism, and empathy.

Concerns from students have been identified during physical practice with peers. Students have indicated being embarrassed or uncomfortable with their peers (Barnett et al., 2000; Chang & Power, 2000; Consorti et al., 2013; Grace et al., 2019; McLachlan et al., 2010; O'Neill et al., 1998; Rees et al., 2005; Rees et al., 2009a; Wearn & Bhoopatkar, 2006; Wearn et al., 2008). Unlike the role they are preparing for in the healthcare environment, students spend hours with their cohort peers and engage in social interactions, which is different from the patient/caregiver relationship (Barnette et al., 2000; Rees et al., 2009a). Physically touching their peers with whom they interact socially in other circumstances adds to the uncomfortable feelings (Wearn et al., 2008; Wearn & Bhoopatkar, 2006). Physical touch also creates an uncomfortable environment for students that have a negative self-image (McLachlan et al., 2010; Rees et al., 2005; Wearn & Bhoopatkar, 2006). Furthermore, concerns for peer physical touch increase when peers engage in negative behaviors during MEM (Chang & Power, 2000; Vnuk et al., 2017; Consorti et al., 2013; Grace et al., 2019; O'Neill et al., 1998; Rees et al., 2005; Wearn

et al., 2008). Lack of maturity among students can cause students to make fun of other students or use language that can be perceived as sexual harassment (Vnuk et al., 2017; O'Neill et al., 1998; Rees et al., 2005; Rees et al., 2009a). While existing literature is varied, other factors such as gender, age, religion, and race are additional influences in students' perceptions of MEM (Chang & Power, 2000; Chen, et al., 2011; Rees, 2007; Rees, et al., 2005; Reid, et al., 2012; Wearn, et al., 2013).

Statement of the Problem

Research has been conducted on the perceptions and willingness to participate in this pedagogical practice from a student perspective. However, exploration of radiography faculty roles and their perceptions and comfort levels concerning the pedagogy of MEM has been limited. While a small amount of literature explored the concerns of faculty touching students, almost none explored this practice as part of teaching. Additionally, little literature exists to understand how faculty perceive the pedagogical practice or understand faculty comfort level in their role. While the literature does help to understand the attributes of a good role model to catch the attention of students in MEM, none of the literature explores faculty perceptions as a role model or seeks to correlate their role model perceptions as faculty using MEM. While there are many concerns for this practice, it is important to investigate the faculty's perceptions and comfort levels in this aspect of teaching.

Purpose

The purpose of this quantitative study was to examine radiography faculty perceptions and comfort levels with the pedagogical practice of MEM and correlate those perceptions and comfort levels to self-efficacy by radiography educators who have taught at least one radiographic procedures course in a Joint Review Committee on Education in Radiologic Technology (JRCERT) accredited associate or bachelor's radiography program. The research hopes to address the following research questions:

1. What are radiography faculty perceptions of MEM teaching pedagogy?

2. What are radiography faculty comfort levels with MEM teaching pedagogy?
3. What are radiography faculty perceptions of themselves as role models?
4. Is there a relationship between radiography faculty perceptions of themselves as role models and their perceptions of MEM pedagogy?
5. Is there a relationship between radiography faculty perceptions of themselves as role models and their comfort levels with MEM pedagogy?
6. Is there a difference in radiography faculty perception scores of MEM teaching pedagogy by gender?
7. Is there a difference in radiography faculty comfort level scores of MEM teaching pedagogy by gender?

Theoretical Framework

Through a postpositivist world view, this study utilized a correlational research design with quantitative methodology. In the postpositivist world view, the researcher looks to objectively identify or assess the causes that influence and affect outcomes when MEM is used by faculty in health education (Creswell & Creswell, 2018). A postpositivist view also realizes that there is no absolute truth and accepts that research is not always perfect (Creswell & Creswell, 2018). Quantitative research fits into a postpositivist view as the methodology is predetermined and tests or objectively verifies theories or explanations through scientific thinking (Nardi, 2018). In a postpositivist worldview, epistemology is rooted in statistical measures and contains objective, quantifiable data. Correlational research is grounded in the postpositivist world view as it maintains an objective view in the investigation of relationships (Terrell, 2016) while using a scientific method. In correlational research, there is testing and exploring of constructs to help further the understanding of phenomena.

Social learning and observational theories provide a useful framework when evaluating the entire learning process, including the role of faculty. When designing instruction or evaluating the use of a specific pedagogical practice, faculty consider how students learn and the steps in the process to establish behaviors and practices needed for successful healthcare professionals to model. Albert Bandura's Social Learning Theory provides a unified framework for understanding the learning processes. In Bandura's theory, he underlines how external influences have been shown to change, eliminate or reestablish behaviors (Bandura, 1977). This suggests that there are environmental influences that are important in the learning process. Additionally, some behaviors can only be created through the process of modeling and thus is another important aspect of learning (Bandura, 1977). Modeling also serves as a symbol that students can remember and use to reproduce those same behaviors later. Faculty through both the process of modeling and controlling environmental factors, help students to begin to learn the means to self-regulate and have control over their behavior, which is an additional important factor in the learning process.

Research Methods

This study utilized a correlational research design with a quantitative methodology. This quantitative research utilized a single survey created through a combination of survey items from previously validated surveys and the results of a review of the literature. This survey examined perceptions and comfort levels regarding the pedagogical practice of MEM of radiography faculty that have taught at least one imaging procedures course in a JRCERT accredited associate or bachelor's program. Additionally, as role modeling is important in social learning theory, the survey examined the same groups' self-efficacy as role models. The reliability and validity of the survey was established before its use.

A purposive sample of radiography faculty in JRCERT accredited associate and bachelor's programs that have taught at least one radiographic positioning/procedures course was studied as they are the individuals who teach hands-on radiographic positioning/procedures courses or have the experience and knowledge in the process of this pedagogy. Qualtrics, an online survey tool, was utilized for the formatting and delivery of the survey, and collection of responses online. The JRCERT was contacted to obtain a list of faculty emails in accredited associate and bachelor's radiography programs. An email with consent and a link to the Qualtrics survey was sent to the individuals on the list, which includes radiography programs directors, clinical coordinators, and instructors. The email included the purpose of the study, detailed instructions, consent procedures, benefits, risks, the deadline for completion, and a link to the survey. The research was conducted after the proposal was approved by the dissertation committee and the USI Institutional Review Board. The collection of data lasted for 20 business days. The survey link was active during that time, and after that period, the survey link was deactivated. A reminder email was sent approximately 10 days after the initial start of the survey. Each research question was analyzed using SPSS. Data collected was evaluated for normal distribution and assumptions before selection and use of the appropriate parametric or nonparametric test.

Definition of Terms

Specific terms used in this study are defined as follows:

Medical Education Modeling (MEM). An educational pedagogical method where students practice modeled skills in a classroom environment on their peers that are studying the same academic content (Braunack-Mayer, 2001; Chinnah et al., 2011; Hendry, 2013; O'Neill et al., 2013; Wearn et al., 2013).

Peer Physical Examination (PPE). An educational pedagogical method where students practice their physical examination skills on peers within the same field of study or cohort (Chen et al., 2011; Chinnah, et al., 2011; Consorti, et al., 2013; Hendry, 2013).

Imaging Science. The multidisciplinary field of medical imaging that includes bone densitometry, cardiac-interventional and vascular-interventional, computed tomography, limited x-ray machine operator, magnetic resonance imaging, mammography, medical dosimetry, nuclear medicine, radiation therapy, radiography, and sonography (American Society of Radiologic Technologists, 2021).

Radiographic positioning/procedures. The practice of physically placing human anatomy in a specific manner through hands-on manipulation to achieve a radiographic image that will be used for diagnosis; each anatomical region has specific techniques and methods to manipulate specific anatomical parts for an accurate image used in diagnosis (Lampgnano & Kendrick, 2021).

Radiography. Field of medical imaging responsible for the administration of ionizing radiation in radiographic or fluoroscopic procedures for diagnostic purposes needed for medical diagnosis (American Society of Radiologic Technologists, 2021).

Postpositivist view. A philosophy of research looking objectively through the lens of which some causes determine effects; used in quantitative research; often referred to as the scientific method (Ary et al., 2019).

Pedagogy. The formal means of teaching students for learning (pedagogy, 2021).

Efficacy. The ability to produce the desired result (efficacy, 2021).

Role model. A person who sets a positive example in demonstrating the skills and knowledge needed by a student; one whose skills are worthy of emulation (Conway et al., 2008; Passi & Johnson, 2016; Perry, 2008; Price & Price, 2009; Stegman et al., 2013; Wright & Carrese, 2002).

Perception. How one thinks, understands or feels about something (perception, 2021).

Comfort Level. The degree to which faculty feel at ease or relaxed with a practice.

Technologist. A healthcare individual with clinical and technical knowledge that is responsible for patient care and imaging human anatomy using medical equipment (American Registry of Radiologic Technologists, 2021).

***Observational learning*.** A method of learning where a student observes the performance of a process or skill modeled by someone and then models the same process or skill (Bandura, 1977; Horsburgh & Ippolito, 2018).

Assumptions

The data is being collected under the conditions of anonymity and the respondent's identity is protected. Considering the anonymity of the survey, it is assumed those taking the survey will truthfully answer the questions presented. Additionally, it is assumed the methodology chosen will address the research questions to be answered.

Limitations

A quantitative methodology using a survey does limit the study. Surveys have limitations in the areas of sampling, social desirability bias, central tendency bias, researcher bias, low response rates, and missing survey answers which can affect the reliability of the survey (Nardi, 2018). In the area of sampling, this research study used a purposive sample. Purposive sampling is a nonprobability sampling technique, which means it is not generalizable to the entire population (Nardi, 2018; Terrell, 2016). This study's findings are limited to only JRCERT accredited radiography associate and bachelor's degree programs. Additionally, while survey directions indicate anonymity, respondents may still give socially acceptable responses rather than being honest (Nardi, 2018). As an example, in this current study, it is not socially acceptable to indicate sexual interest in a student when demonstrating radiographic procedures on students and thus the analysis may not be accurate. In addition, respondents on long Likert scale surveys may avoid choosing responses on either end of the scale. Central tendency bias for

this study may be seen in fewer responses for strongly disagree (1) and strongly agree (10) as respondents avoid choosing extremes. Bias may also exist on the part of the researcher (Creswell & Creswell, 2018). The researcher for the current study has the same background as the sample population, which shapes the researcher's underlying thoughts and perceptions on the current topic.

Nonresponse bias is another limitation of conducting research with a survey (Rea & Parker, 2014). Nonresponse bias within a given sample may occur due to failure to fill out the survey in part or at all or due to never receiving the survey because of invalid emails or loss of access to email systems (Rea & Parker, 2014). In all instances, this lowers the overall response rate, which affects the reliability that results are representative of the sample population chosen (Rea & Parker, 2014). In the current research, the email list provided by the JRCERT may not be current or contain inaccurate information.

Lastly, when conducting correlational research there is the possibility of confounding variable(s) (Terrell, 2016). While the analysis of the correlation may be negative or positive, there are sometimes other variables that are not included in the correlation that would better explain the relationship (Terrell, 2016). Correlational research is also limited as it cannot establish causation (Terrell, 2016).

Delimitations

Delimitations to this study include the research methodology, which is quantitative. While there are three short open-ended questions within this research, qualitative research design could pull information from participants that are of interest to this topic that Likert Scale responses do not address. Additionally, the research is looking only at educators in the field of radiography that have participated in courses with hands-on radiographic positioning. There may be educators with experience in this area through observation and their opinions or perceptions are not being captured. Educators from other health-related fields utilizing this type of pedagogical practice are also not included as the

researcher is an educator in the field of radiography and has an interest in the perceptions and comfort levels of those in the same field.

Summary

This research aimed to create useful knowledge regarding radiography faculty perceptions and comfort levels with the pedagogical practice of MEM and correlate those perceptions and comfort levels to self-efficacy as a role model. Faculty perceptions and comfort levels are also important in deciding the continued use of this pedagogical method. It is through the sharing of the research findings and creating new literature on faculty attitudes and perceptions, faculty within imaging programs can begin to evaluate the continued use of this pedagogical practice if used in their programs.

Chapter 2: A Review of Relevant Literature

The relationship between students and faculty in higher education can sometimes be very complex. Faculty are hired to teach in a specific discipline due to their expertise and content knowledge in an area of study (Arslan & Dinc, 2017). However, faculty are often responsible for academic advising (Bongartz et al., 2011; Braunack-Mayer, 2001; Holmes et. al, 1999; Owen & Zwahr-Castro, 2007; Rupert & Holmes, 1997), supervising research (Holmes et al., 1999), supervising student organizations (Owen & Zwahr-Castro, 2007), mentoring in professional organizations or professional socialization (Arslan & Dinc, 2017; Bongartz et al., 2011; Holmes, et al., 1999; Plaut & Baker, 2011), and personal counseling (Holmes et al., 1999; Owen & Zwahr-Castro, 2007; Plaut & Baker, 2011). Faculty expertise in a highly technical academic field may have an even more complex role with their students.

Faculty teaching radiography have a unique relationship with their students due to the hands-on nature of the academic discipline. Many health professions programs, including radiography, often teach skills that will be used to take care of patients in professional practice. As these skills will require students to physically touch patients, these skills must be practiced by future health professionals and become refined before being applied to actual patients. One method to practice the skills needed by radiography professionals is to engage in practicing these skills on peers. Medical Education Modeling (MEM), also referred to as peer physical examination (PPE), is a common model used for honing these skills (Braunack-Mayer, 2001; Chinnah et al., 2011; Hendry, 2013; O'Neill et al., 2013; Wearn et al., 2013). In MEM, students practice modeled skills in a classroom environment on their peers that are studying the same academic content (Braunack-Mayer, 2001; Chinnah et al., 2011; Hendry, 2013; O'Neill et al., 2013; Wearn et al., 2013). During this training method, instructors are often found using those same peer models for demonstration of proper practice. In providing feedback and in practical examinations, faculty review the work of their students, which requires the touching of the peer model.

A lot of research has been conducted on the perceptions and willingness to participate in this pedagogical practice from a student perspective. Exploration of radiography faculty roles and their perceptions and comfort levels concerning the pedagogy of MEM has been limited. While a small amount of literature explored the concerns of touching students, almost none explored this practice as part of teaching. Additionally, little literature exists to understand how faculty perceive the pedagogical practice or understand faculty comfort level in their role. While the literature does help to understand the attributes of a good role model to catch the attention of students in MEM, none of the literature explores faculty perceptions as a role model or seeks to correlate their role model perceptions as faculty using MEM. While there are many concerns for this practice, it is important to investigate the faculty's perceptions and comfort levels in this aspect of teaching. The purpose of this quantitative study was to examine radiography faculty perceptions and comfort levels with the pedagogical practice of MEM and correlate those perceptions and comfort levels to self-efficacy by radiography educators who have taught at least one radiographic procedures course in a JRCERT accredited associate or bachelor's radiography program.

Through the lens of Albert Bandura's Social Learning Theory, this review looked at the role radiography faculty have in the MEM pedagogy and their perceptions of and comfort levels with this hands-on pedagogical practice. This literature review begins with an examination of Albert Bandura's Social Learning Theory to understand how it can be pedagogically applied by faculty through MEM. Next, as role modeling is important in observational learning, the literature review explores the attributes of a good role model to understand the appropriate practice of faculty in this pedagogy. Finally, the literature explores the known benefits, concerns, and influences of the pedagogical practice of MEM.

Bandura's Social Learning Theory

When designing instruction or evaluating the use of a specific pedagogical practice, faculty should consider how students learn and the steps in the process to establish behaviors and practices needed for successful healthcare professionals to model. Albert Bandura's Social Learning Theory provides a unified framework for understanding the learning processes. In Bandura's theory, he underlines how external influences have been shown to change, eliminate, or reestablish behaviors (Bandura, 1977). This suggests there are environmental influences important in the learning process. Additionally, some behaviors can only be created through the process of modeling and thus is another important aspect of learning (Bandura, 1977). Bandura further argues that while behaviors can be learned through other means, modeling behaviors shortens the learning process (Bandura, 1977). Modeling also serves as a symbol that students can remember and reproduce those same behaviors later. Faculty through both the process of the modeling and environmental factors, help students to begin to learn the means to self-regulate and have control over their behavior, which is an additional important factor in the learning process.

Observational Learning

Modeling is an informative process where the modeled activities serve as guides for future replication of those activities. In a hands-on learning environment of radiography procedures laboratory instruction, the faculty person often utilizes a student model to display the appropriate procedures to obtain a radiologic image. Faculty model the appropriate steps to create the needed radiographic view as would be expected by a practicing technologist. In this process, students learn the appropriate steps and professional behaviors needed to replicate the steps on their own. Bandura (1977) outlined the four processes that are important to observational learning: attention, retention, motor reproduction, and motivation.

Attention. Instructors can impact the learning process by understanding the influence they have over gaining the attention of students. The social context of learning with others begins through regular associations and through modeling of behaviors of those that display influential and engaging qualities (Bandura, 1977; Horsburgh & Ippolito, 2018). While faculty do not have to associate with students in a social environment, they should take time in the classroom to engage with students and earn their professional respect (Althouse et al., 1999). Taking the opportunity to demonstrate a sincere interest in teaching and their learning attracts students' attention (Althouse et al., 1999; Gibbs et al., 2017; Passi & Johnson, 2016; Perry, 2008; Price & Price, 2009; Stegman et al., 2013; Wright and Carrese, 2002). Positive, repeated influences gain the attention of students and thus students will learn more readily from those individuals (Horsburgh & Ippolito, 2018; Stegman et al., 2013). Some faculty can be so successful in the modeling processes that they hold the attention of their students. Holding the attention of students is the first step in the process; getting students to retain the information is the next step.

Retention. Students must retain what they have learned to use the information. Observing good, modeled practice and instruction from engaging faculty is limited to the time the practice is modeled unless it is maintained in their permanent memory. Repeated exposure to the behavior or practice is important in the retention process (Horsburgh & Ippolito, 2018). Rehearsing the process of obtaining radiographic positions many times allows the learner to store the visual information of the process. Verbal reinforcement of the process in a continual pattern is also influential in the proficiency and retention of the procedure (Conway et al., 2008; Donaldson & Carter, 2005). Systematic questioning aids in the reinforcement and retention process and allows faculty the opportunity to gauge where students are in the process (Althouse et al., 1999; Horsburgh & Ippolito, 2018; Stegeman et al., 2013). Faculty who are consistently engaging students in a discussion of the process can help students transfer

their visual imagery of the process into a verbal form for retention. Students can also be encouraged to walk themselves through the process out loud (Horsburgh & Ippolito, 2018; Price & Price, 2009). When the process of the procedure is needed to be displayed without the modeling present, the student has two forms of the process in retention to recall the skill. However, skills are not perfected through observing alone. The appropriate action has to be ordered correctly in the motor reproduction process.

Reproduction. Converting the visual and verbal retained skill into the appropriate action is important to the motor reproduction process. Spatially, the student processes the skills in their permanent memory in the same pattern that was modeled. This process is dependent upon their attention to the process and the amount they retained. The amount they gained in these two processes will either be displayed as a reproduction of the process or, in some, assimilation of the steps in a faulty manner (Althouse et al., 1999). When there is a deficit in the reproduction of the process, the student will need to develop the deficits through a return to the modeling and practice process. Students need the opportunity to practice the skills and faculty can encourage students to take opportunities as they arise (Conway et al., 2008; Horsburgh & Ippolito, 2018). The necessary skills needed to be learned are not solely learned through observation or learning from mistakes. Informative feedback of their performance or evaluations creates the motivation to recreate the process.

Motivation. Motivation to reproduce what has been learned can come from the positive or negative feedback students receive from those initiating the modeling or those within the social group (Bandura, 1977; Horsburgh & Ippolito, 2018; Stegeman et al., 2013). Faculty can provide positive feedback and reactions to the student when the student reproduces the process to further motivate them to continue to perform the learned process (Althouse et al., 1999; Donaldson & Carter, 2005; Horsburgh & Ippolito, 2018; Stegman et al., 2013). However, when providing feedback for nonperformance, the faculty should take into consideration the underlying cause of the lack of

performance of the modeled behavior (Horsburgh & Ippolito, 2018). Consideration should be taken to figure out what step of the learning process failed or decide if negative or nonrewarding feedback can elicit the appropriate processes. If a student did not observe a process due to lack of attention, then negative feedback will not work for this student. In this circumstance, faculty will need to go back and demonstrate the process again and have the student practice so either the attention or retention will increase. The reward of the informative feedback to the student can also depend on the significance of the task being performed. In a task the student finds no value in, the feedback, especially corrective feedback, will reduce any extra effort on their part (Horsburgh & Ippolito, 2018; Stegman et al., 2013). If the feedback is one the student was expecting and matches the performance level they thought they were obtaining, this can influence the student to continue to perform tasks at the same level or raise their performance (Horsburgh & Ippolito, 2018; Stegman et al., 2013). Observational learning can be supplemented through other influential media sources to acquire the behaviors or processes that need to be obtained.

Electronic Acculturation

Outside of observational learning provided by faculty or peers, social learning can be done through the modeling that comes from media sources. Television, films, videos, and other media sources can be used in the modeling process (Bandura, 1977). New processes can be learned by watching various displays of the process on media (Bandura, 1996). Bandura (1996) calls this process "electronic acculturation." Using media, faculty can incorporate videos of radiography procedures being performed as a means of learning the task, reinforcing the task, or in the remediation process (Hendry, 2013; Wearn & Bhoopatkar, 2006). While this leaves a less prominent role for the faculty, it could be used in circumstances where the procedures are more intimate. In procedures that are intimate, faculty may wish to not engage in modeling the appropriate procedure on their students. Students in this

circumstance would also have a way of observing the practice that would not be modeled by faculty. The downfall to this practice is taking the learning by doing out of the process where students experience the trial and errors of their learning (Bandura, 1996). While the basic modeling process of learning remains the same, students benefit from repeated experiences to reinforce content needed to be maintained in the permanent memory for use in actual practice. Different forms of modeling can be used, but some forms of modeling are more powerful. When faculty are primarily responsible for the learning activity, their role modeling behaviors come under scrutiny in the social learning environment.

Role Model Behaviors

It is the modeling behaviors used and environment created by faculty that will have the greatest influence on students during their developing career and learning process. Faculty need to be aware of the enormous responsibility they have in being a role model for students. Educators in healthcare programs may be the first professional in their field of study with whom students may have significant contact. As faculty hold or have held the positions that students aspire to become, faculty will be the initial resource for students' introduction to practice (Horsburgh & Ippolito, 2018). Students depend on faculty for their guidance in learning the necessary educational content, but also to navigate the professional role the student will assume in practice (Althouse et al., 1999, Price & Price, 2009). Self-awareness of the role helps faculty to facilitate and plan for educational activities that are important to practice (Horsburgh & Ippolito, 2018), but also to navigate their interactions with their students (Price & Price, 2009).

Approachable

Good role models are approachable and enjoy teaching. Students are drawn to those individuals that want to spend time with students and have an interest in teaching students (Passi & Johnson, 2016; Price & Price, 2009; Stegman et. al, 2013; Wright & Carrese, 2002). Students will gravitate to individuals

they feel will take the time to answer their questions and share their own practice experiences to aid in understanding (Conway et al., 2008; Gibbs & Kulig, 2017; Wright & Carrese, 2002). Approachable role models are aware that students depend on them for learning the professional tasks (Althouse et al., 1999) and seek out students to engage in those learning opportunities (Perry, 2008), including the actual practice of the profession (Horsburgh & Ippolito, 2018).

The overall learning environment created by these role models makes students feel comfortable (Gibbs & Kulig, 2017), feel included (Perry, 2008), feel supported (Horsburgh & Ippolito, 2018), and overall feel like a member of the healthcare team (Althouse et al., 1999; Perry, 2008). This approachable environment created by these role models is furthered by their high level of personal and interpersonal skills (Cruess et al., 2008; Fluit et al., 2010), and their often friendly, easy-going (Wright & Carrese, 2002), and nonjudgmental attitudes (Wright & Carrese, 2002). These approachable attributes and comfortable learning environments created by good role models attract students and gain their attention and respect (Stegman et al, 2013). Gaining the attention of students is important in observational learning.

Professional

Good role models mimic professionalism and maintain a professional, caring attitude in practice. They are witnessed having good relationships with colleagues and students (Passi & Johnson, 2016). Additionally, when in practice, they are compassionate with their patients, ethical in the care they provide (Asghari et al., 2011; Conway et al., 2008; Passi & Johnson, 2016), and are true patient advocates (Fluit et al., 2010). Professionalism is also viewed through their honesty and integrity and in their ability to take responsibility for their actions (Asghari et al., 2011; Fluit et al., 2010). Professional role models can often be found involved in the community outside of their professional role (Althouse et al., 1999) and are remembered by students for their professional attitude and actions (Stegman et al.,

2013). These repeated positive influences from professional individuals further gain the attention of students.

Knowledgeable

Good role models have great professional skills and are knowledgeable about their field. Understanding the field of practice and the techniques used are skills students will need to mimic and develop during their educational experiences (Fluit et. al, 2010; Stegman et al., 2013). Individuals that have good diagnostic and clinical skills within the medical field can provide students with the content knowledge and practical applications needed to be successful in their careers (Conway et al., 2008; Passi & Johnson, 2016). Additional skills necessary for actual practice include "practice wisdom" that is only gained through professional experience, which is something these role models share and students value (Perry, 2008; Price & Price, 2009). Students will select knowledgeable individuals to interact with during their practical experiences to gain these valuable insights.

Positive Environment

Good role models create a positive environment. Students learn through their environment, not just within the environment. Students feel comfortable in their educational practices when the environment created by the faculty is welcoming and encouraging (Conway et. al, 2008). This environmental space is positive and one that promotes students' learning through open questioning and engagement (Conway et al., 2008; Cruess et. al, 2018; Fluit et al., 2010). It allows for student independence (Horsburgh & Ippolito, 2018) and is a safe space for making mistakes and learning from those mistakes (Donaldson & Carter, 2005; Horsburgh & Ippolito, 2018). Within these positive environments, faculty demonstrate enthusiasm in their conversations and foster student confidence by pushing students in positive ways while making them feel comfortable (Gibbs & Kulig, 2017). Additionally, faculty make the time for quality contact with students and ensure sufficient time is spent

on educational activities (Cruess et al., 2018; Donaldson & Carter, 2005). Good role models take the time to create educational spaces to connect with students and the content. The attention of students can be obtained when these connections are made and the learning environment is positive.

Communicator

Being able to communicate is an important healthcare and life skill students will need to obtain. Communication is a valued skill in a good role model. The communication elements of a faculty role model include superior verbal and nonverbal communication abilities, interpersonal skills, and listening. These aspects of communication are important in transferring knowledge and skills and are reflected in students' behavior. Students' attention is gained when role models can verbally communicate well with patients, families, students, and others (Conway et al., 2008; Cruess et al., 2018; Fluit et al., 2010; Gibbs & Kulig, 2017; Stegman et al., 2013; Wright & Carrese, 2002). This attention is also gained through effective listening where the role model takes the time to pay attention to students' questions or responses to feedback (Stegman et al., 2013).

Role models are effective in their communication by making sure there is sufficient time to explain the knowledge of practice and how it is used for patient care (Price & Price, 2009; Stegman et al., 2013). This communication also includes explaining practice concepts in steps and communicating with terms at the same level of knowledge as a student (Price & Price, 2009). Good role models communicate practice concepts through the incorporation of meaningful stories which aids to provide a deeper meaning of practice (Conway et al., 2008; Price & Price, 2009) and further gained the attention of students.

Timely Feedback

Part of the art and skill of communication is providing feedback to students. Feedback is providing students with information regarding their performance on a task, which also includes

communication on how to move forward in future performances of a task (Stegman et al., 2013). Good role models provide students with complete, specific, and timely feedback to support learning (Althouse et al., 1999; Cruess et al., 2018; Stegman et al., 2013). Even in circumstances where the student's performance is lacking, feedback from positive role models is done constructively (Donaldson & Carter, 2005; Perry, 2008). Constructive feedback helps to maintain a student's confidence in the learning process but also supports students' development in the areas of needed practice (Donaldson & Carter, 2005; Gibbs & Kulig, 2017; Perry, 2008). Offering suggestions for the development of skills in a non-threatening manner and walking students through the skills process will also help to maintain a student's confidence (Donaldson & Carter, 2005; Horsburgh & Ippolito, 2018). Students need positive feedback and encouragement to continue to practice the skill. Providing this type of feedback is important for faculty as role models to consider especially in the motivation stages of observational learning.

Encourage Reflection

Feedback is part of good communication with students and encouragement of reflection is part of that feedback process. Good role models encourage active reflection (Althouse et al., 1999; Cruess et al., 2018; Fluit et al., 2010; Price & Price, 2009). Self-reflection is important in the learning process. Students must understand the skill they are performing, perform the skill, and then reflect on the actual performance to enhance their skills (Price & Price, 2009). As part of the reflection process faculty role models encourage students to think about what and how they perform a skill or learn a process (Horsburgh & Ippolito, 2018; Price & Price, 2009). Faculty can encourage this through open discussion about the process, summarization of the skill (verbal or written form), or in a debriefing method (Cruess et al., 2018; Price & Price, 2009; Horsburgh & Ippolito, 2018). During the reflection of the process, faculty can reflect on their knowledge and share the processes they used to learn the skill (Price & Price,

2009). Faculty's self-reflection with the student further develops the student's reflection competence and moves the student forward in retention. Additionally, this reflection dialogue between faculty and student is also an opportunity to give additional feedback, especially when a student's reflection may need correction or reinforcement (Horsburgh & Ippolito, 2018). As communication in the form of feedback and reflection is exchanged, students progress in the reproduction and motivation stages of observational learning.

Medical Education Modeling

MEM is the pedagogical practice of students learning medical professional practice skills using their peers as models (Consorti et al., 2016; O'Neill et al., 1998; Rees et al., 2009; Taylor & Shulruf, 2016; Wearn et al., 2008; Wearn et al., 2013; & Vnuk et al., 2017). This is a reciprocal practice where students share the roles of practicing being the medical professional and, in most circumstances, participating in the patient role. This pedagogy is used in many medical professional programs, including medical schools and nursing (Chinnah et al., 2011; Hendry, 2013; McLachlan et.al., 2010; & Wearn et al., 2013). The practice is often used as a pedagogy to hone skills before use in a clinical environment. While hands-on clinical practice with patients (Wearn et al., 2013), simulation (Chinnah et al., 2011; Chunharas et.al., 2013; Wearn et al., 2013) and standardized professional patients (Chang & Power, 2000; Hendry, 2013; Rees et al., 2009a) are options for skills practice, MEM pedagogy has seen an increase in use because of the changing healthcare system. This increase is a result of the decrease in the number of clinical practice facilities; a decrease in the number of clinical preceptors to watch over students; an increase in the number of health care students; and an increase in the severity of patient illness that cannot tolerate student practice (Hendry, 2013; Rees et al., 2009a & 2009b). The following review of literature will identify the benefits and concerns with this practice along with the conflicting research regarding the role that gender, age, religion, race, and the environment have on MEM.

Benefits

The practice of MEM has overall shown to be acceptable by students and beneficial to their learning (Chang & Power, 2000; Grace et al., 2019; Metcalf et al., 1982; O'Neill et al., 1998; Rees et al., 2005; Wearn & Bhoopatkar, 2006; Wearn et al., 2008; Wearn & Vnuk, 2005). Students have felt this pedagogy is beneficial to learning by hands-on application of the skills they have studied in their didactic coursework (McLachlan et al., 2010; Rees et al., 2005). Additionally, when practicing with peers, students have the opportunity to learn together and gain feedback from each other in their experiences (Grace et al., 2019; Rees et al., 2005; Wearn & Bhoopatkar, 2006; Wearn et al., 2008). These experiences allow students to learn necessary communication skills, professionalism, and empathy.

Learning skills with peers promotes communication (Wearn & Vnuk, 2005; Wearn et al., 2008) and professionalism (Metcalf et al., 1982; Wearn & Bhoopatkar, 2006; Wearn & Vnuk, 2005; Wearn et al., 2008; Wearn et al., 2013) needed for professional practice. Part of communicating is learning to discuss the appropriate professional language of a specific practice field (Grace et al., 2019). Professional communication is important in gaining patients' trust and learning valuable medical history. Learning appropriate communication is part of professionalism and professional acculturation. In a study conducted by Metcalf et al. (1982), students who practiced skills in groups scored higher in the category of professionalism. Group skills practice is also important in learning anatomy needed for professional practice.

Students have found it valuable to learn their craft on a real person (O'Neill et. al, 1998; Rees et al., 2005; Wearn et al., 2008). Practicing on peers allows for this type of training with the added benefit of learning normal anatomy (O'Neill et. al, 1998; Rees et al., 2005; Wearn & Bhoopatkar, 2006). Students can learn the correct location of anatomy and its normal presentation. It is a hands-on approach where students learn to palpate normal surface anatomy and visually see what it should look like (Rees et al.,

2005; Wearn et al., 2008). Learning normal anatomy in a safe, low-pressure environment helps students identify abnormal anatomy when it presents on a real patient.

Learning normal anatomy in a peer setting allows for students to make mistakes in a safe environment (Rees et al., 2005; Wearn & Bhoopatkar, 2006; Wearn et al., 2008). Students can then refine their skills, reduce their stress in developing their skills and do so without putting a real patient in potential harm (Rees et al., 2005; Wearn & Bhoopatkar, 2006; Wearn et al., 2008). As patients in today's hospital environment are becoming sicker, they are also less tolerant of student practice (Rees et al., 2009b). Students have more time to develop their pre-clinical skills in MEM and do so without having to put a patient at risk.

Practicing in the role of technologist and as a patient puts students in the position to understand how a patient feels. Students have found that MEM provides them with the opportunity to experience what a patient may undergo during an examination (Chinnah et al., 2011; Chunharas et al., 2013; Grace et al., 2019; Metcalf et al., 1982; O'Neill et al.,1998; Rees et al., 2005; Wearn & Bhoopatkar, 2006). Being in the patient role provides students the perspective of how it feels when being examined and greater insight into the healthcare experience of a patient. Students gain awareness into making the patient experience better through being mindful of a patient's comfort needs and respecting their dignity (Chinnah et al., 2011).

Concerns

In the MEM pedagogy, students have indicated being embarrassed or uncomfortable with their peers (Barnett et al., 2000; Chang & Power, 2000; Consorti et al., 2013; Grace et al., 2019; McLachlan et al., 2010; O'Neill et al., 1998; Rees et al., 2005; Rees et al., 2009a; Wearn & Bhoopatkar, 2006; Wearn et al., 2008). Students in cohort groups spend a few years with each other, often seeing each other daily. Unlike the role they are preparing for in the healthcare environment, students spend hours with their

cohort peers and engage in social interactions, which is different from the patient/ caregiver relationship (Barnette et al., 2000; Rees et al., 2009a). Physically touching their peers with whom they interact socially in other circumstances adds to the uncomfortable feelings (Wearn et al., 2008; Wearn & Bhoopatkar, 2006). Students may feel they are being judged by their peers during physical touching (Grace et al., 2019). Some students are concerned about being considered prudish when they are simply being modest about their bodies (O'Neill et al., 1998; Rees et al., 2009a). These uncomfortable feelings can sometimes increase when the area of skills practices includes intimate body areas such as the breasts, groin, or sexual organs (Hendry, 2013; Rees et al., 2005; Rees et al., 2009a; Wearn et al., 2008; Wearn & Bhoopatkar, 2006).

Physical touch also creates an uncomfortable environment for students that have a negative self-image (McLachlan et al., 2010; Rees et al., 2005; Wearn & Bhoopatkar, 2006). There is uncertainty for some students that may not want peers to discover a weight issue (either over or underweight), a lump or a bump, a scar, or other imperfections (Rees et al., 2005). Additionally, there are concerns among both males and females about socially perceived body appearances and not meeting those expectations (Chang & Power, 2017; Wearn & Bhoopatkar, 2006). These negative self-body image concerns are heightened when the physical touch is done when partial undressing is required for the skills practice (Chang & Power, 2000; Hendry, 2013).

Concerns for peer physical touch increase when peers engage in negative behaviors during MEM (Chang & Power, 2000; Vnuk et al., 2017; Consorti et al., 2013; Grace et al., 2019; O'Neill et al., 1998; Rees et al., 2005; Wearn et al., 2008). Lack of maturity among students can cause students to make fun of other students or use language that can be perceived as sexual harassment (Vnuk et al., 2017; O'Neill et al., 1998; Rees et al., 2005; Rees et al., 2009a). Negative behaviors are also seen with digital means when peers socially share group activities through photographs and video (Grace et al., 2013). The

interpersonal boundaries between peers are blurred through these negative behaviors and are confounded when the peer relationship is not positive (Consorti et al., 2013; Rees et al., 2005). Students found fewer negative behaviors when they were in groups of people they felt comfortable with (Hendry, 2013; McLachlan et al., 2010).

Gender

Faculty roles are important in the perceived relationship, but the gender of both faculty and students can create concerns in their interactions. Female students have been shown to rate interactions with faculty as more inappropriate than male students (Owen & Zwahr-Castro, 2007). Male students will seem to perceive contexts of a scenario with faculty as being more sexual than females but will also not perceive this as inappropriate or harassing (Holmes et al., 1999). Gender has also been shown to play a part in students' perception of faculty members' actions in their roles. Male faculty are often perceived as having higher levels of inappropriate behaviors than if the same interaction occurred with a female faculty member (Owen & Zwahr-Casto, 2007). Relationships are often viewed as more sexual when the faculty member is a male and the student is a female (Holmes et al., 1999). Holmes et al. (1999) also found that physically touching a student on the shoulder was considered to be more sexual when the faculty member was a male. However, Arslan & Dinc (2017) found that 42% of students believe that faculty, in general, should avoid all physical contact with students and did not discriminate on an area of touch.

When MEM is viewed from a student perspective, females are less comfortable with the pedagogy than male students (Barnette et al., 2000; Chang & Power, 2000; Consorti et al., 2013). Female students feel a sense of sexual exploitation and are less willing to have sensitive areas being touched or volunteer to be the patient for these types of exams than male students (Chang & Power, 2000; Hendry, 2013; O'Neill et al., 1998; Rees et al., 2005; Rees et al., 2009a; Rees et al., 2009b). Male students are

more willing to be examined and found this to be the reason they volunteer to be the patient more often, leaving a disadvantage for them in learning opportunities to practice exams on females (Vnuk et al., 2017). Females are more comfortable in this pedagogy when they can choose the same gender group (Wearn & Vnuk, 2005).

Age

While stronger patterns exist for perceptions about MEM and gender, age has had differing results in various studies. While older women were more uncomfortable being undressed in group settings (Change & Power, 2000) and having their abdomens and backs examined (Rees et al., 2005), they were more willing to examine patients and have a higher number of body parts willing to be examined by other females (Rees et al., 2009b; Wearn et al., 2013). As for males, there was no relationship to willingness in body parts to be examined as age increased (Rees et al., 2009b). Older men were also found to be more comfortable with being undressed in front of peers (Chang & Power, 2000). Like older females, older males were more willing to examine patients (Wearn et al., 2013). In one final study by Rees et al. (2004), no relationship was found between age and attitudes towards MEM.

Religion

Similar to the category of age, there are differing results for perceptions of MEM when religion is considered. Perceptions and willingness to participate in MEM, especially when exposing the body, has been shown to be dependent upon on religious beliefs and individual interpretation of religious principles (Grace et al., 2019; Hendry, 2013; O'Neill et al., 1998). As found in a study by Rees et al. (2009b), religiosity plays as part in student comfort level and willingness to participate with non-religious students being significantly more comfortable with MEM. Students that consider themselves religious are less willing to participate in MEM with opposite-gender peers (Rees et al., 2009b).

Additionally, there seem to be religious concerns regarding MEM in sensitive areas (Grace et al., 2019; Rees et al., 2005; Rees et al., 2009a; Rees et al., 2009b). Students of Islamic faith had anxieties regarding participation in MEM with students of the opposite sex (Grace et.al., 2019; Rees et al., 2009a) especially when sensitive areas were to be touched or if there was exposure of the body, in particular of females to males (O'Neill et al., 1998). Rees et al. (2005) found that religion was the significant variable that made gender of concern in a person's perceptions of having certain body parts examined. Rees et al. (2009a) also had a student with a conservative Catholic background express concern with MEM in any area that was 'uncomfortable'. Finally. O'Neill et al. (1998) had one student cite the Christian religion as a reason to not participate. Overall, participation and comfort levels with MEM differed based on individual religious influence.

Race

Race has been found to be a variable in comfort levels and willingness to participate in MEM. In an international, cross-sectional, longitudinal study, Rees et al. (2009b), found that white students were more comfortable with being examined by their peers than non-white students. In the same study, non-white students were less comfortable with students of the same sex in body regions near the groin and in their upper body, back, groin, and hips area by students of the opposite sex (Rees et al., 2009b). Wearn et al. (2013) found that Asian students were less willing to participate in MEM with students of the opposite sex in either the examiner or patient role and that both gender and ethnic origin were significant variables in a student's overall total score regarding examining fellow students in certain body regions.

Environment

The environment of the faculty-student interaction has been identified as important in the relationship and overall student perceptions due to the construction of context. Additionally, judgment

on boundary issues and crossing will vary from student to student and faculty to faculty dependent upon the perceived environment. Holmes et al. (1999) in their evaluation of faculty-student relationships found that when the role of the faculty member remained professional and academic, there was no confusion about the appropriateness of the relationship. However, they also found that students' perceptions of the levels of the appropriateness of the faculty-student relationship declined when the role of the faculty member was more of a social one and was even lower when it was a dating or sexual relationship (Holmes et al., 1999). Faculty attitudes and choice of words influenced students' feelings about the educational environment (McLachlan et. al, 2010). Students are more likely to change their perceptions about participation in activities in the classroom when faculty negatively present a task or are unencouraging of their participation (McLachlan et al., 2010). Faculty can influence the environment with practice preference to the point where it feels coercive to students and where no exception to the processes is in place (Delany & Frawley, 2012; McLachlan et al., 2010). Willingness to participate is further decreased when faculty embarrass students and lack professionalism in instruction (McLachlan et al., 2010).

The length of the engagement or interaction also plays a part in the environmental context. Zieber and Hagan (2009) performed a qualitative study of faculty in the clinical environment. They found faculty felt shorter time periods with students did not allow them to engage in mentor relationships (Zieber & Hagan, 2009). As relationships develop over time, it was important to faculty to have time to create a relationship and be able to disclose personal information. Faculty felt this disclosure would help to promote a deeper understanding of learning, as it shows why and how the faculty do what they do (Zieber & Hagan, 2009). Faculty felt longer clinical placement times allowed for the development of relationships, which creates a closer, personal clinical environment (Zieber & Hagan, 2009). Hoffman (2014) found the amount of time faculty must spend in developing relationships with students is

reduced due to other faculty responsibilities. Faculty spend time engaging in non-student aspects of their employment, such as scholarship for tenure and promotion, which limits the time they devote to students (Hoffman, 2014). With the reduced amount of time given to students, relationships with students may decline and the needed personal connection will not be developed.

Social affairs on campus and even professional conferences and meetings are environments that may include both faculty and students that can assist in developing personal connections between the two groups. Bongartz et al. (2011) looked at perceptions of various levels of pharmacy students when engaging in social interactions with faculty. Very few students thought it was wrong for faculty to invite students after a conference to a bar and buy them drinks so long as no one got intoxicated or out of control (Bongartz, 2011). Support was higher for this social interaction in graduate students and upperclassmen undergraduate students (Bongartz, 2011). However, Owen & Zwahr-Castro (2007), found students felt going out for drinks with faculty was very inappropriate. During social events, Bongartz (2011) found students did not support faculty discussing other students or absent faculty negatively, but did find more support for this behavior so long as it was positive. Negatively discussing students or sharing students' performance outside the classroom with peer students or another faculty was also found to be inappropriate (Arslan & Dinc, 2017). Social affairs and events are environments to develop connections and relationships with students so long as they are carefully conducted.

Personal connections and student relationships may also depend upon the physical place of the learning environment. Zieber & Hagen (2009) in their research found some faculty felt touching students in the clinical environment was more appropriate than it would be in the classroom environment. Faculty believed the overall nature of the caring clinical environment made touching students more acceptable (Zieber & Hagen, 2009). However, in the same study, a male and a female instructor were hesitant to touch students in the clinical environment and kept some distance.

The nature of the learning environment and the influences controlling perceptions are structured by faculty (Barnette et al., 2000; Grace et.al., 2019; Metcalf et al., 1982). Creating positive environments come from having structured processes that are clear in the design and define boundaries for all participants (Barnette et al., 2000; Chang & Power, 2000; O'Neill et al., 1998; Wearn et al., 2008; Wearn et al., 2017; Wearn & Vnuk, 2005). Informed consent should be part of the structured process so students have an understanding of their participation including the risks and benefits of MEM (Hendry, 2013; Wearn & Bhoopatkar, 2006; Wearn & Vnuk, 2005). Faculty should consider allowing students to form groups they feel comfortable practicing skills with and limit the size of groups to encourage more participation (McLachlan et al., 2010; O'Neill et al., 1998; Wearn & Bhoopatkar, 2006). Faculty should also maintain private areas for students to change, if needed, and establish a dress code for MEM (Barnette et al., 2000; Hendry, 2013). When sensitive body areas are studied, consideration should also be given to use alternative pedagogical methods (electronic/digital means/standardized patients/ mannequins) (Chang & Power, 2000; Chinnah et al., 2011; Chunharas et al., 2013; Hendry, 2013; Rees et al., 2009a), have a chaperon or faculty present for supervision (Hendry, 2013; O'Neill et al., 1998) or exclude the area of practice (O'Neill et al., 1998; Rees et al., 2009b).

Summary

Bandura's social learning theory can be used to understand how students learn in the observational environment and in understanding the role faculty play. As faculty are important in the role modeling process of students' learning, it is important for faculty to have attributes that will gain students' attention. Faculty need to give timely feedback, be approachable, be professional, be a good communicator, be knowledgeable about the field, create a positive learning environment, and encourage reflection. This will help students in the observational learning process while engaging in MEM.

Students have expressed benefits of and concerns with MEM. All students will agree there is a beneficial learning experience with the pedagogy. Students see MEM as a good way to learn normal anatomy, practice on a live person, hone their skills in a safe environment, and practice communication and professionalism. However, students are concerned with embarrassment, having a negative self-image, and the negative behaviors peers may exhibit during the process. To confound the concerns, age, gender, religion, and ethnicity have mixed findings in the literature. Older students may be more willing to participate in the process but may have more concerns with body image. Females are usually the most reluctant to participate as a model and both genders have expressed concerns with body image. Religion and ethnicity can prove to be a reason for the lack of participation in the process. However, the structure of groups can play a part in the process.

While literature explores the process of MEM thoroughly from a student perspective, little exists to understand how faculty perceive the pedagogical practice or understand their comfort level in their role. While the literature does help to understand the attributes of a good role model to catch the attention of students in MEM, none of the literature explores faculty perceptions as a role model or seeks to correlate their role model perceptions as faculty using MEM. Faculty perceptions and comfort levels are also important in deciding the continued use of this pedagogical method. This research aims to start a body of knowledge with a focus on the faculty role in MEM. It is through sharing the research findings and creating new literature on faculty attitudes and perceptions that faculty within imaging programs can begin to evaluate the continued use of this pedagogical practice if used in their programs.

Chapter 3: Methodology

Purpose

The purpose of this quantitative study was to examine radiography faculty perceptions and comfort levels with the pedagogical practice of MEM and correlate those perceptions and comfort levels to self-efficacy of radiography educators who have taught at least one radiographic procedures course in a JRCERT accredited associate or bachelor's radiography program. MEM is the pedagogical practice of students learning medical professional practice skills using their peers as models (Consorti et al., 2016; O'Neill et al., 1998; Rees et al., 2009a; Taylor & Shulruf, 2016; Wearn et al., 2008; Wearn et al., 2013; & Vnuk et al., 2017). Many health professions programs, including radiography, often teach skills that will be used to take care of patients in professional practice. These skills will require students to physically touch patients. These skills must be practiced by future health professionals and honed before being applied to actual patients. Peer-on-peer training is a common model used for honing these skills (Braunack-Mayer, 2001). When using this training method, instructors often use those students as models for demonstration of proper practice. Literature does lack exploration of radiography faculty perceptions and comfort levels concerning this hands-on training pedagogy. Only a small amount of literature explored the concerns of touching students, but almost none explored this practice as part of teaching. Additionally, little literature exists to understand how faculty perceive the pedagogical practice or understand faculty comfort levels.

This quantitative research utilized a single survey created through a combination of survey items from previously validated surveys and the results of a review of the literature. The survey examined perceptions and comfort levels regarding the pedagogical practice of MEM of radiography faculty that have taught at least one imaging procedures course in a JRCERT accredited associate or bachelor's degree program. Additionally, as role modeling is important in social learning theory, the survey

examined the same groups' self-efficacy as role models. The research aimed to create useful knowledge regarding radiography faculty perceptions and comfort levels with this pedagogical practice and the correlation to self-efficacy as role models. It is through sharing the research findings, imaging programs can begin to evaluate this pedagogical practice if used in their programs. Faculty perceptions and comfort levels are also important in deciding the use of this pedagogical method.

While relationships between students in peer-to-peer practice models have been researched in many disciplines, there has been a lack of research regarding faculty perceptions and comfort levels with this pedagogy. Literature also lacks a correlation with these perceptions and comfort levels to how faculty perceive themselves as role models, which is important in the observational learning process. Only a small amount of literature explored the concerns of touching students, but almost none explored this practice as part of teaching. This research aimed to answer the following questions as they relate to radiography educators in JRCERT accredited associates or bachelor's degree programs that have taught at least one imaging positioning/procedures course:

1. What are radiography faculty perceptions of MEM teaching pedagogy?
2. What are radiography faculty comfort levels with MEM teaching pedagogy?
3. What are radiography faculty's perceptions of themselves as role models?
4. Is there a relationship between radiography faculty perceptions of themselves as role models and their perceptions of MEM pedagogy?
5. Is there a relationship between radiography faculty perceptions of themselves as role models and their comfort levels with MEM pedagogy?
6. Is there a difference in radiography faculty perception scores of MEM teaching pedagogy by gender?

7. Is there a difference in radiography faculty comfort level scores of MEM teaching pedagogy by gender?

Research Design

Through a postpositivist world view, this study utilized a correlational research design with quantitative methodology. In the postpositivist world view, the researcher is looking to objectively identify or assess the causes that influence and affect outcomes when MEM is used by radiography faculty in health education (Creswell & Creswell, 2018). A postpositivist view also realizes that there is no absolute truth and accepts that research is not always perfect (Creswell & Creswell, 2018). Quantitative research fits into a postpositivist view as its methodology is predetermined and tests or objectively verifies theories or explanations through scientific thinking (Nardi, 2018). In a postpositivist worldview, epistemology is rooted in statistical measures and contains objective, quantifiable data. Correlational research is grounded in the postpositivist world view as it maintains an objective view in the investigation of relationships (Terrell, 2016) while using a scientific method. In correlational research, there is testing and exploring of constructs to help further the understanding of phenomena.

Population and Sample

A purposive sample of radiography faculty in JRCERT accredited associate and bachelor's degree programs that have taught at least one radiographic positioning/procedures course was studied as they are the individuals who teach hands-on radiographic positioning/procedures courses or have the experience and knowledge in the process of this pedagogy. This population was reached through a database of accredited radiography programs that is available to imaging sciences educators from the JRCERT, the national radiography program accrediting body. An email to the JRCERT with the request for the continuously updated file was made. The JRCERT categorizes accredited radiography programs by institutional type and further classifies them according to terminal award type.

For the intent of this research, the purposive selection of JRCERT associate and bachelor's radiography degree-granting programs were used. The decision was made to include both JRCERT accredited associate and bachelor's radiography degree programs, as most of the curricular content taught in both degree programs is outlined in the associate degree curriculum; specifically, the guidelines for radiographic positioning/procedures courses are found within this established curriculum. Within JRCERT accredited associate and bachelor's radiography degree programs, both male and female genders were invited to participate as literature related to students in MEM has shown that gender affects perceived differences in the use of this pedagogy (Barnette et al., 2000; Chang & Power, 2000; Consorti et al., 2013; Rees et al., 2004; Rees et al., 2005; Rees, 2007; Rees et al., 2009a; Rees et al., 2009b). The age of the participants ranged from 20 years of age to above 60 years of age. As literature has shown variability of specific demographics in acceptance of MEM, there were no exclusions regarding ethnic background, minority status, or culture (Consorti et al., 2013; Grace et al., 2019; O'Neill, 1998; Rees et al., 2005; Rees et al., 2009a; Rees et al., 2009b). It was estimated that two educators can be reached for each of the JRCERT accredited radiography associate and bachelor's degree programs. As there are approximately 500 JRCERT accredited radiography associate and bachelor's degree programs, about 1000 educators received this survey. Out of those that received this survey, it was estimated that one-fourth or approximately 250 educators would return the survey. Online surveys have been shown to have a variable response rate, but can be as low as 30 percent (Nardi, 2018).

Survey Design and Development

The survey (see appendix A) developed for this study was created from a review of the literature and adapted from two commonly used surveys that investigate PPE in physician training: the Peer Physical Examination Questionnaire (PPEQ) and the Examining Fellow Students Questionnaire (EFS)

(Consorti et al., 2013; O'Neill et al., 1998; Rees, et al., 2005). The authors of both surveys provided approvals for their use and adaptation (see Appendix B & C). The survey began with consent and a screening question to establish if the respondent has taught at least one positioning or procedures course in a JRCERT accredited associate or bachelor's radiography program. Screening questions help to determine if the respondent fits the criteria of the research study before the survey starts (Rea & Parker, 2014). For this survey, if the respondent selected a "No" answer, then the survey stopped. For those respondents that had positive answers, the survey started.

The first section of the survey was adapted from the PPEQ survey and were designed to help in establishing faculty perceptions of MEM. The statements were reworded from a peer-to-peer perspective to a faculty-to-student perspective. A total of nine statements from the original 16 were adapted for this study. Five statements of the original survey were similar in content and not used as they could not be reworded from peer-to-peer perspective to faculty-to-student perspective. Additionally, two statements regarding undressing were not used as they were not applicable to radiography positioning in the classroom. This section of the survey asked faculty to rate their level of agreement using a scale of one to ten, with one being strongly disagree and ten being strongly agree. Likert scale data is useful in the assessment of attitudinal types of questions (Rea & Parker, 2014). A scale of ten was utilized as the longer the scale the better in determining the agreement of respondents and in establishing construct validity (Awang et. al, 2016). Additionally, the distance between the scale can be inferred to be more accurate and thus can be used as interval data (Awang et al., 2016). As an example, an agreement of 50% more closely matches a rating of five on a scale of 10, than two or three would match on a scale of five. Awang et al. (2016) found that the ten-point scale serves as a promising scale to conduct parametric testing.

The second section of the survey was adapted from the EFS questionnaire and was reworded to gain feedback on the comfort levels of faculty when demonstrating on students. The original survey intended to elicit feedback regarding students' willingness to participate in examining peers in various body areas. These items were changed from a willingness to participate in examining specific body areas to asking faculty about comfort levels in demonstrating exams on students in specific body areas. This section contains ten statements regarding comfort levels in demonstrating examinations in various body areas. The original survey had 12 body areas. As radiography procedures do not position for the breast or genitals, those areas were removed. Again, faculty were asked to rate their level of agreement using the same scale as the first section. In the original survey, a dichotomous response of yes or no was collected. As it is important to understand a level of comfort, the nominal scale was not used in this survey development.

The third section of the survey was developed through a review of pertinent literature to establish criteria for role modeling. Faculty play an important role in observational learning and MEM by demonstrating appropriate radiographic positions/procedures on students. Within Bandura's Social Learning Theory, role modeling is important in many of the stages, especially the attention and retention stages. Literature suggests that exemplary role models are aware of their responsibility to students as they hold the positions of individuals they aspire to be (Althouse et al., 1999; Horsburgh & Ippolitao, 2018; & Price & Price, 2009). Literature suggests that the following criteria is found to be exhibited and practiced by good role models: approachable (Althouse et al., 1999; Conway et al., 2008; Cruess et al., 2008; Donaldson & Carter, 2005; Passi & Johnson, 2016; Price & Price, 2009; Stegman et al., 2013; & Wright, Carrese, 2002), exhibit professionalism (Asghari et al., 2011; Fluit et al., 2010; Gibbs & Kulig, 2017; Passi & Johnson, 2016; Stegman et al., 2013; & Wright & Carrese, 2002), good communicator (Althouse et al., 1999; Conway et al., 2008; Cruess et al., 2008; Fluit et al., 2010; Perry,

2008; Price & Price, 2009; Stegman et al., 2013; & Wright & Carrese, 2002), provide timely feedback (Althouse et al., 1999; Cruess et al., 2008; Donaldson & Carter, 2005; Gibbs & Kulig, 2017; Horsburgh & Ippolito, 2018; Perry, 2008; & Stegman et al., 2013), encourage reflection (Althouse et al., 1999; Cruess et al., 2008; Fluit et al., 2010; Horsburgh & Ippolito, 2018; Price & Price, 2009; & Wright & Carrese, 2002), creates a positive environment (Althouse et al., 1999; Conway et al., 2008; Cruess et al., 2008; Donaldson & Carter, 2005; Fluit et al., 2010; Gibbs & Kulig, 2017; Horsburgh & Ippolito, 2018; Passi & Johnson, 2016; Perry, 2008; & Wright & Carrese, 2002), and are knowledgeable clinical experts (Althouse et al., 1999; Conway et al., 2008; Cruess et al., 2008; Donaldson & Carter, 2005; Fluit et al., 2010; Gibbs & Kulig, 2017; Passi & Johnson, 2016; Perry, 2008; Price & Price, 2009; Stegman et al., 2013; & Wright & Carrese, 2002).

The fourth section of the survey contained three open-ended questions on the opinions of the pedagogical practice of hands-on demonstrations performed in MEM. Faculty were asked to provide insight on the benefits, drawbacks, and concerns of the MEM pedagogy. A drawback to survey research is the inability to gather insight into the individual participant. Only data from specific questions can be obtained from a scale survey, which makes short open-ended questions valuable to obtain details that are not covered on a scale response (Rea & Parker, 2014).

The last section of the survey was developed by the researcher to gain demographic information of respondents. This section asked for information regarding years of teaching in the field of radiography, positions held within the JRCERT accredited program and current or previous assignments of courses that require the teaching of radiographic positioning/procedures. The remaining demographic questions gained information regarding religious affiliation, age, gender, and race. Demographic information is important in understanding the different categories of individuals that will return the survey (Nardi, 2018) and provide insight into the findings of the research. As religion and

individual interpretations of religion has shown to be a variable among students that affect perceptions and willingness to participate in MEM, it is important to capture this demographic from faculty to provide insight into the findings from the current respondents (Grace et al., 2019; Hendry, 2013; O'Neill et al., 1998). Demographic information was added to the end of the survey, in case respondents experience survey fatigue, find some demographic information as sensitive or fail to complete the entire survey (Nardi, 2018; Rea & Parker, 2014).

Validation of Survey

The survey was tested for validity before use for data collection. Validity is needed to establish that the tool will measure what it is intended to measure (Bolarinwa, 2015; Creswell & Creswell, 2018; Mohamad et al., 2015; Rea & Parker, 2014; Taherdoost, 2016). A three person expert panel of imaging faculty whom have used MEME was created to establish the face validity of the survey. Face validity is a subjective review of survey items by a group of experts in either survey design or in the field of study pertinent to the research to establish if each item seems like it is measuring what it is supposed to be measuring (Nardi, 2018; Taherdoost, 2016). This same panel was asked to also look for content validity. With content validity, the expert panel looked to see if the items were measuring the concept that it was supposed to be measuring (Creswell & Creswell, 2018; Nardi, 2018; Taherdoost, 2016). Additionally, they assessed if items were missing that would add to the study and help further define the construct (Creswell & Creswell, 2018; Nardi, 2018; Taherdoost, 2016; Terrell, 2016). To facilitate this process a "Yes" or "No" response was identified by each panel member to establish if the items were structured to measure the intended construct (Taherdoost, 2016).

After content and face validity was established, construct validity was established using a pilot test of the survey that matched the sample population surveyed and the research procedures used. Construct validity is an actual measurement of the degree to which the questions measure the construct

intended (Nardi, 2018; Terrell, 2016). A correlational analysis will be done using the latest version of IBM's Statistical Package for the Social Sciences (SPSS).

Reliability of Survey

The survey was tested for reliability before use for data collection. Reliability testing establishes the degree to which the survey will yield consistent or reliable results (Creswell & Creswell, 2018; Mohamad et al., 2015; Taherdoost, 2016; Terrell, 2016). The internal consistency was calculated after a pilot test of the survey using a Cronbach's alpha value (Nardi, 2018; Taherdoost, 2016; Terrell, 2016). This test was run in the latest version of SPSS. Values closer to 1.0 would indicate high reliability (Mohamad et al., 2015; Nardi, 2018; Terrell, 2016).

Research Procedures

Administering the Survey

Qualtrics, an online survey tool, was utilized for formatting the survey, delivering the survey, and collecting responses online. Online distribution of surveys is a convenient method when emails of the population to be sampled are readily available (Rea & Parker, 2014). Additionally, online surveys are convenient in their distribution to the sample population, following up with the sample population, and in transferring data collected to tools used for analysis (Creswell & Creswell, 2018; Rea & Parker, 2014). The ability to transfer data collected from the online survey into IBM's SPSS reduces data entry errors and accelerates data testing and analysis (Creswell & Creswell, 2018). However useful in distribution, online surveys can only reach the population with a known and valid email, may limit responses due to nonresponses to emails, fear of technology use, or confusion with questions or directions (Rea & Parker, 2014).

The researcher contacted the JRCERT to obtain a file of faculty emails in accredited associate and bachelor's degree radiography programs. The JRCERT makes accredited program faculty information

public and provides this information in a Microsoft Excel file for convenience to researchers. An email with consent (Appendix D) and a link to the Qualtrics survey was sent to the individuals on the list, which included programs directors, clinical coordinators, and instructors. The email included the purpose of the study, detailed instructions, consent procedures, benefits, risks, the deadline for completion, and a link to the survey. The participants clicked on the survey link to take the survey but could have declined to take the survey by not clicking on the link. The participant could have decided to withdraw from the study by stopping or closing the survey without answering further questions. The survey was designed to only take approximately 10-15 minutes to complete to increase completion rates by respondents (Rea & Parker, 2014).

Timeline. The research was conducted after the proposal was approved by the dissertation committee and USI's Institutional Review Board. The collection of data lasted for 20 business days. The survey link was active during that time, and after that period, the survey link was deactivated. A reminder email was sent approximately 10 days after the initial start of the survey. After the approval and successful defense of the dissertation, the data and other materials used for the survey will be kept for five years and then destroyed (Creswell & Creswell, 2018).

Ethical Considerations. The research study was reviewed by the Institutional Review Board at the USI for approval and safeguarding of human subjects (Creswell & Creswell, 2018). To safeguard the subjects' participation, all data collected was kept confidential as no individually identifying information was requested (Nardi, 2018). The data was protected in a secure network and on the investigator's log-in and password-secured computer. Survey responses were presented in an aggregate form in study results (Creswell & Creswell, 2018). The consent form indicated that participation in the survey was voluntary and could be terminated at any time by closing out the survey or through non-answering of questions (Nardi, 2018; Terrell, 2016). The consent form explained to the respondent any potential risks

or benefits of taking part in the survey (Nardi, 2018; Terrell, 2016). For this survey, respondents benefited from participation in the form of gaining a better understanding of their perceptions and comfort levels in hands-on pedagogy involving students as models. Respondents may have had the risk of being uncomfortable in answering some of the survey questions.

Pilot Testing of Survey

Procedures. As the current survey was altered from more than one previously used survey and developed from a review of literature, the known validity and reliability of any survey item would not be consistent for the current study. To establish validity and reliability before use in gathering information for the dissertation, the survey was pilot-tested after content and face validity was established by a three-person content expert review. Pilot testing is a pre-testing of the survey using the same research procedures intended in the actual data collection (Rea & Parker, 2014). Pilot testing also aids in the testing of the survey instructions and to gain feedback regarding the flow of the survey (Creswell & Creswell, 2018; Nardi, 2018; Rea & Parker, 2014). The pre-test of the survey allows for evaluation and consideration of necessary revisions to avoid errors in data measurements. Pretesting also allows for changes that would increase the clarity or interpretation of survey items or in the directions. The pilot survey did have an additional set of questions regarding the flow of the survey, directions for the survey, and the estimated time it took to complete the survey (Nardi, 2014). Additionally, an open response section to gather additional feedback from respondents on the construction or format of the survey was included (Nardi, 2018). These additional questions were not available on the survey used for data collection.

The pilot survey created in Qualtrics was distributed to approximately 38 individuals known to the researcher and matched the sample population to be surveyed. Contacting individuals who know the researcher was done to increase the chances the pilot survey will be filled out and returned. After a

3-day reminder was sent regarding the survey, only 11 responses had been received. To obtain more data for reliability and validity testing, a call for volunteers was placed on the American Society of Radiologic Technologists' Educator's community forum. Volunteer educators sent an email indicating their willingness to participate. Those volunteers were sent an email with the online consent form and an anonymous link to the survey. An additional 27 volunteers were recruited in this fashion. Pilot survey participants were not invited to take the survey for data collection as they had already seen the survey once before (Rea & Parker, 2014).

Results. The pilot survey was exported from Qualtrics into SPSS. Total columns for perceptions, comfort levels, and role modeling were created. Three questions within the perception section of the survey (questions 3, 4, & 7) were recoded before statistical testing as they were negatively worded. All Likert scale data was reviewed for homogeneity using the Kolmogorov-Smirnov test of normality. The Kolmogorov-Smirnov test indicated that no Likert scale item followed a normal distribution, as all items were below the 0.05 level.

Reliability testing was performed on each Likert scale section of the survey. Cronbach's alpha was utilized to determine the internal consistency, with optimum values ranging between .7 and .9 (Creswell & Creswell, 2018). Cronbach's alphas for the 9 perceptions, the 10 comfort levels, and the 10 role modeling items were .735, .958, and .865, respectively. All Likert scale sections of the survey were found to have good reliability.

Correlational testing using the Spearman's Rho test statistic was used to determine the validity of each of the three sections of Likert scale questions (perception, comfort levels, and role modeling efficacy) by correlating each Likert scale item with the total score. An item that significantly correlated with the total score indicates that the item is valid. The nine items within the perception section of the survey were all significantly correlated ($r = .418$ -$.521$, $p < .05$ or $p < .01$). Items within the comfort level

section of the survey (10) were all significantly correlated ($r = .658$-$.968$, $p < .01$). Within the role modeling section of the survey, all ten items were significantly correlated ($r = .632$ -$.830$, $p < .01$). All Likert scale sections of the survey were found to have validity.

Feedback from the respondents regarding the survey, its construction, and its format were reviewed. Respondents reported that the survey took between 4-20 minutes with an average of 10.71 minutes. The survey was found to be extremely or somewhat easy to navigate by 86% of respondents. Many individuals commented on the abbreviation usage for Medical Education Modeling (MEM) near the end of the survey. Respondents felt it would be beneficial to spell out the abbreviation instead of assuming the abbreviation would be remembered. One respondent stated they had to back-track to the beginning of the survey to identify the abbreviation. As a result of these comments, the abbreviation was eliminated, and the entire term was used. Additional feedback, resulted in adding an option for respondent's role within their program, elimination of "Catholic" as a separate religion and adding it to the religion "Christian", and moving the open response regarding concerns with demonstrating exams on students from the end of the survey to right after the Likert scale questions on comfort levels. The rest of the subcategories of religion were not changed as there was not concern among the pilot sample population to combine any additional groups. Additionally, the findings when reviewed through the respondents' lens may have lost some of the specific views relating to perceptions and comfort levels if religion was placed into umbrella categories as literature has shown religious beliefs and individual interpretation of religious principles can affect the variables examined in this study.

Procedures for Data Analysis

Research Question 1: What are radiography faculty perceptions of MEM teaching pedagogy?

Descriptive statistics were used to report the level of agreement on each perception of MEM as a teaching pedagogy question. The mean and standard deviation were reported as the variables are

being used as scale data. As a ten-point scale was used, the distance between the scale can be inferred to be more accurate and thus can be used as interval data (Awang et al., 2016). Awang et al. (2016) found that the ten-point scale serves as a promising scale to conduct parametric testing. The latest version of SPSS was used for this analysis. Additionally, the MEM perception score was calculated as a total of all responses. This score was used for correlational analysis in research question number four and in comparing means in question six. As a total score was calculated, survey items in the faculty perceptions of MEM teaching pedagogy section that were missing responses voided all responses and were not used for the total score.

Research Question 2: What are radiography faculty comfort levels with MEM teaching pedagogy?

Descriptive statistics was used to report the level of agreement on comfort levels with MEM teaching pedagogy. The mean and standard deviation was reported as the variables were used as scale data. As a ten-point scale was used, the distance between the scale can be inferred to be more accurate and thus can be used as interval data (Awang et al., 2016). Awang et al. (2016) found that the ten-point scale serves as a promising scale to conduct parametric testing. The latest version of SPSS was used for this analysis. Additionally, a MEM comfort level score was calculated as a total of all responses. This score was used for correlational analysis in research question five and in comparing means for research question seven. As a total score was calculated, survey items in the faculty comfort levels of MEM teaching pedagogy section that were missing responses voided all responses and was not used for the total score.

Research Question 3: What are radiography faculty perceptions of themselves as role models?

Descriptive statistics were used to report the level of agreement on each role model statement. The mean and standard deviation was reported as the variables were being used as scale data. As a ten-point scale was also used for this section of the survey, the distance between the scale can be inferred

to be more accurate and thus can be used as interval data (Awang et al., 2016). Awang et al. (2016) found that the ten-point scale serves as a promising scale to conduct parametric testing. The latest version of SPSS was used for this analysis. Additionally, a role model perception score was calculated as a total of all responses. This score was used for correlational analysis in research questions four and five. As a total score was calculated, survey items in the faculty self-efficacy as a role model section that were missing responses voided all responses and was not used for the total score.

Research Question 4: Is there a relationship between radiography faculty perceptions of themselves as role models and their perceptions of MEM pedagogy?

After evaluation for normal distribution and test assumptions, Spearman's rho correlation was used to analyze the relationship between dependent variables: role model perception score and MEM perception score. A Spearman's rho correlation was chosen as the scores were being used as scale data but did not meet normal distribution. The latest version of SPSS was used for this analysis.

Research Question 5: Is there a relationship between radiography faculty perceptions of themselves as role models and their comfort levels with MEM pedagogy?

After evaluation for normal distribution and test assumptions, a Spearman's rho correlation was used to analyze the relationship between dependent variables: role model perception score and MEM comfort level score. A Spearman's rho correlation was chosen as the scores were being used as scale data but did not meet normal distribution. The latest version of SPSS was used for this analysis.

Research Question 6: Is there a difference in radiography faculty perception scores of MEM teaching pedagogy by gender?

After evaluation for normal distribution and test assumptions, a Wilcoxon-Mann-Whitney test was used to determine any difference in faculty perception scores of MEM teaching pedagogy by gender. The dependent variable in the analysis was identified as MEM perception score (scale/ratio

data). The independent variable was identified as gender (nominal data). The latest version of SPSS was used for this analysis.

Research Question 7: Is there a difference in radiography faculty comfort level scores of MEM teaching pedagogy by gender?

After evaluation for normal distribution and test assumptions, a Wilcoxon-Mann-Whitney test was used to determine any difference in MEM comfort level scores by gender. The dependent variable in the analysis was identified as MEM comfort level scores (scale/ratio data). The independent variable was identified as gender (nominal data). The latest version of SPSS will be used for this analysis.

Demographic Data

Descriptive statistics were used for the demographic data collected in terms of analyzing means and standard deviations (Creswell & Creswell, 2018). The latest version of SPSS was used for this analysis. Demographic data were used to define and understand different categories of individuals that returned the survey and provided insight into the findings of the research.

Open-ended Questions

The three open-ended questions were exported from SPSS to Microsoft Word. A thematic analysis was conducted. Each response will be coded into a single word or short phrase summary. Words or phrases that repeat in the responses will be grouped according to themes. Percentages of responses will then be reported. Data was used to further add qualitative information to the findings of research questions one and two.

Assumptions

The data was collected under the conditions of anonymity and the respondent's identity was protected. Considering the anonymity of the survey, it was assumed those taking the survey would

truthfully answer the questions presented. Additionally, it was assumed the methodology chosen would address the research questions.

Limitations

A quantitative methodology using a survey does limit the study. Surveys have limitations in the areas of sampling, social desirability bias, central tendency bias, researcher bias, low response rates, and missing survey answers, which can affect the reliability of the survey (Nardi, 2018). In the area of sampling, this research study used a purposive sample. Purposive sampling is a nonprobability sampling technique, which means it is not generalizable to the entire population (Nardi, 2018; Terrell, 2016). This study's findings are limited to only JRCERT accredited associate and bachelor's radiography degree programs. The research findings cannot be generalized to programs that provide certificates of completion or are not accredited.

Several additional types of bias could have limited this research. While survey directions indicate anonymity, respondents could have given socially acceptable responses (social desirability bias) rather than being honest (Nardi, 2018). As an example, in this current study, it is not socially acceptable to indicate sexual interest in a student when demonstrating radiographic procedures on them and thus the analysis may not be accurate. Additionally, respondents on long Likert scale surveys may avoid choosing responses on either end of the scale. Central tendency bias for this study may have been seen as fewer responses for strongly disagree (1) and strongly agree (10) as respondents may have avoided choosing extremes. Bias may also exist on the part of the researcher (Creswell & Creswell, 2018). The researcher for the current study has the same background as the sample population, which shapes the researcher's underlying thoughts and perceptions on the current topic. Theoretically, the researcher's bias, while unintentional, may have shaped decisions made about conducting the research and in the analysis.

Nonresponse bias is another limitation of conducting research with a survey (Rea & Parker, 2014). Nonresponse bias within a given sample may occur due to failure to fill out the survey in part or at all or due to never receiving the survey because of invalid emails or loss of access to email systems (Rea & Parker, 2014). In all instances, this lowers the overall response rate, which affects the reliability that results are representative of the sample population chosen (Rea & Parker, 2014). In the current research, the email list provided by the JRCERT may not be current or contain inaccurate information.

Lastly, when conducting correlational research there was the possibility of confounding variable(s) (Terrell, 2016). While the analysis of the correlation may have been negative or positive, there could have been other variables that were not included in the correlation that would have better explained the relationship (Terrell, 2016). Correlational research is also limited as it cannot establish causation (Terrell, 2016). Just because two variables are correlated does not mean that one causes the other (Terrell, 2016).

Delimitations

Delimitations to this study include the research methodology, which was quantitative. While there were three short open-ended questions within this research, qualitative research design could pull information from participants that would have been of interest to this topic that Likert Scale responses did not address. Additionally, the research looked only at educators in the field of radiography that had participated in courses with hands-on radiographic positioning. There may have been educators that had experience in this area through observation and their opinions or perceptions were not captured. Educators from other health fields utilizing this type of pedagogical practice were also not included as the researcher is an educator in the field of radiography and had an interest in the perceptions and comfort levels of those in the same field.

Summary

This research, using a postpositivist world view and guided by Bandura's Social Learning Theory, provided quantitative statistical analysis of the research questions related to radiography faculty perceptions and comfort levels with MEM as part of the educational curriculum, as well as perceptions regarding being role models. It is through sharing the data and research findings and creating new literature on faculty attitudes and perceptions that faculty within JRCERT accredited associate or bachelor's radiography programs can begin to evaluate the continued use of this pedagogical practice. Reflection on pedagogical practices can benefit academic programs by strengthening practices already in use, modifying practices that may be concerning, or identifying other pedagogical methods that can be used to replace or supplement current practices.

Chapter 4: Findings

The purpose of this quantitative study was to examine radiography faculty perceptions and comfort levels with the pedagogical practice of MEM and correlate those perceptions and comfort levels to self-efficacy of radiography educators who have taught at least one radiographic procedures course in a JRCERT accredited associate or bachelor's radiography program. An email during the Spring semester of 2022 was sent to radiography educators in accredited radiography programs asking them to participate in a survey regarding their perceptions and comfort levels with MEM and their perceptions as role models. The survey comprised of five main sections: perceptions of MEM, comfort levels when demonstrating positioning on students, role modeling perceptions, open-ended response questions, and demographic information.

Description of the Sample

A purposive sample of radiography faculty in JRCERT accredited associate and bachelor's degree programs that have taught at least one radiographic positioning or procedures course was sent a single survey. This population was chosen as they are the individuals who teach hands-on radiographic positioning or procedures courses or have the experience and knowledge in the process of this pedagogy. This population was reached using a database of accredited radiography programs that is available to imaging sciences educators from the JRCERT, the national radiography program accrediting body. A total of 1,606 emails were sent with 270 participants starting the survey and 252 finishing the survey. Of the 18 unfinished surveys, it is possible that participants started the survey and did not agree to consent to start the survey, or they had a "no" response to the qualifier question regarding having been an instructor in at least one radiographic procedures or positioning course in their career in a JRCERT accredited associate or bachelors' program. Either response would have not allowed the participant to start the survey. Additionally, of the emails sent, 94 emails were invalid and 18 were

duplicated. The total number of possible participants for the current study was 1,476. The total response rate was 17%.

Demographics

In order to assist in understanding the responses collected when answering the research questions, a section of the survey gathered participant demographic information. The demographic questions asked about age, gender, race, religion, years of teaching radiography, role within a radiography program, and teaching assignment of positioning courses. Not all of the 252 participants responded to the demographic information questions. The responses that were received ranged between 208-213 participants. Frequency counts and percentages were used to analyze the responses. As seen in Table 1, the majority of participants were female (79.3%). The age of the participants ranged between 23-72, with 67.3% of the respondents being between 38-57 years of age (see Table 2). The largest age category of respondents was 38-42 (18.8%). Additionally, there were a similar number of respondents in the 48-52 (16.8%) and 53-57 (16.8%) age categories. Further characterizing respondents, as seen in Tables 3 & 4, participants were mostly white (89.4%) and had a Christian religious affiliation (65.6%).

Table 1

Demographic Information: Gender

Gender	*n*	%
Male	41	19.7
Female	165	79.3
Prefer not to answer	2	1.0
Total	208	100

Table 2

Demographic Information: Age

Age range	*n*	%
23-27	4	1.9
28-32	5	2.4
33-37	15	7.2
38-42	39	18.8
43-47	31	14.9
48-52	35	16.8
53-57	35	16.8
58-62	22	10.6
≥ 62	19	9.1
Prefer not to answer	3	1.4
Total	208	100

Table 3

Demographic Information: Race

Race	*n*	%
Asian	1	0.5
Black/African	6	2.9
White	185	89.4
Hispanic/Latino	5	2.4
Pacific Islander	1	0.5
Mixed Race	1	0.5
Other	1	0.5
Prefer not to answer	7	3.4
Total	207	100

Table 4

Demographic Information: Religious Affiliation

Religious affiliation	*n*	%
Christian/Catholic	139	65.6
Mormon	4	1.9
Jehovah's Witness	1	0.5
Orthodox	1	0.5
Jewish	2	0.9
Buddhist	3	1.4
Other	3	1.4
Nothing in particular	24	11.3
Prefer not to answer	19	9.0
Atheist	11	5.2
Agnostic	5	2.4
Total	212	100

Program directors (43.7%), clinical coordinators (27.4%) and instructors (13.5%) made up 213 of the respondents. Over half (50.7%) of the radiography educators had been teaching for 16 or more years with 62% having a regular assignment to teach radiographic positioning course (lecture and/or laboratory). Tables 5-7 describe this demographic information in detail. The majority (70.2%) of respondents (*n* = 177) indicated MEM best described the pedagogy used in their positioning and procedures course(s). Other pedagogies described were: standardized patients (*n* = 8, 3.2%), virtual or augmented reality (*n* = 10, 4%), combination of several pedagogies (*n* = 43, 17.1%) and other (*n* = 11, 4.4%). Phantoms, mannequins, video, simulation software, cadavers, and pre-radiology students were mentioned as other methods for positioning practice.

Table 5

Demographic Information: Years as a Radiography Educator

Year of experience range	*n*	%
≤ 5 years	29	13.6

Year of experience range	*n*	%
6-10 years	39	18.3
11-15 years	37	17.4
16-20 years	53	24.9
≥ 20 years	55	25.8
Total	213	100

Table 6

Demographic Information: Radiography Educator Role Within Program

Educator role	*n*	%
Program Director	110	51.6
Clinical Coordinator	69	32.4
Instructor (not program director or clinical coordinator)	34	16.0
Total	213	100

Table 7

Demographic Information: Teaching Assignment for Procedures Courses

Teaching assignment	*n*	%
I am regularly assigned to teach radiographic procedures/positioning course lectures and/or laboratory practice.	110	51.6
I have taught radiographic procedures/positioning courses (lecture and/or laboratory practice) in the past, but do not now.	69	32.4
I teach radiographic procedures/positioning courses, but this is not a regular assignment.	34	16.0
Total	213	100

Overall, participants were white females between the ages of 38-57 with a Christian religious affiliation. Additionally, most participants were radiography educators that held administrative positions as directors of programs with more than 16 years of teaching experience and regular assignment of

teaching radiographic positioning or procedures courses. Most respondents indicated MEM as the pedagogy used in their program. The responses to survey items from this demographic will help to frame and provide a perspective of the analysis and outcomes of the research questions.

Analysis of Research Questions

Research Question 1: What are Radiography Faculty Perceptions of MEM Teaching Pedagogy?

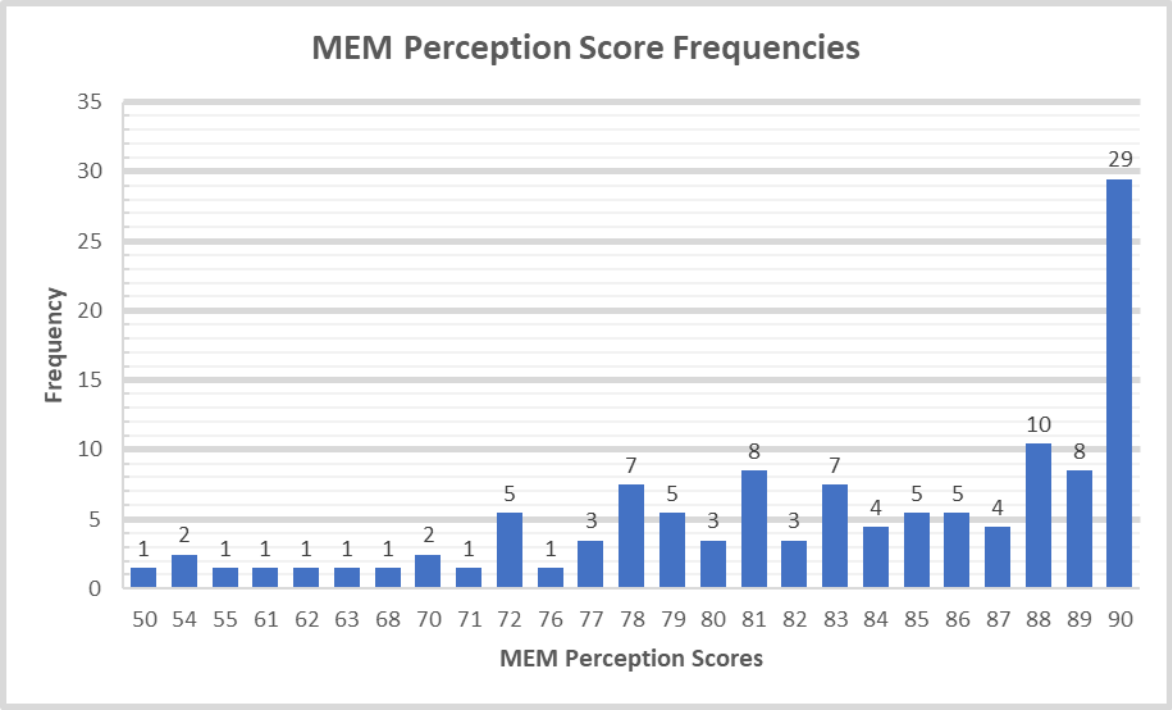
The first section of the survey contained nine statements designed to establish perceptions of MEM. These statements were adapted from the PPEQ survey and were reduced to nine statements from the original 16. The statements were reworded from a peer-to-peer perspective to a faculty-to-student perspective. This section of the survey asked radiography educators to rate their level of agreement using a scale of one to ten, with one being strongly disagree and ten being strongly agree. Descriptive statistics in the form of the mean, range, and standard deviation were calculated for each of the nine statements used to identify faculty perceptions of MEM teaching pedagogy. Prior to statistical analysis, reliability, validity, and normality tests were conducted. The items used to determine faculty MEM perceptions had high reliability with a Cronbach's alpha of 0.72. Correlational testing using the Spearman's Rho test statistic was used to determine the validity of each Likert-scale question by correlating each Likert-scale item with the total score. The nine items within the perception section of the survey were all significantly correlated (r_s = .337 -.713, p <.01). A Kolmogorov-Smirnov test for normality indicated that responses of faculty perceptions of MEM teaching across all statements do not follow a normal distribution (D[131-219] = 0.29 - 0.45, p = 0.000).

A total MEM perception score was calculated for use in analyzing question one, but in also the analysis and answering of research questions four and six. Recoding of negatively worded statements (3, 4 & 7) was done prior to calculating a total MEM perception score. As a total score was calculated, survey items in the faculty perceptions of MEM teaching pedagogy section that were missing responses

voided all responses and were not used. Out of a total of 118 MEM perception scores calculated, the mean MEM perception score was 82.56 (*SD* = 8.64) with a range of scores between 50.0-90.0. Twenty-four percent of the participants (*n* = 29) had a MEM perception score of 90, which was the maximum score in this area. Scores between 88-89 (*n* =18) counted for 15.3% of the MEM perception scores with 11.5% of scores being 71 and below (*n* = 11). All MEM perception score frequencies can be found in Figure 1.

Figure 1

MEM Perception Score Frequencies



As seen in Table 8, radiography educators felt that demonstrating exams on students was an appropriate teaching strategy (*m* = 9.39, *SD* = 1.34) and were comfortable with the pedagogy (*m* = 9.33, *SD* = 1.30). Educators also felt that demonstrating examinations on students shows proper positioning technique (*m* = 9.39, *SD* = 1.60) and allows them to provide feedback when checking students' work performed on another student (*m* = 9.53, *SD* = 1.42). Additionally, radiography educators

felt comfortable when demonstrating examinations on students of the same sex (*m* = 9.44, *SD* = 1.32) and opposite-sex (*m* = 9.07, *SD* = 1.57). When educators were asked about being concerned with experiencing sexually interested in a student (*m* = 1.61, *SD* = 1.85) or being the object of sexual interest (*m* = 2.59, *SD* = 2.51) when demonstrating examinations on their students, educators strongly disagreed with those statements. It is important to note that while collectively educators strongly agreed with the statements on MEM pedagogy, a review of the range minimums may suggest there are some who do not have a good perception of the practice.

Table 8

Faculty Perceptions of MEM Teaching Pedagogy Descriptive Statistics

Perception statement	*n*	Range		Mean	*SD*
		Minimum	Maximum		
Demonstration of examinations on my students is an appropriate teaching strategy.	219	2	10	9.39	1.34
In general, I feel comfortable when demonstrating examinations on my students.	219	3	10	9.33	1.30
I am concerned about being a possible object of sexual interest when demonstrating examinations on my students.	156	1	10	2.59	2.51
I am concerned about experiencing possible sexual interest in a student(s) when demonstrating examinations on my students.	131	1	10	1.61	1.85
I feel comfortable when demonstrating examinations on students of my same sex.	218	1	10	9.44	1.32
I feel comfortable when demonstrating examination on a student(s) the opposite sex than mine.	218	1	10	9.07	1.57
It is inappropriate to demonstrate examinations on my own students.	136	1	10	2.27	2.62

Perception statement	*n*	Range		Mean	*SD*
		Minimum	Maximum		
Demonstrating examinations on students shows proper positioning technique.	215	1	10	9.39	1.60
I am able to provide useful feedback to students when I physically check their positioning performed on another student.	215	1	10	9.53	1.42

Research Question 2: What are Radiography Faculty Comfort Levels With MEM Teaching Pedagogy?

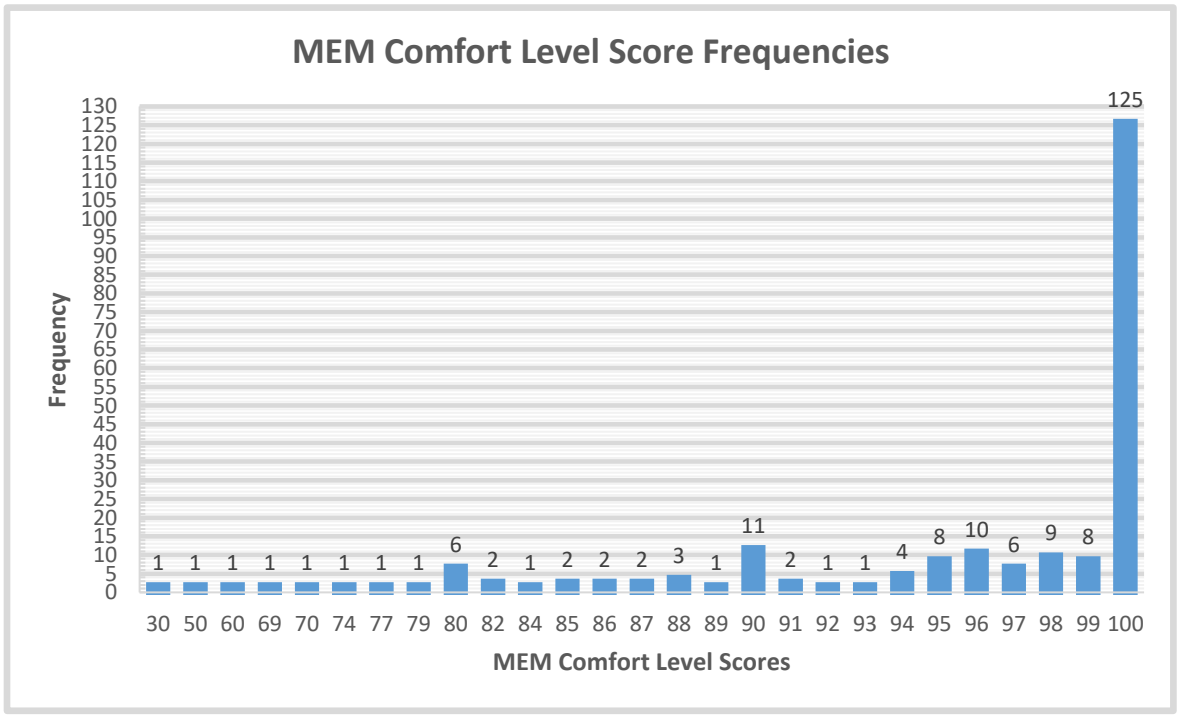
The second section of the survey contained 10 statements regarding comfort levels in demonstrating exams on students in various body areas. This section was adapted from the EFS questionnaire and was reworded to gain feedback on the comfort levels of faculty when demonstrating on students. The original survey's intent was to elicit feedback regarding students' willingness to participate in examining peers in various body areas. These items were changed from a willingness to participate in examining specific body areas to asking faculty about comfort levels in demonstrating exams on students in specific body areas. Again, faculty were asked to rate their level of agreement using the same scale as the first section where one was strongly disagree and 10 was strongly agree. Descriptive statistics in the form of the mean, range, and standard deviation were calculated for each of the 10 statements used to identify faculty comfort levels when engaging in MEM teaching pedagogy within specific body regions. Prior to statistical analysis reliability, validity, and normality tests were conducted. The items used to determine faculty MEM comfort levels had very high reliability with a Cronbach's Alpha of 0.95. Correlational testing using the Spearman's Rho test statistic was used to determine the validity of Likert-scale questions by correlating each Likert-scale item with the total score. Items within the comfort level section (10) of the survey were all significantly correlated (r_s = .531-.743, $p < .01$). A Kolmogorov-Smirnov test for normality indicated that responses of faculty comfort levels in

engaging in MEM pedagogy across all statements do not follow a normal distribution (D[215-217] = 0.37 - 0.50, p = .000).

A total MEM comfort level score was calculated for use in answering this research questions but was also needed to analyze and answer questions five and seven. As a total score was calculated, survey items regarding faculty comfort levels in demonstration of exams on students in a particular body area that were missing responses voided all responses and were not used. Out of the 212 MEM comfort level scores calculated, the mean MEM comfort level score was 95.83 (SD = 8.66) with a range of scores between 30.0 – 100.0. Fifty-nine percent of the participants (n = 125) had a MEM comfort level score of 100, which was the maximum score in this area. Scores between 95-99 (n =41) counted for 15.3% of the MEM comfort level scores with 6.8% of scores being 80 and below (n = 14). All MEM comfort level score frequencies can be found in Figure 2.

Figure 2

MEM Comfort Level Scores Frequencies



When reviewing Table 9, educators were comfortable with engaging in MEM in all body areas as means ranged from 9.17 (*SD* = 1.49) to 9.8 (*SD* = 0.80). The hand area (*m* = 9.80, *SD* = 0.73), arm and shoulder (*m* = 9.77, *SD* = 0.78), and lower leg and foot (*m* = 9.76, *SD* = 0.77) ranked highest in comfort level among educators. The abdomen (*m* = 9.54 *SD* = 1.42), hip joint (*m* = 9.53, *SD* = 1.42), and pelvis area (*m* = 9.53, *SD* = 1.42) ranked the lowest in comfort levels. Again, it is important to note that while collectively educators had high levels of comfort in MEM pedagogy, a review of the range minimums may suggest there are some who are not strongly comfortable with the practice, especially in the pelvis and hip joint areas.

Table 9

Comfort Level of Faculty Engagement in MEM Within Specific Body Regions Descriptive Statistics

Comfort level statement	*n*	Range		Mean	*SD*
I am comfortable with demonstrating exams on my students in….		Minimum	Maximum		
Upper Body (e.g. chest, sternum, bony thorax)	217	3	10	9.60	0.94
Head and Neck (e.g. skull, cervical spine)	217	3	10	9.73	0.80
Hand area (fingers, hand, wrist)	217	3	10	9.80	0.73
Arm and shoulder (humerus, scapula, elbow, shoulder)	217	3	10	9.77	0.78
Abdomen (KUB, Upper GI, barium enema)	217	3	10	9.42	1.20
Back area (thoracic, lumbar spine)	217	3	10	9.64	0.93
Pelvis area (bladder, pelvic anatomy, sacrum/coccyx)	217	1	10	9.17	1.49
Lower leg and foot (tibia/fibula, ankle, toes, foot)	216	3	10	9.76	0.77
Knee area (patella, distal femur, knee)	217	3	10	9.73	0.83
Hip Joint area (proximal femur)	215	1	10	9.28	1.43

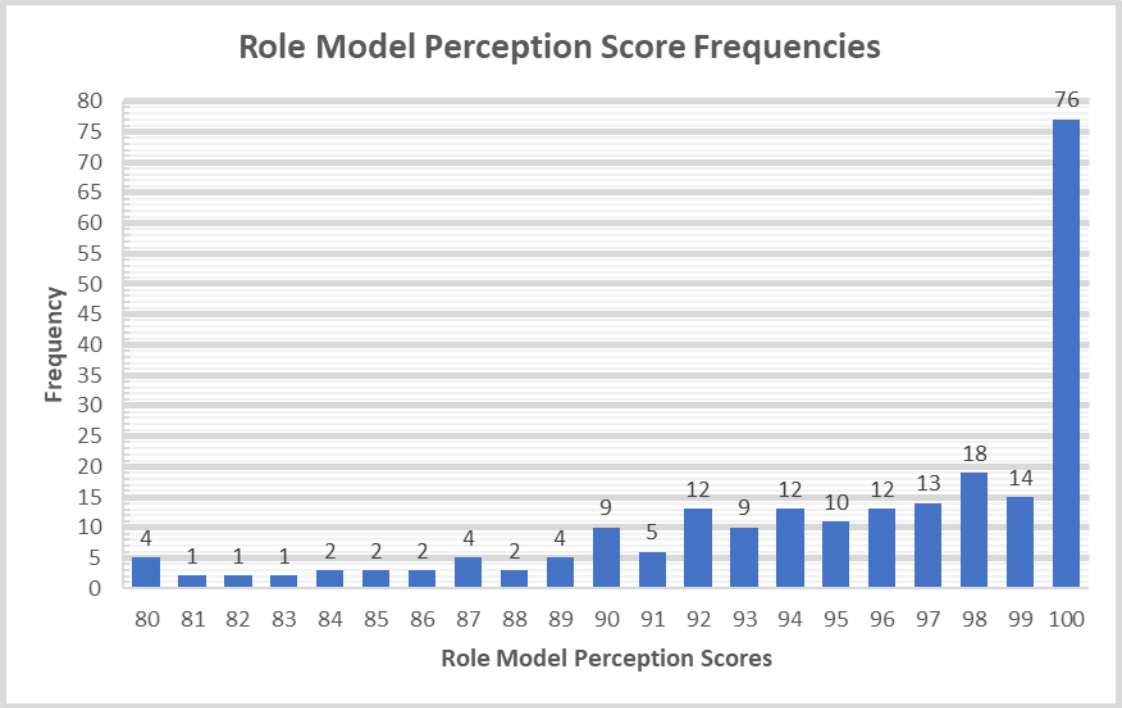
Research Question 3: What are Radiography Faculty Perceptions of Themselves as Role Models?

The third section of the survey was developed through a review of pertinent literature to establish criteria for role modeling. This section of the survey contained 10 statements regarding role modeling. Faculty were asked to rate their level of agreement using a 10-point scale, where one was strongly disagree and 10 was strongly disagree. Descriptive statistics in the form of the mean, range, and standard deviation were calculated for each of the 10 statements used to identify faculty perceptions of themselves as role models. Prior to statistical analysis reliability, validity, and normality tests were conducted. The items used to determine faculty role model perceptions had high reliability with a Cronbach's alpha of 0.88. Correlational testing using the Spearman's Rho test statistic was used to determine the validity of Likert-scale questions by correlating each Likert-scale item with the total score. Within the role modeling section of the survey, all 10 items were significantly correlated (r_s = .565 -.942, p < .01). A Kolmogorov-Smirnov test for normality indicated that responses of faculty perceptions of role modeling across all statements do not follow a normal distribution (D[216-218] = 0.37 - 0.50, p = 0.000).

A total role model perception score was calculated for use in answering research questions four and five. As a total score was calculated, survey items in the role modeling perceptions section that were missing responses voided all responses and were not used. Out of the 215 role model perception scores calculated, the role model perception score mean was 95.61 (*SD* = 5.25) with a range of scores between 75.0-100.0. More than thirty-five percent (35.3%) of the participants (*n* = 76) had a role model perception score of 100. Scores between 90-99 (*n* =114) counted for 53.1% of the role model perception scores with 11.8% of scores being 89 and below (*n* = 25). All role model perception score frequencies can be found in Figure 3.

Figure 3

Role Model Perception Score Frequencies



When reviewing Table 10, radiography educators strongly agreed with being a good role model for students (*m* = 9.59, *SD* = 0.71). As part of being a good role model, sharing professional experiences (*m* = 9.78, *SD* = 0.61), utilizing constructive feedback while teaching (*m* = 9.67, *SD* = 0.69), and creating a positive learning environment (*m* = 9.63, *SD* = 0.66) ranked highest among role modeling characteristics. The lowest among role modeling characteristics was encouraging student reflection (*m* = 9.32, *SD* = 1.07) and being a good communicator with students and others (*m* = 9.35, *SD* = 0.97). It should be noted in a review of the minimum range, some educators strongly disagreed with modeling professionalism in the classroom, being a good communicator with students, and displaying a high level of content or technical knowledge.

Table 10

Radiography Faculty Perceptions as Role Models Descriptive Statistics

Role model perception statement	*n*	Range		Mean	*SD*
		Minimum	Maximum		
I see myself as a good role model for students.	217	7	10	9.59	0.71
I see myself as approachable.	217	7	10	9.57	0.72
I model professionalism within the classroom.	218	1	10	9.52	0.91
I am a good communicator with students and others.	218	1	10	9.35	0.97
I share my professional experiences with students.	217	6	10	9.78	0.61
I utilize constructive feedback during the teaching process.	217	6	10	9.67	0.69
I encourage student reflection.	217	5	10	9.32	1.07
I create a positive learning environment.	216	7	10	9.63	0.66
Within the classroom, I display a high level of content knowledge.	217	1	10	9.55	0.88
Within the classroom, I display a high level of technical knowledge.	218	1	10	9.46	1.03

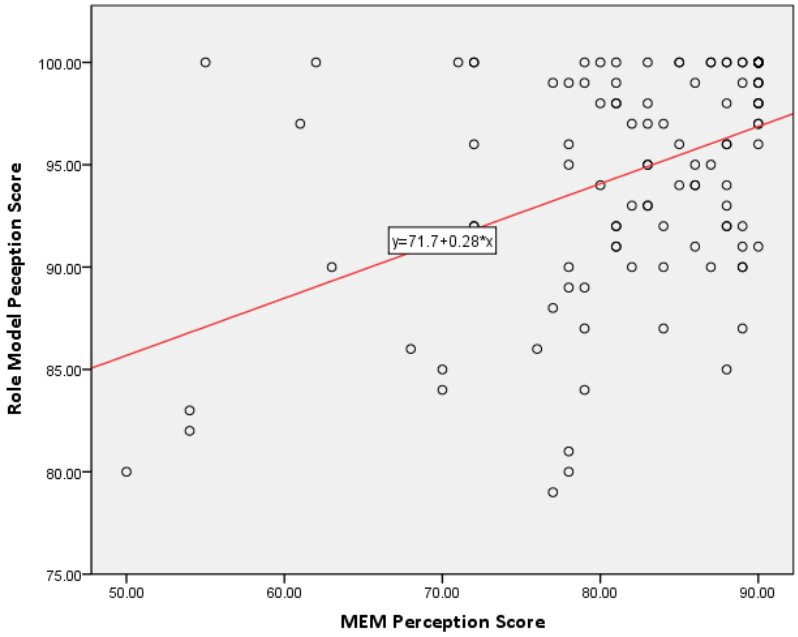
Research Question 4: Is There a Relationship Between Radiography Faculty Perceptions of Themselves as Role Models and Their Perceptions of MEM Pedagogy?

After evaluation of the data regarding faculty perceptions as a role model and their perceptions of MEM pedagogy for normal distribution and test assumptions, a Spearman's Rho was utilized to calculate the correlation between dependent variables role model perception score and MEM perception score. There was a statistically significant, moderate positive correlation between role model

perception scores, $r_s(215) = .45$, $p < .000$, with MEM perception scores. To display the relationship, a scattergram of the dependent variables (Figure 4) shows scattering of dots that do not form a perfectly straight line. This presence of this scatter indicates that the relationship is not perfect; however, the direction of the pattern is positive and linear.

Figure 4

Scatterplot of Role Model Perceptions & MEM Perception Scores



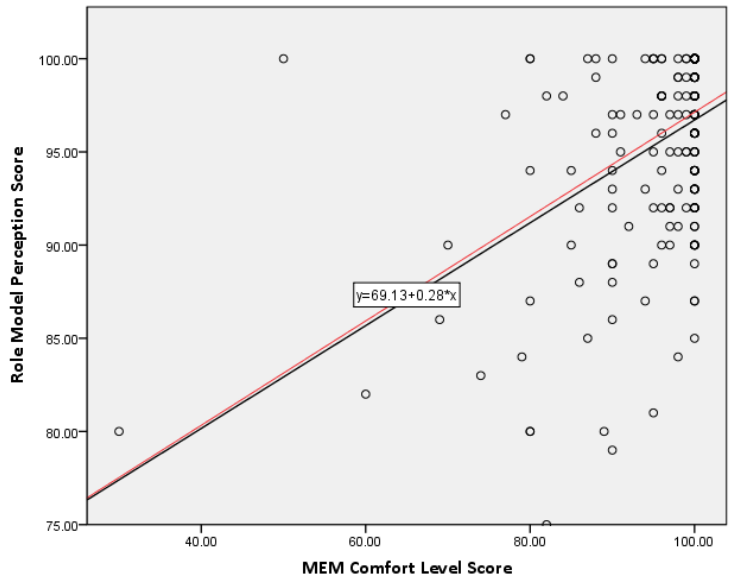
Research Question 5: Is There a Relationship Between Radiography Faculty Perceptions of Themselves as Role Models and Their Comfort Levels With MEM Pedagogy?

After evaluation of the data regarding faculty perceptions as a role model and their comfort level with MEM pedagogy for normal distribution and test assumptions, a Spearman's Rho was utilized to calculate the correlation between dependent variables role model perception score and MEM comfort level score. There was a statistically significant, moderate positive correlation between role model perception scores, $r_s(215) = .40$, $p < .000$, with MEM comfort level scores. To display the relationship, a scattergram of the dependent variables (Figure 5) shows the scattering of dots that do

not form a perfectly straight line. This presence of this scatter indicates that the relationship is not perfect; however, the direction of the pattern is positive and linear.

Figure 5

Scatterplot of Role Model Perceptions and MEM Comfort Level Scores



Research Question 6: Is There a Difference in Radiography Faculty Perception Scores of MEM Teaching Pedagogy by Gender?

After evaluation of the data regarding faculty perceptions for normal distribution and test assumptions, a Mann-Whitney U test was run to determine if there was a difference in dependent variable MEM perception scores and independent variable gender (male or female). Distributions of the MEM perception scores for males and females were not similar, as assessed by visual inspection. Mean rank MEM perception scores for males (45.07) and females (58.86) was not statistically different, U = 760.50, z = -1.848, p = .065.

Research Question 7: Is There a Difference in Radiography Faculty Comfort Level Scores of MEM Teaching Pedagogy by Gender?

After evaluation of the data regarding faculty comfort levels with MEM for normal distribution and test assumptions, a Mann-Whitney U test was run to determine if there was a difference in dependent variable MEM comfort level scores and independent variable gender (male or female). Distributions of the MEM comfort level scores for males and females were not similar, as assessed by visual inspection. Mean rank MEM comfort level scores for males (79.71) were statistically significantly lower than females (105.86), $U = 760.50$, $z = -1.848$, $p = .065$.

To further define this significance, a Mann-Whitney U test was run on each of the body regions to determine if there were differences in scores between males and females. A Mann-Whitney U test showed that there was a significant difference in six body regions between males and females. Three body regions were significantly different at the $p < .05$ level: hand area ($p = .05$), arm and shoulder area ($p = .02$) and back area ($p = .02$). Additionally, three body regions were highly significant at the $p < .001$ level: abdomen area ($p = .000$), pelvis area ($p = .000$), and hip joint area ($p = .000$). Table 11 displays the means for each group in each area as well as the test statistics

Table 11

Mann-Whitney U Results for Body Regions and Gender

Body regions	Mean				*U*	*Z*	*p*
I am comfortable with demonstrating exams on my students in….	Male (*n*)	*SD*	Female (*n*)	*SD*			
Upper Body (e.g. chest, sternum, bony thorax)	9.34 (41)	1.37	9.69 (163)	0.78	2887.50	1.88	.06
Head and Neck (e.g. skull, cervical spine)	9.56 (41)	1.23	9.77 (163)	0.67	3067.00	1.30	.19

Body regions	Mean				*U*	*Z*	*p*
I am comfortable with demonstrating exams on my students in….	Male (*n*)	*SD*	Female (*n*)	*SD*			
Hand area (fingers, hand, wrist)	9.63 (41)	1.16	9.85 (162)	0.60	2971.50	1.93	.05*
Arm and shoulder (humerus, scapula, elbow, shoulder)	9.53 (41)	1.23	9.81 (163)	0.63	2888.00	2.28	.02*
Abdomen (KUB, Upper GI, barium enema)	8.98 (41)	1.67	9.58 (163)	0.97	2580.00	2.93	$p < .001$**
Back area (thoracic, lumbar spine)	9.27 (41)	1.47	9.73 (163)	0.74	2807.00	2.39	0.02*
Pelvis area (bladder, pelvic anatomy, sacrum/coccyx)	8.32 (41)	2.22	9.41(164)	1.12	2334.50	3.53	$p < .001$**
Lower leg and foot (tibia/fibula, ankle, toes, foot)	9.61 (41)	1.18	9.80 (163)	0.64	3103.00	1.18	0.24
Knee area (patella, distal femur, knee)	9.54 (41)	1.27	9.80 (164)	0.63	3031.00	1.61	0.11
Hip Joint area (proximal femur)	8.44 (41)	2.25	9.49 (162)	1.04	2259.00	3.79	$p < .001$**

*$p < .05$ **$p < .001$

Responses to Open-ended Questions

Three open-ended questions were asked regarding the benefits and drawbacks of faculty engagement with MEM and, if uncomfortable when demonstrating exams on students, the reasons for being uncomfortable. Text from each of the questions was exported from SPSS to Microsoft Word. A thematic analysis was conducted with each response coded into a short phrase summary. Words or phrases that repeat in the responses were grouped according to themes and counted. Percentages of

responses were then calculated from the total number of comments. Not every educator made comments and some comments contained multiple themes.

Responses for Feeling Uncomfortable With Demonstration of Exams on Students. In a review of the responses (*N* = 49) for why radiography educators feel uncomfortable with the demonstration of exams on students in particular body areas, several themes emerged: demonstration being perceived as inappropriate or seen as sexual harassment (*n* = 9); fear of litigation (*n* = 2); uncomfortable with touch in hip and pelvic region (*n* = 20); uncomfortable with touch in the upper body, chest and sternum region (*n* = 2); concerns of students being uncomfortable (*n* = 10); and concerns with how students are dressed (*n* = 6). Most comments from faculty centered around being uncomfortable with touch in the hip and pelvic regions (40.8%). Comments about student dress centered around revealing clothing, exposed waistlines, and skintight or see-through clothing. Percentages of all themed responses can be found in Table 12.

Table 12

Feeling Uncomfortable With Demonstration of Exams on Students Themed Responses

Theme	Frequency (*n*)	%
Uncomfortable with touch in hip and pelvic regions	20	40.8
Concerns with students being uncomfortable	10	20.4
Demonstration being perceived as inappropriate or sexual harassment	9	18.4
Concerns with student dress	6	12.2
Fear of litigation	2	4.1
Uncomfortable with touch in upper body region: chest/sternum	2	4.1
Total	49	100.0

While this open-ended response question sought reasons for why faculty might be uncomfortable demonstrating exams on students in particular body areas, some radiography educators (*n* = 25) did make note that they were comfortable with the practice. Some of those educators further chose to explain why they were not uncomfortable with demonstrating exams on students. In a review of the responses from those educators some themes were noted: students need to learn professionalism through role modeling; faculty maintain a positive and professional learning environment for this pedagogy; students need to learn proper positioning as part of professional practice and modeling provides this; in sensitive areas, phantoms are used instead of demonstrations; and educators maintain the use of professional and appropriate contact. Some educators went on to further explain the practice of having discussions with students about appropriate laboratory practice and the importance of consent forms to make the pedagogy comfortable for all involved. Additionally, some radiography educators felt that confronting uncomfortable situations with demonstration of radiographic positions helps students to navigate their emotions in their professional experiences, learn professional terminology and maybe figure out if this high-touch profession is the correct career path.

Responses for Pedagogical Benefits of Faculty Engagement in MEM. In review of the responses, radiography educators provided feedback regarding faculty participation in MEM, the overall benefit of MEM, and the specifics on how MEM looks at their own institution. The themes identified for analysis address the first two of these types of responses. Out of a total of 205 counted responses, the majority of faculty felt that engagement in MEM was beneficial because it demonstrated the proper technique and skills (27.8%) needed to practice radiography. When engaging in MEM, the second-largest theme to emerge was that faculty can display their expertise in radiography and provide the practical knowledge that comes from current or previous clinical experience (12.2%). Some educators made specific comments about their continued professional practice or stated the importance for those faculty

engaging in MEM to continue to work in some capacity in a radiology department. Other themes emerging from radiography educators' comments included: providing active learning prior to practice on real patients (10.2%); teaching appropriate touch and radiographic palpation of patients (9.3%); and teaching communication skills (6.8%), empathy (5.9%), and professionalism (3.9%). In addition to professional skills being identified by radiography educators, being able to provide timely feedback about student performance (5.9%), including offering constructive feedback and identifying gaps in students' knowledge (5.9%) was also a benefit to engaging in MEM. Additional topics regarding benefits of MEM were the importance of connections and trust that are built between faculty and students (4.9%); creation of a safe space and environment for learning and being able to make mistakes (4.4%); providing opportunities to address different learning styles (kinesthetic and visual) (4.9%); and providing opportunities for critical thinking (1.7%). Table 13 addresses the frequency of the responses of the benefits of faculty engagement in MEM, as well as the overall benefits of the pedagogy.

Table 13

Benefits of Faculty Engagement in MEM & Overall Benefit of the Pedagogy Themed Responses

Theme	Frequency (*n*)	%
Demonstration of proper technique/technical skills	57	27.8
Faculty demonstration of expertise and experience	25	12.2
Provides active learning prior to practice on real patients	21	10.2
Teaches appropriate touch/palpation	19	9.3
Teaches communication skills	14	6.8
Teaches empathy	12	5.9
Timely feedback	12	5.9
Builds connections/trust between faculty and students	10	4.9
Addresses different learning styles	10	4.9
Engagement in a safe environment	9	4.4
Teaches professionalism	8	3.9

Theme	Frequency (*n*)	%
Assessment of student knowledge/identify gaps	5	2.4
Provides critical thinking	3	1.7
Total	205	100

Responses for the Drawback of Faculty Engagement in MEM. When evaluating the feedback of radiography educators (152 counted responses) regarding the perceived drawbacks of faculty engaging in MEM, multiple themes emerged: no drawbacks (*n* = 46); possibility of litigation (*n* = 5); perceived inappropriateness, misunderstood intentions, or sexual harassment accusations (*n* = 24); lack of faculty clinical practice experiences (*n* = 5); faculty uncomfortable with MEM (*n* = 9); students uncomfortable with MEM (*n* = 18); unprofessional or inappropriate behavior by faculty (*n* = 11); negative tone of the learning environment (*n* = 5); time consuming pedagogy (*n* = 7); students are intimidated by faculty (*n* = 5); pedagogy cannot be done online (*n* = 2); lack of faculty engagement or role modeling (*n* = 4); student traits (*n* = 10); and no benefit to the student that is the faculty model (*n* = 1). Outside of radiography educators expressing no drawbacks to this pedagogy (30.3%), most concerns for faculty engaging in MEM were perceived inappropriateness, misunderstood intentions and/or the possibility of sexual harassment accusations from students (15.8%). Additional concern was surrounded around students feeling uncomfortable in the process (11.8%). Faculty noted discomfort by students when being touched in general, not feeling like they can tell faculty they don't want to be a model, in the techniques used by faculty when engaging in this pedagogy, and when positioning practice is just being introduced. As for student traits (6.6%) that can cause drawbacks for faculty engagement in MEM, educators noted a variety of behaviors or attributes: lack of soft skills, lack of emotional intelligence, concerns with self-image, lack of respect, lack of engagement, immaturity, and disrespectful attitudes regarding receiving feedback and corrections. The percentage of all themed responses can be found in Table 14.

Table 14

Drawbacks of Faculty Engagement in MEM Themed Responses

Theme	Frequency (*n*)	%
No drawbacks	46	30.3
Perceived inappropriateness/ misunderstood intentions/sexual harassment accusations	24	15.8
Students uncomfortable with MEM	18	11.8
Unprofessional/inappropriate behavior by faculty	11	7.2
Student traits	10	6.6
Faculty uncomfortable with MEM	9	5.9
Time-consuming pedagogy	7	4.6
Possibility of litigation	5	3.3
Students intimidated by faculty	5	3.3
Lack of faculty clinical practice experiences	5	3.3
Negative tone of the learning environment	5	3.3
Lack of faculty engagement/role modeling	4	2.6
Pedagogy cannot be done online	2	1.3
No benefit to the student that is the faculty model	1	.7
Total	152	100.0

A large percent of faculty comments noted no drawbacks to the pedagogical practice because students need faculty to model radiographic positions as faculty are the ones with the experience in the field. Radiography educators stated that faculty are professionals and experienced in their craft. Through the creation of a positive educational environment and conducting activities in a professional manner, the engagement that is needed to teach students skills for radiography practice will not have any drawbacks. Educators also noted that at times additional tools such as videos and radiographic phantoms can be used to demonstrate radiographic positions that may be in sensitive areas. Other ways

to successfully conduct MEM without drawbacks included being clear with students about areas to be touched, utilizing consent forms, finding students that volunteer to be models for faculty demonstrations, establishing a dress code for students, and having clear guidelines for faculty and students within MEM.

Conclusion

Chapter 5 discusses these results and infers conclusions based on the findings. Further, implications for use by radiography educators and program officials will be made and suggestions will be offered regarding opportunities for future research.

Chapter 5: Conclusions

This research aimed to create useful knowledge regarding radiography faculty perceptions and comfort levels with the pedagogical practice of MEM and correlate those perceptions and comfort levels to their self-efficacy as a role model. As faculty have the responsibility to choose pedagogical methods for classroom instruction, their perceptions and comfort levels are important in deciding the continued use of this method. It is through the sharing of the research findings and creating new literature on faculty attitudes and perceptions, faculty within imaging programs can begin to evaluate the continued use of this pedagogical practice if used in their programs.

This chapter discusses the research findings organized by research questions. As there is little research on faculty perceptions and comfort levels within MEM, some of these findings will be compared to the body of research collected from a student perspective. Joining the known student perspective to findings from the current study on faculty perspectives provides a comprehensive understanding of the communities of interest engaged in these practices. Additionally, the implications for how this information can be used in educational practices or may be of interest to radiography programs will be discussed. Finally, the limitations of the current study as well as recommendations for future research will be addressed.

Research Question 1: What are Radiography Faculty Perceptions of MEM Teaching Pedagogy?

The practice of MEM was perceived as an appropriate teaching strategy by radiography educators. Educators felt that demonstrating examinations on students allows the proper technique for radiographic positioning to be displayed, which was also mirrored in educators' open-ended responses regarding the benefits of MEM. Educators felt the proper technique and practical application of skills displayed in positioning textbooks allows educators to display those skills properly without students having to navigate the positions on their own. Additionally, radiography educators expressed the

opinion that during this time of demonstration, techniques learned through their own practice within the field (practice knowledge) can be shown to students. As there are no previous studies on faculty perceptions of MEM, these findings mirror previous research involving the perceptions of students participating in MEM. The practice of MEM has overall shown to be acceptable by students. (Chang & Power, 2000; Grace et al., 2019; Metcalf et al., 1982; O'Neill et al., 1998; Rees et al., 2005; Wearn & Bhoopatkar, 2006; Wearn et al., 2008; Wearn & Vnuk, 2005). Students also agree this pedagogy is beneficial to learning through hands-on application of the skills they have studied in their didactic coursework (McLachlan et al., 2010; Rees et al., 2005).

A review of educators' comments regarding the benefits of MEM helps to further characterize radiography educators' perceptions. Educators felt the pedagogy allows timely feedback for students. Educators felt that continuous engagement with students in MEM allowed for answering "in the moment" questions and provides an opportunity for questioning students on the "what if's" that may occur during practice for the specific procedure. Educators can also guide students in their practice or correct any missteps in the process as this type of feedback is also important in the motivation step of observational learning. When faculty can provide positive feedback and reactions to the student during MEM, the student reproduces the process to further motivate them to continue to perform the learned process (Althouse et al., 1999; Donaldson & Carter, 2005; Horsburgh & Ippolito, 2018; Stegman et al., 2013). However, faculty will have to assess the underlying cause of the reduced performance when providing feedback for nonperformance. Negative or nonrewarding feedback for students that lacked attention when the process was modeled by faculty will not motivate these students to learn (Horsburgh & Ippolito, 2018). The literature surrounding students' perceptions also agrees that MEM allows for the opportunity to learn as a group and gain feedback important to their learning (Grace et al., 2019; Rees et al., 2005; Wearn & Bhoopatkar, 2006; Wearn et al., 2008).

Additional comments from radiography educators suggest that MEM provides an avenue to learn empathy. Educators noted that MEM helps students to understand the importance of quality patient care. Educators believe that students need to understand what it feels like to be in the same positions as their patients, lay on uncomfortable tables, or hold their extremities up for a short time as their patients will have to do. It was noted that having this understanding helps students to remember comfort aids for their patients and promotes empathy. Literature from student perceptions also agrees that part of professional practice is the opportunity to empathize with the patient experience. Students have found that MEM provides them with the opportunity to experience what a patient may undergo during an examination (Chinnah et al., 2011; Chunharas et al., 2013; Grace et al., 2019; Metcalf et al., 1982; O'Neill et al.,1998; Rees et al., 2005; Wearn & Bhoopatkar, 2006) and gain awareness into making the patient experience better through being mindful of a patient's comfort needs and respecting their dignity (Chinnah et al., 2011).

Further noted by educators in this study was that faulty engagement in MEM promotes professionalism and helps students learn communication techniques. Radiography educators noted that during MEM there is an opportunity for faculty to demonstrate the expectations of a professional when they model skills during MEM. Educators said that faculty engagement is crucial in displaying to students how to interact appropriately and professionally with a patient, use effective communication even when language is a barrier, and in providing necessary education for patients. Literature regarding student perceptions agree with faculty and note learning skills through MEM promotes communication (Wearn & Vnuk, 2005; Wearn et al., 2008) and professionalism needed for professional practice (Metcalf et al., 1982; Wearn & Bhoopatkar, 2006; Wearn & Vnuk, 2005; Wearn et al., 2008; Wearn et al., 2013).

To further characterize perceptions, a review of comments regarding drawbacks of MEM does reveal some differences between faculty and students' perceptions. While students' apprehensions are

more centered around self-image and peer concerns (uncomfortable touch on peers and immature peer behaviors) when faculty do have apprehensions they arise from concerns of sexual harassment accusations and unprofessional and inappropriate faculty behaviors which can lead to possible litigation. Faculty not being professional in the process or having inappropriate behavior also adds to this concern. Literature suggests that the environment is important in establishing appropriate faculty-student relationships (Holmes et al., 1999). When faculty are professional and academic in their interactions with students, the concern about misunderstandings and inappropriate behavior is reduced (Holmes et al., 1999). However, when the faculty takes a more social role with students in their interactions, the appropriateness of the behavior is reduced and further is reduced when the actions involved dating or having a sexual relationship with students (Holmes et. al, 1999). Although concerns of sexual harassment accusations were the most common theme reported as a drawback, there was not a high concern among educators about being an object of sexual interest or having a sexual interest in students when demonstrating exams on students during MEM. Educators also felt comfortable demonstrating exams on all students (same-sex and opposite-sex).

Additionally, while students were concerned about their bodies and having a negative self-image when engaging in MEM (McLachlan et al., 2010; Rees et al., 2005; Wearn & Bhoopatkar, 2006), radiography educators were concerned about how students felt. While a small number of educators noted being personally uncomfortable with MEM, many radiography educators were more concerned with how students felt than they did themselves. Educators were concerned about students being uncomfortable in the physical touch of their bodies, in touching others, or possibly some students may not feel like they have a voice to say they do not want to participate. Educators expressed concern about the process's techniques, especially when students are just being introduced to MEM. While this is a noted concern by radiography educators, many educators emphasized that explaining the process in

advance and creating a safe learning environment can reduce the apprehension and negative feelings of students.

Research Question 2: What are Radiography Faculty Comfort Levels with MEM Teaching Pedagogy?

In this study, radiography educators (both genders) indicated being comfortable demonstrating exams on their students. Educators were most comfortable in performing exams on their students in the hand, the arm and shoulder, and lower leg and foot areas. Radiography educators felt slightly less comfortable when they demonstrate exams in the abdomen, hip joint, and pelvis area (areas considered to be sensitive in nature). Being uncomfortable with touch in the hip and pelvic regions was also indicated as a theme in educators' responses to why they may feel uncomfortable. Prior research on students' comfort levels in participation in examinations and MEM, suggests that female students are less comfortable with the practice than male students (Barnette et al., 2000; Chang & Power, 2000; Consorti et al., 2013). Specifically, female students feel less comfortable and are less willing to have sensitive areas being touched. It was an interesting finding that the chest and sternum area, while mentioned in open responses by educators, was low in frequency as demonstration of positioning in this area can also be considered a sensitive area.

Educators also feel uncomfortable in MEM as they are concerned about the student in the process. Some cited reasons for this concern are that students may be embarrassed about faculty having to locate landmarks and embarrassed about their self-body image. This concern by faculty may be valid as having a negative body image (McLachlan et al., 2010; Rees et al., 2005; Wearn & Bhoopatkar, 2006) or being embarrassed or uncomfortable with their peers is cited as a concern by students (Barnett et al., 2000; Chang & Power, 2000; Consorti et al., 2013; Grace et al., 2019; McLachlan et al., 2010; O'Neill et al., 1998; Rees et al., 2005; Rees et al., 2009a; Wearn & Bhoopatkar, 2006; Wearn et al., 2008). Finally, radiography educators again mentioned fear of litigation and their roles in MEM being perceived as

sexual harassment as a source of why they may feel uncomfortable. This provides continued evidence that faculty are concerned with students' perceptions and the roles faculty play in MEM and steps to control the environment should be considered by radiography programs.

Research Question 3: What are Radiography Faculty Perceptions of Themselves as Role Models?

Findings from this study suggest that radiography educators perceive themselves as being good role models for students. As faculty hold or have held the positions that students aspire to become, faculty will be the initial resource for students' introduction to practice (Horsburgh & Ippolito, 2018). Radiography educators also perceived themselves as approachable individuals. Literature from students' perceptions suggests they are drawn to individuals that want to take time and have an interest in teaching students (Passi & Johnson, 2016; Price & Price, 2009; Stegman et. al, 2013; Wright & Carrese, 2002). This approachable attribute helps to attract students and gain their attention and respect which is important in observational learning (Stegman et al., 2013).

Results from this study also showed that radiography educators perceived themselves as good communicators, who share professional experiences and use constructive feedback. Being able to communicate (both verbally and through active listening) is an important healthcare skill that students need to learn, but it is also important in transferring knowledge and skills to a student (Conway et al., 2008; Cruess et al., 2018; Fluit et al., 2010; Gibbs & Kulig, 2017; Stegman et al., 2013; Wright & Carrese, 2002). As part of being a good communicator, radiography educators indicated in their open-ended responses that they provide students with the specific and timely feedback that is needed to support learning (Althouse et al., 1999; Cruess et al., 2018; Stegman et al., 2013). When educators share their professional experiences along with their feedback for students in MEM, aids to provide a deeper meaning of practice that further gains the attention of students, which is important in observational learning (Conway et al., 2008; Price & Price, 2009).

Feedback is part of good communication with students and encouragement of reflection is part of that feedback process. Good role models encourage active reflection (Althouse et al., 1999; Cruess et al., 2018; Fluit et al., 2010; Price & Price, 2009) and this study found that radiography educators feel strongly they do this with their students. During the reflection of the process, faculty reflect on their knowledge and share the processes they used to learn the skill (Price & Price, 2009). Faculty's self-reflection with the student further develops the student's reflection competence and moves the student forward in the retention stages of observational learning.

Overall, radiography educators perceived themselves as good role models. Contrary to the rest of the population sampled, it was interesting that one educator strongly disagreed with demonstrating professionalism within the classroom, being a good communicator with students, and having a high level of content and/or technical knowledge. While this response is an outlier, faculty are hired to teach within their specific discipline due to their expertise and content knowledge (Arslan & Dinc, 2017) and radiography educators at the minimum should have the technical knowledge of the profession coming from and having practiced within the health care environment.

Research Question 4: Is There a Relationship Between Radiography Faculty Perceptions of Themselves as Role Models and Their Perceptions of MEM Pedagogy?

In this study, a significant moderate positive correlation was found between role model perception scores and MEM perception scores. That is, radiography educators' MEM perceptions increase as their role modeling perception increases. Given the significance of faculty in the modeling process, it is important for faculty to understand their perceptions of MEM pedagogy to be effective role models. Instructors can impact the learning process by understanding the influence they have over gaining the attention of students. The social context of learning for students begins through regular associations and through modeling of behaviors of those that display influential and engaging qualities

(Bandura, 1977; Horsburgh & Ippolito, 2018). As this study is unique in the correlation of faculty role model perceptions and their comfort levels, there are no previous studies to compare this finding with. Further predictive research would help understand how MEM perceptions are related to role modeling attributes and perceptions.

Research Question 5: Is There a Relationship Between Radiography Faculty Perceptions of Themselves as Role Models and Their Comfort Levels with MEM Pedagogy?

In this study, a significant moderate positive correlation was found between role model perception scores and MEM comfort level scores. That is, radiography educators' MEM comfort levels increase as their role modeling perception increases. Given the significance of faculty in the modeling process, it is important for faculty to understand their comfort levels of MEM pedagogy to be effective role models. As this study is unique in the correlation of faculty role model perceptions and comfort levels, there are no previous studies to compare this finding with. Further predictive research would help understand how MEM comfort levels are related to role modeling attributes and perceptions.

Research Question 6: Is There a Difference in Radiography Faculty Perception Scores of MEM Teaching Pedagogy by Gender?

Regarding perceptions of MEM and radiography faculty gender, this study did not find a significant difference in male and female radiography educators' perception scores of MEM pedagogy. This finding also correlates to previous research regarding student perceptions of MEM. Students regardless of gender see the practice of MEM as beneficial to their learning of the hands-on skills needed for professional practice (McLachlan et al., 2010; Rees et al., 2005). As this study is unique in the review of faculty perceptions, there are no previous studies to further compare this finding with. Radiography educators independent of gender found MEM as an appropriate teaching strategy. Radiography educators' perceptions of the practice were reviewed in research question one.

Research Question 7: Is There a Difference in Radiography Faculty Comfort Level Scores of MEM Teaching Pedagogy by Gender?

Faculty roles and comfort levels are important in MEM, but the gender of both faculty and students can create concerns in their interactions. This current study found that male radiography faculty are significantly less comfortable with MEM than female radiography faculty. Literature suggests that male faculty are often perceived as having higher levels of inappropriate behaviors in their interactions when compared to female faculty performing the same interactions (Owen & Zwahr-Castro, 2007). Male faculty may be aware of this perception and this may be a contributing factor to the male faculty's comfort level. Male faculty also have a lower comfort level when demonstrating examinations in sensitive areas such as the pelvis, hip joint, and abdomen compared to female faculty. Prior research suggests when MEM is viewed from a student perspective, it is female students that are less comfortable with the pedagogy than male students (Barnette et al., 2000; Chang & Power, 2000; Consorti et al., 2013). Female students feel a sense of sexual exploitation and are less willing to have sensitive areas being touched or volunteer to be the patient for these types of exams than male students (Chang & Power, 2000; Hendry, 2013; O'Neill et al., 1998; Rees et al., 2005; Rees et al., 2009a; Rees et al., 2009b). As both male faculty and female students participate in this process, educators and program administrators should keep these findings in mind.

Previous research finds that female students are more comfortable in MEM when they can choose the same gender group (Wearn & Vnuk, 2005). While this may be a strategy to encourage female student participation and help them to feel uncomfortable, this may be difficult to employ as a strategy for educators assigned to courses utilizing MEM. Program administrators that are responsible for the assignment of course instructors should review the pedagogical processes and practices within radiographic positioning/procedures courses and reflect on the comfort levels of their faculty. As male

faculty in this study were significantly less comfortable with the demonstration of exams on opposite-gendered students, program directors should also consider this in their assignment of course instructors to positioning/procedures courses. While nonassignment of male faculty to courses that employ MEM may not be an option, alternative methods to observational learning should be considered. As social learning can be done through modeling that comes from media sources, television, films, videos, and other digital media sources can be considered in the modeling process (Bandura, 1977). Using media, faculty can incorporate videos of radiography procedures being performed as a means of learning the task, reinforcing the task, or in the remediation process (Hendry, 2013; Wearn & Bhoopatkar, 2006). While this leaves a less prominent role for the faculty, it could be used in circumstances where the procedures are more intimate.

As radiography educators mentioned fear of litigation and MEM being perceived as sexual harassment as a source of why they may feel uncomfortable, administrators should look to create positive structured environments that are clear in design and define boundaries for all participants (Barnette et al., 2000; Chang & Power, 2000; O'Neill et al., 1998; Wearn et al., 2008; Wearn et al., 2017; Wearn & Vnuk, 2005). Literature suggests that informed consent should be part of this structured process so students have an understanding of their participation, the role of faculty in the process, and the risks and benefits (Hendry, 2013; Wearn & Bhoopatkar, 2006; Wearn & Vnuk, 2005).

Implications for Practice

When deciding the specific pedagogy to teach students how to radiographically position patients for radiology practice, MEM is a strategy that should be considered. Both faculty and students have a positive perception of the pedagogy and recognize its importance in the process for students to learn the skills needed to take care of their future patients. It assists students in developing the needed professional, communication, and empathy skills important in patient care and does so in a safe

environment where mistakes can be made and learned from. This pedagogy provides educators many opportunities to engage with students and share their expertise and experience in actual practice.

While the pedagogy is perceived as an appropriate teaching strategy, faculty need to be professional in their behaviors with students to reduce any perceptions or misunderstandings when performing examinations on students. Controlling the environment and setting a positive (nonsocial) tone will further reduce these perceptions from students and reduce litigation stress among faculty. Having processes in place to explain MEM to new students has been noted as being necessary to further create a positive environment.

Radiography program administrators can take steps to reduce faculty fears and the potential for litigation through the creation of policies and procedures that are explicit in the expectations of the practice and define boundaries for all participants. As there are concerns by radiography educators regarding student comfort levels and having a voice in the process, consent documents should be considered to be intentional in explaining the pedagogy used and provide the opportunity for students to accept or not accept their role in the process.

In addition to policy creation, radiography program administrators should understand their faculty perceptions and comfort levels with MEM. As role modeling is important in the student learning process, faculty perceptions and comfort levels in their roles within MEM can have an impact on their role modeling. Additionally, as male faculty are less comfortable with the practice, consideration should be given to their comfort levels when assigning course instructors. As nonassignment may not be practical given the size or number of faculty within the radiography program, having meaningful conversations with male faculty to assist with their concerns or provide strategies and other pedagogical practices to mitigate specific concerns should be considered.

To further assist with comfort levels, as faculty note being less comfortable with exams in the abdomen, hip joint, and pelvis, radiography educators should explore other pedagogical practices or methods to reduce or eliminate touch in those areas. Outside of observational learning provided through faculty demonstration, social learning can be done through modeling that comes from media sources.

Limitations

While this current study does create a body of research regarding radiography faculty perceptions and comfort levels with MEM and their perceptions as role models, there are several limitations. The size of the sample represented only 17% of the total possible population. This small sample may limit the generalizability of the findings. Additionally, purposive sampling was used, and that further limits the findings to only JRCERT accredited associates and bachelor's radiography degree programs. The findings are not generalizable to programs that are not accredited or do not offer a degree.

A quantitative methodology using a survey does further limit the study. While the survey provided anonymity, respondents may have not been honest on sensitive questions and may have given socially acceptable responses instead. Nonresponse bias also limited the study as some of the survey questions were not answered by all participants. Almost 90 respondents did not answer the question regarding experiencing possible sexual interest in students compared to the rest of the perceptions questions. Additionally, the overall response rate may have been lowered through nonresponse bias as 94 emails were invalid. Finally, part of the study conducted correlational research which cannot establish causation. While the correlational analysis was positive, only three variables were reviewed and this may have missed a variable that could have explained the relationship better.

Suggestions for Future Research

While this study added to and created new literature within the body of research on pedagogical practices for teaching students hands-on skills, several questions and implications for future research resulted. This current study reviewed perceptions and comfort levels of MEM by radiography educators in JRCERT accredited associates and bachelor's programs. Repeating the research and including all accredited radiography programs may add to the findings and help add reliability to the current results. While this study did ask about comfort levels in performing exams in general on same-sex or opposite-gendered students, this study did not ask this information about comfort levels in performing exams on specific body regions. The current study could be improved to assess faculty comfort levels of performing examinations on students in specific body regions on same-sex and opposite-sex students. This would further allow for the investigation of comfort levels of male and female educators when touching students in specific body areas.

When using a survey for quantitative research, the research is limited. While this study did have three short open-ended questions, qualitative research on this topic could further gain information from radiography educators about their perceptions of MEM and role modeling, and their comfort levels with the pedagogy that Likert-scale responses did not address. Qualitative research could help in further investing male radiography educators' comfort levels in MEM.

This study did not investigate strategies for creating or preparing students for the MEM environment. Some radiography educators in this study through open-ended responses indicated various strategies used by their specific programs to increase student comfort levels with MEM and decrease misunderstandings of the pedagogy. Investigation of current practices, protocols, and policies used by radiography programs could assist program administrators in the development of their own protocols and policies to create a safe learning environment when using MEM. As litigation was of

concern to faculty members, a review of case law and outcomes of similar circumstances could also assist program administrators in the development of policies or consent forms.

Pedagogies used by radiography educators in positioning/procedures courses were identified in this study, but alternatives to using MEM were not investigated. Investigation of alternative pedagogical practices currently used and the perception and efficacy of their use in the hands-on learning of radiography skills could further help radiography educators decide on appropriate teaching strategies. As this study did show a decrease in comfort levels in demonstrating exams within sensitive areas of the body, alternative pedagogical practices could be found to address this concern.

Finally, learning hands-on skills is not solely performed within radiography education. Other healthcare professions (including other radiology disciplines) must teach students skills that may require the educator to demonstrate those skills on their students. Conducting a similar study within different health professions may provide larger insight into educators' perceptions and comfort levels about these types of pedagogical practices.

Summary

The results of this research start a body of knowledge regarding MEM and radiography faculty perceptions and comfort levels, as well as the importance of role modeling in those perceptions. This study provides evidence that faculty, similar to student responses, find the pedagogy important to learning which strengthens the applicability of the practice in radiography positioning and procedures courses. While numerous benefits of MEM were reported by radiography educators, a consistent theme of the intentions in MEM being misunderstood did emerge. Adding this fear to the finding that male faculty are uncomfortable in MEM compared to female faculty, radiography programs, educators and administrators need to evaluate the specific procedures and policies regarding the pedagogy within their own program. Reflection on the pedagogical practice can benefit the academic program by

strengthening practices already in use, modifying practices that may be concerning, or identifying other pedagogical methods that can be used to replace or supplement current practices.

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Appendices

Appendix A: MEM Pedagogy Survey With Post-Pilot Study Revisions

UNIVERSITY OF SOUTHERN INDIANA

Default Question Block

Radiography Faulty Perceptions and Comfort Levels in Medical Education Modeling with Correlation to Role Modeling (IRBNet ID Number: 1816579-1)

Pedagogy to teach radiography curriculum will often use enrolled students as medical education models (MEM) as part of practicing radiographic positions. As part of this pedagogy, radiography instructors are engaged in demonstration of radiology positioning on students. This survey aims to collect information on radiography faculty's perceptions and comfort level with this pedagogical practice.

You are invited to participate in a research study on radiography faculty perceptions and comfort levels with hands-on teaching pedagogy within JRCERT accredited associate and bachelor's radiography programs with a correlation to role modeling. This study is being conducted by Joy Cook from the University of Southern Indiana, Educational Leadership Doctoral student with Dr. Bonnie Beach as faculty sponsor. Joy Cook can be reached at HP3066, 8600 University Blvd., Evansville, IN 47712, jacook3@usi.edu, or 812-465-1183.

This study will take approximately 10-15 minutes of your time. You will be asked to complete an online survey about your perceptions with the hands-on pedagogical practice of using students as models for radiographic positioning and procedures courses. You will also be asked about your comfort levels with demonstration of radiographic positioning on students in various areas of the body. Additionally, you will be asked about your level of agreement in performing as a role model. Your decision to participate or decline participation in this study is completely voluntary and you have the right to terminate your participation at any time without penalty. You may skip any questions you do not wish to answer. If you do not wish to complete this survey simply do not proceed, decline, or if started, simply close your browser. Your participation in this research will be completely confidential. You may benefit from participation by gaining a better understanding of your own perceptions and comfort levels in hands-on pedagogy involving students as models. You may also benefit from evaluation of your own efficacy as a role model. There is a risk of participant discomfort in answering some of the survey questions. Participants have the option to skip questions. No compensation will be awarded for participation in this study. Please print a copy of this consent form for your records, if you so desire.

- ○ Yes, I agree to participate
- ○ No, I decline participation

Have you been an instructor or laboratory instructor for at least one radiographic procedures/positioning course in your teaching career in a JRCERT accredited associate or bachelors radiography program?

- ○ Yes
- ○ No

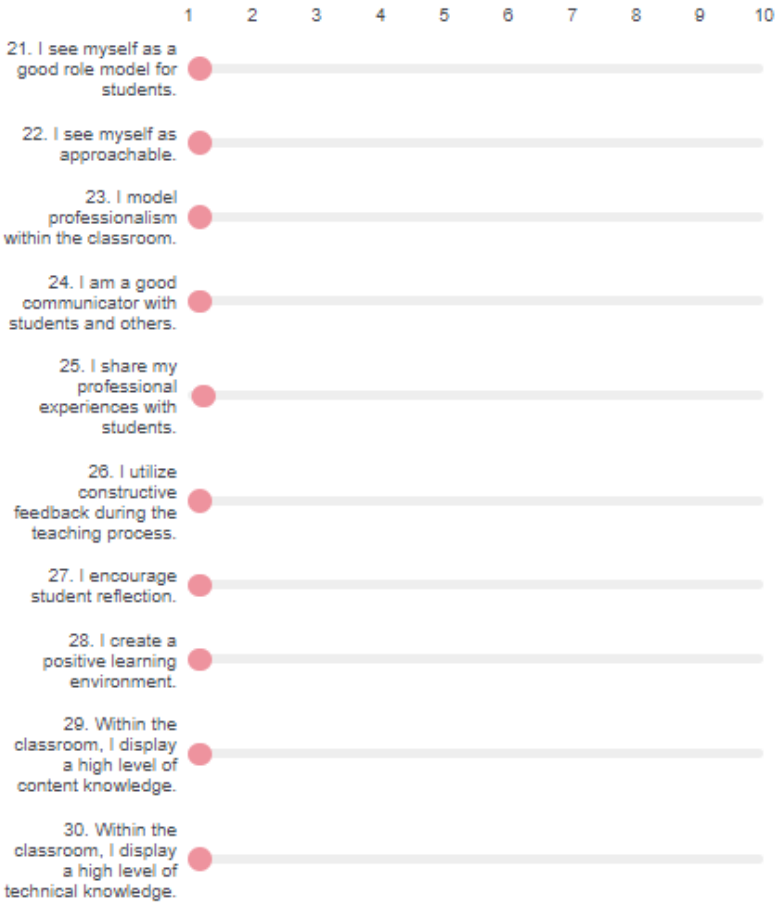
Using a scale of 1-10, with **1 being "Strongly Disagree"** and **10 being "Strongly Agree"**, rate your level of agreement with the following statements:

Using a scale of 1-10, with **1 being "Strongly Disagree"** and **10 being "Strongly Agree"**, rate your level of agreement with the following statements:

Using a scale of 1-10, with **1 being "Strongly Disagree"** and **10 being "Strongly Agree"**, rate your level of agreement with the following statements:

20. If you feel uncomfortable with demonstration of exams on students in a particular body area, please explain why.

Using a scale of 1-10, with **1 being "Strongly Disagree"** and **10 being "Strongly Agree"**, rate your level of agreement with the following statements:



31. In your opinion, what are the pedagogical benefits of faculty engagement in Medical Education Modeling?

32. In your opinion, what are the drawbacks of faculty engagement in Medical Education Modeling?

Share about yourself:

33. How many years have you been an educator in the field of radiology?

- ◯ 1-5 years
- ◯ 6-10 years
- ◯ 11-15 years
- ◯ 16- 20 years
- ◯ 21 or more years

34. How many years as a radiography educator have you taught radiographic procedures/positioning courses?

- ◯ 1-5 years
- ◯ 6-10 years
- ◯ 11-15 years
- ◯ 16- 20 years
- ◯ 21 or more years

35. Which of the following describes your role within the program (being faculty is assumed)?

- ◯ Program Director
- ◯ Clinical Coordinator
- ◯ Instructor (not program director or clinical coordinator)

36. Which of the following best describes your assignment for teaching procedures/positioning courses?

- ◯ I am regularly assigned to teach radiographic procedures/positioning courses lecture and/or laboratory practice
- ◯ I teach radiographic procedures/positioning courses, but this is not a regular assignment.
- ◯ I have taught radiographic procedures/positioning courses (lecture and/or laboratory practice) in the past, but do not now

How many years has it been since you last taught a radiographic positioning/procedures courses?

37. Which of the following best describes the pedagogy used in your program to teach procedures/positioning during laboratory practice?

- [ ] Faculty and students use enrolled students for procedures/positioning practice
- [ ] Standardized patients are used for procedures/positioning practice
- [ ] Virtual or augmented reality is used for procedures/positioning practice
- [ ] A combination of several pedagogies. Please indicate what combination.
- [ ] Other. Please indicate other pedagogy used.

38. What is your religious affiliation?

- ○ Christian/Catholic
- ○ Mormon
- ○ Jehovah's Witness
- ○ Orthodox
- ○ Jewish
- ○ Muslim
- ○ Buddhist
- ○ Hindu
- ○ Other
- ○ Atheist
- ○ Agnostic
- ○ Nothing in particular
- ○ Prefer not to answer

Block 1

39. Share a little about yourself:

Age

Gender

Race

Appendix B: Permission to use Examining Fellow Students Survey From Original Survey Author

Re: Greeting from the USA Request for permission to use survey instrument

PO

Paul Oneill <paul.oneill3@me.com>
To Cook, Joy A
Cc Paul O'neill; Schmuck, Heather M

You replied to this message on 5/8/2020 9:27 AM.

Reply | Reply All | Forward | ...

Wed 5/6/2020 12:06 PM

*** This message was sent from a non-USI address. Please exercise caution when responding, clicking on links or opening attachments. ***

Hi

At present, I am preoccupied with the Covid pandemic (with my clinical work) so sorry for the delay in responding. Yes, happy for you to use.

Regards

Paul O'Neill

On 30 Apr 2020, at 00:18, Cook, Joy A <jacook3@usi.edu> wrote:

From: Cook, Joy A
Sent: Thursday, April 23, 2020 11:08 AM
To: Paul.A.ONeill@manchester.ac.uk
Cc: Schmuck, Heather M <hmschmuck@usi.edu>
Subject: Greeting from the USA Request for permission to use survey instrument

Dear Dr. O'Neill,

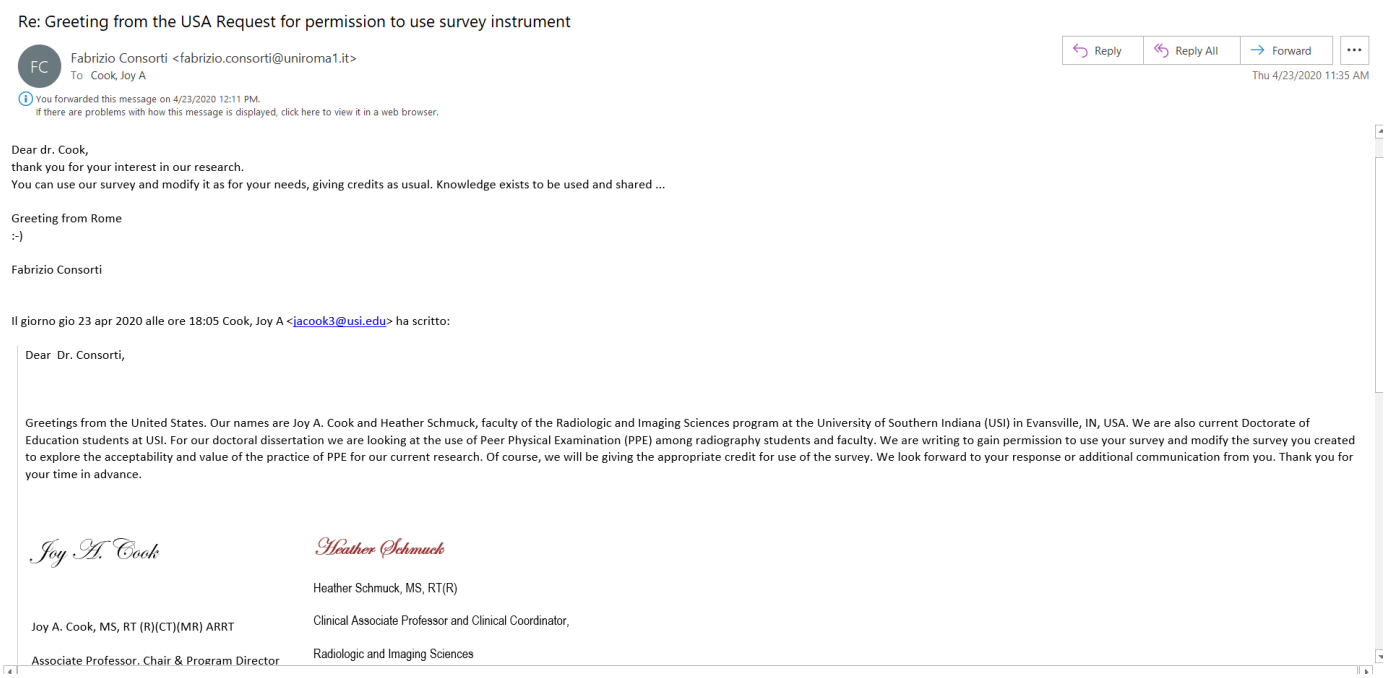
Greetings from the United States. Our names are Joy A. Cook and Heather Schmuck, faculty of the Radiologic and Imaging Sciences program at the University of Southern Indiana (USI) in Evansville, IN, USA. We are also current Doctorate of Education students at USI. For our doctoral dissertation we are looking at the use of Peer Physical Examination (PPE) among radiography students and faculty. We are writing to gain permission to use your survey and modify the Examining Fellow Students survey for our current research. Of course, we will be giving the appropriate credit for use of the survey. We look forward to your response or additional communication from you. Thank you for your time in advance.

Joy A. Cook

Heather Schmuck

Heather Schmuck, MS, RT(R)

Appendix C: Permission to use Peer Physical Examination Questionnaire (PPEQ) Survey From Original Survey Author



Re: Greeting from the USA Request for permission to use survey instrument

FC Fabrizio Consorti <fabrizio.consorti@uniroma1.it>
To Cook, Joy A

Reply | Reply All | Forward | ...
Thu 4/23/2020 11:35 AM

You forwarded this message on 4/23/2020 12:11 PM.
If there are problems with how this message is displayed, click here to view it in a web browser.

Dear dr. Cook,
thank you for your interest in our research.
You can use our survey and modify it as for your needs, giving credits as usual. Knowledge exists to be used and shared ...

Greeting from Rome
:-)

Fabrizio Consorti

Il giorno gio 23 apr 2020 alle ore 18:05 Cook, Joy A <jacook3@usi.edu> ha scritto:

Dear Dr. Consorti,

Greetings from the United States. Our names are Joy A. Cook and Heather Schmuck, faculty of the Radiologic and Imaging Sciences program at the University of Southern Indiana (USI) in Evansville, IN, USA. We are also current Doctorate of Education students at USI. For our doctoral dissertation we are looking at the use of Peer Physical Examination (PPE) among radiography students and faculty. We are writing to gain permission to use your survey and modify the survey you created to explore the acceptability and value of the practice of PPE for our current research. Of course, we will be giving the appropriate credit for use of the survey. We look forward to your response or additional communication from you. Thank you for your time in advance.

Joy A. Cook

Joy A. Cook, MS, RT (R)(CT)(MR) ARRT
Associate Professor, Chair & Program Director

Heather Schmuck

Heather Schmuck, MS, RT(R)
Clinical Associate Professor and Clinical Coordinator,
Radiologic and Imaging Sciences

Appendix D: Online Informed Consent Document for Participants

UNIVERSITY OF SOUTHERN INDIANA

Radiography Faculty Perceptions and Comfort Levels in Medical Education Modeling with Correlation to Role Modeling

(IRB 1816579-1)

Informed Consent Document

You are invited to participate in a research study on faculty perceptions and comfort levels with hands-on teaching pedagogy within JRCERT accredited associate or bachelor's radiography programs with a correlation to role modeling. This study is being conducted by Joy Cook from the University of Southern Indiana, Educational Leadership Doctoral student with Dr. Bonnie Beach as faculty sponsor. Joy Cook can be reached at HP3066, 8600 University Blvd., Evansville, IN 47712, jacook3@usi.edu, or 812-465-1183.

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Your decision to participate or decline participation in this study is completely voluntary and you have the right to terminate your participation at any time without penalty. Consent is implied when you begin the survey. You may skip any questions you do not wish to answer. If you do not wish to complete this survey simply do not proceed to the link or if started, simply close your browser.

Your participation in this research will be completely confidential. You may benefit from participation by gaining a better understanding of your own perceptions and comfort levels in hands-on pedagogy involving students as models. You may also benefit from evaluation of your own efficacy as a role model. There is a risk of participant discomfort in answering some of the survey questions. Participants have the option to skip questions. No compensation will be awarded for participation in this study.

Please print a copy of this consent form for your records, if you so desire.