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Leading the Way in Radiography: Radiography Students' Perceptions of Leadership in the Field, Leadership Opportunities, and Themselves as Future Leaders

Renee C. Bloom
Indiana University of Pennsylvania

LEADING THE WAY IN RADIOGRAPHY: RADIOGRAPHY STUDENTS' PERCEPTIONS OF LEADERSHIP IN THE FIELD, LEADERSHIP OPPORTUNITIES, AND THEMSELVES AS FUTURE LEADERS

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Renee C. Bloom

Indiana University of Pennsylvania

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Indiana University of Pennsylvania
School of Graduate Studies and Research
Department of Sociology

We hereby approve the dissertation of

Renee C. Bloom

Candidate for the degree of Doctor of Philosophy

J. Beth Mabry, Ph.D.
Associate Professor of Sociology, Chair

Valerie Gunter, Ph.D.
Associate Professor of Sociology

John Anderson, Ph.D.
Professor of Sociology

Julia Gill, Ph.D.
Associate Professor of Allied Health Sciences
University of Cincinnati, Blue Ash College

ACCEPTED

Timothy P. Mack, Ph.D.
Dean
School of Graduate Studies and Research

Title: Leading the Way in Radiography: Radiography Students' Perceptions of Leadership in the Field, Leadership Opportunities, and Themselves as Future Leaders

Author: Renee C. Bloom

Dissertation Chair: Dr. J. Beth Mabry

Dissertation Committee Members: Dr. Valerie Gunter
Dr. John Anderson
Dr. Julia Gill

The purpose of this cross-sectional descriptive research study was to explore leadership development of professionals in the field of radiography that starts at the level of the student radiographer. Specifically, this study was aimed at understanding radiography students' perceptions of the transformational leadership behaviors of individuals who hold leadership positions relative to the radiography educational process, and how these leader role models related to students' perceptions of leadership opportunities in the field of radiography and beliefs about their own self-efficacy with regard to leadership. Transformational leadership, identity and role formation theory, a feminist perspective with constructs of power, and the construct of self-efficacy served as the theoretical framework.

Study participants included 163 radiologic technologists registered by the American Registry of Radiologic Technologists (ARRT) who, as part of the primary certification examination application process, indicated to the ARRT willingness for inclusion in research correspondence. An adapted version of Kouzes' and Posner's (1998) Student Leadership Practices Inventory was used to assess radiography students' perceptions of their own leadership ability and of the leadership behaviors of radiography program directors, clinical coordinators, clinical instructors, staff radiologic technologists, and imaging department directors. Data were analyzed using quantitative analyses at univariate, bivariate and multivariate levels.

Findings indicated that radiography students observed transformational leadership behaviors in all radiography role models to various degrees and feel highly efficacious, themselves, as transformational leaders. The degree to which students identified with role models appeared to be key in influencing students' perceptions about leadership opportunities in the field and their self-efficacy for transformational leadership. Of the five role models, radiography students consistently identified with radiologic technologists. Perceptions that students had of the transformational leadership of radiologic technologists emerged as the primary predictor of student self-efficacy for leadership. Findings support incorporation of leadership instruction and practical application in the entry-level radiography curriculum that provide radiography students opportunity to develop leadership skills and acquire knowledge in theory and in practice. Findings also suggest incorporation of tenets of adult learning theory in radiography education and provision of professional development opportunities for radiologic technologists relative to their roles as leaders and mentors to radiography students.

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INTRODUCTION

Statement of the Problem

The focus of this study is leadership development of professionals in the field of radiography that starts at the level of the student radiographer. As with many professions, radiography students are the profession's future, and the personal and professional leadership development that occurs in them during the radiography educational process has implications for the profession at large. Today's radiography students are tomorrow's registered radiographers who will be responsible for serving the healthcare industry and the public through the delivery of quality medical imaging services. The profession of radiography, as a whole, effectively equips students with the knowledge and skills necessary to function as future knowledgeable and competent clinicians. This is evidenced by the 93% pass rate of first-time candidates who took the registration examination in radiography that is administered by the American Registry of Radiologic Technologists in 2012 (ARRT, 2012a). Additionally, however, today's radiography students are tomorrow's leaders in the field who will be responsible for navigating the profession through a healthcare environment that McAleraney (2010) contends is increasingly complex and volatile. The profession of radiography, as a whole, must therefore ensure that it prepares its students to assume future leadership roles in the profession. To facilitate leadership development as future registered radiographers, students in radiography educational programs should have positive perceptions about leadership that is demonstrated by their radiography role models. Further, radiography students should perceive that there are leadership opportunities in the field to pursue and have an awareness of their own self-efficacy for leadership as a result of observing positive modeling of leadership throughout the radiography educational process.

If the profession of radiography, as a whole, understands the perceptions that radiography students have of leadership demonstrated to them by radiography role models, students' perceptions of leadership opportunities in the field of radiography, and students' perceptions of their self-efficacy for transformational leadership, the profession will be better informed about what it must do to develop a systematic model of leadership development and succession. A systematic leadership development and succession model will help ensure that the profession of radiography has sustainable effective leadership that will give the profession an adequate voice and representation relative to critical decisions made in health care organizations that affect members of the profession and its constituents. Further, sustainable, effective leadership will help ensure that the profession of radiography is prepared to face future challenges and ongoing changes in the health care environment. Understanding radiography students' perceptions of transformational leadership behavior demonstrated by radiography role models, perceptions of leadership opportunities in the field, and perceptions their self-efficacy with regard to transformational leadership is a logical and critical starting point to devising a systematic leadership development and succession model for the field of radiography that will support advancement of the profession.

For the purpose of this study, "leadership behavior demonstrated by radiography role models" is a concept derived from the transformational leadership behaviors identified in Kouzes and Posner's (2005) model of transformational leadership. Role models in this study include program director(s), clinical coordinator(s), and clinical instructor(s) in radiography educational programs; staff registered radiographers; and directors of medical imaging departments.

Radiography Leadership in the Context of a Healthcare Organization

Radiographer and radiologic technologist are synonymous terms. Radiography is sometimes classified as a sub discipline of radiologic technology (Tolley Gurley & Calloway, 2011). Radiation therapy, magnetic resonance imaging, nuclear medicine, and ultrasonography are also specialty areas of radiologic technology (Tolley Gurley & Calloway, 2011). Medical imaging sciences, diagnostic imaging, and radiographic imaging are relatively newer terms that are sometimes used to reference one or more of the specialty areas of radiologic technology (Bushberg, Seibert, Leidholdt & Boone, 2012; Carlton, 2013; Fazel, Krumholz, Wang, Ross, Chen, Ting, Shah, Nasir, Einstein & Nallamothou, 2009). Radiographers are also considered to be allied health professionals. Allied health is an umbrella category that may be used to identify numerous individual healthcare disciplines in addition to radiologic technology such as respiratory care, dental hygiene, athletic training, and surgical technology (Association of Schools of Allied Health Professions, 2013; Donini-Lenhoff, 2008; Richardson, 1992). The allied health professions comprise 60% of the healthcare provider sector alongside nurses, physicians, dentists, doctors of veterinary medicine, optometrists, podiatrists, pharmacists, and other select medical professionals (Donini-Lenhoff, 2008). An equally proportionate number of allied health professionals, in relationship to nurses, physicians, and other professionals, should therefore be expected to hold leadership positions in healthcare organizations. The proportion of these positions held by allied health professionals is unclear, however, because of lack of empirical research. Further, the body of healthcare leadership and administration literature consistently emphasizes physicians, nurses, and laypersons who hold administration degrees as suitable for leadership development opportunities in healthcare organizations (Houston, 2008;

Schultz, 2004), but it is not apparent that allied health professionals, including radiography professionals, are given equitable consideration for similar leadership opportunities.

The task of identifying suitable candidates for leadership positions in healthcare organizations gives rise to questions of the qualifications necessary to support effectiveness in the role. Of the many types of healthcare professionals that exist, are some assumed to be better candidates for leadership positions because they are members of a specific healthcare discipline such as nursing or medicine? If so, bias may exist in the appointment of leaders in health care organizations, including promotion to senior administrative positions, and radiography professionals and other allied health personnel may be excluded. This is of particular importance since decisions made by healthcare leaders drive distribution and utilization of limited resources (Popple & Leighninger, 2008) that affect patient care and outcomes. Individuals and groups that do not have access to and a voice in organizational administrative ranks have less power and influence and, therefore, a lower propensity to secure resources that enable them to advance their agendas (Popple & Leighninger, 2008). Underrepresentation of radiographers in key leadership positions in health care organizations will equate to important decisions being made for radiography professionals and their constituents, including patients, without appropriate input from the discipline. Instead, other health care professionals such as nurses, physicians, and laypersons - all of whom are likely to lack expertise in the discipline of radiography - may be representing the field of radiography and its constituents at the organizational decision-making table. Central to the concern of adequate representation of radiographers in healthcare organizations is the current state of leadership in the profession of radiography and if the profession is preparing its members for leadership succession.

Radiography Leadership within the Historical Context of the Profession

An historical account of the profession of radiography by Harris (1995) speaks to the importance of effective leadership and the numerous challenges that the profession has overcome through the work of its leaders. Since its origins in the early 1900's, the profession of radiologic technology, a predominantly female profession (Patterson-Lorenzetti, 2002), has contended with issues of male dominance in a paternalistic healthcare environment. Consequently, the profession of radiography, in general, has had to historically contend with issues of low professional status and low pay, limited professional autonomy and independence from radiologists, lack of educational criteria and standardized national professional licensure requirements that would enhance professional recognition, and personnel shortages (Harris, 1995). Still, leaders in the profession of radiography have provided time, energy, and other resources for the greater good of the profession (Harris, 1995). Accomplishments such as the creation of the American Society of Radiologic Technologists, the American Registry of Radiologic Technologist, and the Joint Review Committee on Education in Radiologic Technology speak to the dedication and vision of the profession's early leaders to advance educational and professional standards of the field (Harris, 1995). Recent changes in degree requirements for educators in the field and entry-level technologists, time-limited professional certification that requires renewal every ten years, the emergence of new positions such as radiologist assistants, and new areas of professional specialization including geriatric radiology and emergency room radiology (Lipman & Powers, 2006; Tolley Gurley & Calloway, 2011) speak to the effectiveness of current leaders who have significantly contributed to the profession's ongoing development and increased status. But if a clear and comprehensive plan of leadership development and succession for radiographers does not exist, the profession of radiography may be at risk for losing ground that past and present leaders have worked to gain in organizational and political arenas.

Need for Leadership Development in Allied Health Professions

The profession of radiologic technology, as a whole, might benefit from the sagacity of other healthcare professions, such as pharmacy, that have worked to address the leadership development of its members (Boyle, Beardsley & Hays, 2004; Clark, 2007). In a 2002 address to the American Association of Colleges of Pharmacy, Barbara Wells, founding executive director for the National Association of Pharmacy Regulatory Authorities (NAPRA), expressed the dire need for expanded leadership in the pharmacy profession to increase representation of the field in the political arena. Wells opined that the profession of pharmacy would soon be in peril if it continued to rely solely on the leadership of a "small and select group of highly committed individuals to provide the vision for our future and the fuel to get us to our envisioned destination" (Wells, 2002, p. 437). Wells also stressed that failure to expend the necessary resources to develop adequate leadership in the field of pharmacy was "stealing from our future" (Wells, 2002, p. 437). The field of radiography may be in a similar position as the field of pharmacy at the time of Wells' address. Consequently, it may be beneficial for the profession of radiography to carefully consider Wells' advice as it assesses the current state of leadership in the field.

Kutz' (2004) contentions about leadership development in the allied health professions are similar to Wells' concerns about the adequacy of leadership in pharmacy. Kutz argued that "advancing the allied health care professions and the members of the allied health care community is proving to be difficult without the necessary leadership skills" (Kutz, 2004, p. 1). Further, Kutz stated that "leadership is rarely intentionally taught in allied healthcare disciplines"

(Kutz, 2004, p. 4). Kutz' assertions about leadership development may be particularly relevant to the field of radiography in light of the forecasted 28% growth in the demand for radiographers through 2020 (United Stated Department of Labor, Bureau of Labor Statistics, 2012). As the field of radiography grows, the interests and goals of its members will also grow and diversify. It is therefore essential to ensure that effective leadership is in place that will maintain a united and focused effort in advancing the field.

Determining the Current State of Leadership Development in the Field

This study analyzed perceptions that radiography students have of transformational leadership behaviors demonstrated by radiography role models, perceptions of leadership opportunities in the field, and perceptions of their own self-efficacy with regard to transformational leadership. As such, findings of this study provide a partial assessment of the current state of leadership and leadership development in the field of radiography that starts at the level of the student radiographer. Findings from this study may contribute to the development of a plan for leadership development and succession in the field of radiography that is informed by dynamics of the radiography educational process. Additionally, this empirical research contributes to the sparse body of literature specific to the profession of radiography and augments the scientific information that is necessary for the profession to systematically and logically advance.

Radiography students and radiography educational programs serve as a logical starting point in garnering meaningful information about leadership development in the field of radiography. Analysis of radiography students' perceptions of transformational leadership behaviors of radiography role models, leadership opportunities in the field, and their self-efficacy with regard to transformational leadership may help the profession to better understand what, if anything, is being taught or modeled about leadership to radiography students and what they learning from it. The dynamics of leadership and leadership learning opportunities that occur in the radiography educational process are likely to be pivotal to the overall leadership mentality of radiography students. Sherman and Bishop (2007) argued that that the educational process of nursing students is key in developing a “leadership mindset” (Sherman & Bishop, 2007, p. 295) that will influence future professional leadership roles, and that nurse educators are instrumental in promoting careers as nurse leaders to nursing students. Similar to the field of nursing, the groundwork upon which to build and shape leadership knowledge, attitudes, and behaviors in radiographers is likely to be formed during the radiography educational process. Empirical analysis of radiography students’ awareness and perceptions of leadership in the field of radiography is therefore warranted and may help us to better understand leadership dynamics in the overall profession. This study evaluated radiography students’ perceptions of transformational leadership behaviors demonstrated by radiography role models, perceptions of leadership opportunities in the field, and perceptions of their self-efficacy with regard to transformational leadership. Ideally, radiography students should 1) perceive that their radiography role models demonstrated positive leadership, 2) be hopeful that leadership opportunities exist for themselves as future technologists, and 3) think that they are capable of assuming leadership positions as future health care professionals.

Significance of the Study

Although the presence of and necessity for ongoing leadership in the field of radiography is evident based on past and present advancements of the profession, little empirical research exists about leadership in the field. Consequently, existing empirical evidence that might inform the creation of a systematic model of leadership development and succession for the profession of radiography is minimal. Because radiographers continue to function in a healthcare environment that is in constant flux (Johnson, 2005), effective leadership is necessary to assist radiographers in navigating the complexity and volatility of the health care environment (McAlearney, 2010) and in advancing the profession.

Strong leadership that gives voice to and empowers radiographers also stands to benefit patients. The body of nursing literature suggests that improved patient care occurs when health care professionals are empowered. Results of a 2003 study (Kramer & Schmalenberg) showed improvements in the quality of patient care delivered by nurses who had greater control over their nursing practice. Likewise, nurses at midpoint of a three-year study that analyzed the impact of implementing a shared governance model in a clinical environment reported significant increases in their satisfaction with the overall quality of patient care (Westrope, Vaughn, Bott, & Taunton, 1995). Vahey, Aiken, Sloan, Clark, & Vargas (2004) reported lower mortality rates in Medicare patients, higher patient satisfaction, and lower incidences of needle stick errors when nurses functioned in an environment that fostered self-governance. Edwards (2008) suggested that implementing a model of shared governance that facilitates empowerment in health care professionals across disciplines may aid health care organizations in realizing "organizational goals related to safe patient care" (Edwards, 2008, p. 256). Extrapolating empowerment principles from the field of nursing to the field of radiography suggests potential for improvements in the quality of patient care in clinical practice if radiographers exercise leadership in the form of empowerment. Results of this study will help us to better understand how radiographers perceive leadership, leadership opportunities, and themselves as leaders and will help us foster leadership development. This, in turn, stands to improve positive outcomes for patients, as demonstrated in the field of nursing (Kramer & Schmalenberg, 2003), and also for radiographers as our profession increases in empowerment and self-governance. The radiography educational process may be key to understanding leadership development in the profession, as the educational process is a period of time during which students are likely to be highly impressionable and may therefore carry learned concepts of leadership with them throughout their entire careers. Factors in the educational process that relate to students' perceptions of leadership may be critical to identifying and comprehending underpinnings that impact the leadership attitudes and behaviors of students once they become radiographers. Specifically, understanding radiography students' perceptions of 1) transformational leadership behaviors demonstrated by radiography role models, 2) leadership opportunities in the field, and 3) their self-efficacy with regard to transformational leadership will help the radiography profession identify the role of the radiography educational process in supporting leadership development in the profession at large.

Context of the Study

In the effort to better understand leadership awareness in radiography students for the intent of informing leadership development and succession in the field of radiography, the purpose of this study was two-fold. First, this study describes perceptions that radiography students, as reported by graduates of radiography educational programs, have of leadership in the field based on their evaluation of the transformational leadership behaviors demonstrated by radiography role models during the radiography educational process. Second, this study describes relationships that exist between radiography students' perceptions of transformational leadership behaviors demonstrated by radiography role models and perceptions that radiography students have of (a) leadership opportunities in the field of radiography, and (b) their sense of their own self-efficacy for leadership. Results were used to make suggestions about ways in which leadership role modeling during the radiography educational process may be enhanced to initiate leadership development in students and ensure that they start their careers with positive perceptions about themselves and other radiographers as leaders, recognize that leadership opportunities exist for radiographers, and have confidence in themselves as future leaders.

The scope of this study included an analysis of individuals who meet the following criteria: 1) graduated from a radiography educational program that was "accredited by a mechanism acceptable to ARRT" (American Registry of Radiologic Technologists, 2014, para.3, retrieved from https://www.arrt.org/Certification/Radiography) relative to establishing eligibility for candidacy for certification in radiography and that awarded a certificate or diploma or an associate degree or higher degree; 2) took and passed the primary certification examination in radiography that is offered by the American Registry of Radiologic Technologists (ARRT) as a first-time candidate in 2012, 3) indicated to the ARRT their willingness to be included in research correspondence as part of the primary certification examination application process, and 4) provided an email address to the ARRT as part of the primary certification examination application process. Graduates of radiography programs, regardless of the type of program or terminal award granted, have had exposure to radiography role models and leadership opportunities in the field and therefore have likely formed perceptions of leadership based on their observations and experiences.

Definition of Terms

Clinical instructor - The individual in a radiography educational program who "provides students with clinical instruction and supervision [and] evaluates students' clinical competence" (JRCERT, 2014a, p. 44). Among other duties, the clinical instructor also "maintains current knowledge of program policies, procedures, and student progress" (JRCERT, 2014a, p. 44).

This individual may teach students in didactic and clinical settings and perform other duties in accordance with JRCERT guidelines. There may be multiple clinical instructors in a radiography educational program, and in some programs, all registered radiologic technologists are dually appointed as clinical instructors. According to the JRCERT (2014a):

> A minimum of one clinical instructor must be designated at each recognized clinical education setting. The same clinical instructor may be identified at more than one site as long as a ratio of one full-time equivalent clinical instructor for every ten students is maintained. (p. 25)

For the purpose of this study, a clinical instructor in a radiography educational program not accredited by the JRCERT was defined as an individual who functions in a similar capacity as a clinical instructor in a JRCERT-accredited program.

***Clinical coordinator* –** The individual in a radiography educational program who "correlates students' clinical education with didactic education" (JRCERT, 2014a, p. 43). This individual may "participate in clinical and/or didactic education of students and supports the program director to help support effective program operation" (JRCERT, 2014a, p. 43). Among other duties, the clinical coordinator also "coordinates clinical education and helps evaluate its effectiveness [and] maintains current knowledge of program policies, procedures, and student progress" (JRCERT, 2014a, p. 43). A clinical coordinator is not required for all radiography educational programs. According to the JRCERT, a clinical coordinator "is required if the program has more than five active clinical education settings or more than 30 students enrolled in the clinical component" (JRCERT, 2014a, p. 25). For the purpose of this study, a clinical coordinator in a radiography educational program not accredited by the JRCERT was defined as an individual who functions in a similar capacity as a clinical coordinator in a JRCERT-accredited program.

***Clinical preceptor* –** For the purpose of this study, a radiographer (radiologic technologist) who holds registration with the American Registry of Radiologic Technologists and who is typically charged with providing instruction and oversight to radiography students while performing medical imaging procedures on patients in the clinical environment. There may be multiple clinical preceptors in a radiography educational program.

Joint Review Committee on Education in Radiologic Technology – "The only agency recognized by the U.S. Department of Education (USDE) and the Council for Higher Education Accreditation (CHEA), for the accreditation of traditional and distance delivery educational programs in radiography, radiation therapy, magnetic resonance, and medical dosimetry," (JRCERT, 2013, http://www.jrcert.org/about/).

Leadership demonstrated by radiography role models– For the purpose of this study, this identifier is a concept derived from a modified version of the transformational leadership behaviors identified in Kouzes and Posner's (2005) model of transformational leadership and exhibited by radiography program director(s), clinical coordinator(s), and clinical instructor(s), or individuals who hold equivalent positions in radiography educational programs; staff registered radiographers; directors of medical imaging departments; as well as registered radiographers who are leaders of professional societies for radiographers.

***Leadership in the field* -** For the purpose of this study leadership in the field refers to the leadership demonstrated by radiography role models (see definition of *leadership demonstrated by radiography role models* and of *radiography role models).*

***Leadership opportunities in the field* -** For the purpose of this study, leadership opportunities in the field include perceived formal or informal leadership opportunities in the radiography educational process or as a professional radiographer.

Program officials – For the purpose of this study, this is a collective term and refers to the "program director, educational coordinator (if applicable), full-time didactic faculty, and all clinical preceptors," (JRCERT, 2014a, p. 68) and clinical instructors in a radiography educational program that is accredited by the Joint Review Committee on Education in Radiologic Technology (JRECERT). Relative to this study, program officials in a radiography educational program not accredited by the JRCERT were defined as individuals who function in similar capacities as program officials in a JRCERT-accredited program.

***Program director* –** The individual in a radiography educational program who assumes the leadership role in the continued development of the program" (JRCERT, 2014a, p. 43). In general, the program director "assures effective program operations, oversees program assessment, participates in budget planning, and maintains current knowledge of the professional discipline and educational methodologies through continuing professional development" (JRCERT, 2014a, p. 43). The program director is often considered to have primary authority over the radiography educational program. For the purpose of this study, a program director in a radiography educational program that is not accredited by the JRCERT is defined as an individual who functions in a similar capacity as a program director in a JRCERT-accredited program.

***Radiographer* –** A radiologic technologist produces diagnostic radiographs. The duties of a radiologic technologist include "positioning patients for radiologic examinations; determining proper voltage, current, and exposure time for each radiograph and adjusting x-ray equipment; the production of radiographs as requested; and assisting the radiologist in special procedures and in preparation of radiopaque contrast media" (The Free Dictionary by Farlex, 2012, http://medical-dictionary. thefreedictionary. com/radiographer). Graduates of approved programs are designated (ARRT), Registered Technologist" (The Free Dictionary by Farlex, 2012). Radiographer is synonymous with radiologic technologist although radiography may be referenced as a sub-discipline of radiologic technology (Tolley Gurley & Calloway, 2011). There are typically numerous radiographers associated with radiography educational programs. In some radiography educational programs, all registered radiographers are dually appointed as clinical instructors.

***Radiography* –** "The making of records (radiographs) of internal structures of the body by passing x-rays or gamma rays through the body to act on specially sensitized" (The Free Dictionary by Farlex, 2012, http://medical-dictionary. thefreedictionary. com/radiography) imaging plates. Radiography may be referenced as a sub-discipline of radiologic technology (Tolley Gurley & Calloway, 2011).

***Radiography educational process* –** The period of time that a radiography student is enrolled in a radiography educational program.

***Radiography program* –** "A formal training program in radiography that leads to a certificate or diploma, associate degree, or bachelor's degree. Typical programs include classroom training and clinical training. Coursework includes anatomy, pathology, patient care, radiation physics and protection, and image evaluation," (United Stated Department of Labor, Bureau of Labor Statistics, 2012, http://www. bls. gov/ooh/healthcare/radiologic-technologists. htm#tab-4).

***Radiologic technologist* –** "Health care professional skilled in the theory and practice of the technical aspects of the use of radiation in the diagnosis and treatment of diseases," (Tolley Gurley & Callaway, 2011, p. 279). There are typically numerous radiologic technologists associated with radiography educational programs. Radiologic technologist is synonymous with radiographer although radiography may be referenced as a sub-discipline of radiologic technology (Tolley Gurley & Calloway, 2011). In some radiography programs, all registered radiologic technologists are dually appointed as clinical instructors.

Radiologist – "Physician who specializes in the medical sciences that manages the use of x-rays, radioactive substances, and other forms of radiation energy in the diagnosis and treatment of disease," (Tolley Gurley & Callaway, 2011, p. 279).

Radiology – "The branch of medicine that makes diagnostic images of anatomic structures through the use of electromagnetic radiation or sound waves and that treats disease through the use of radioactive compounds," (The Free Dictionary by Farlex, 2012, http://medical-dictionary. thefreedictionary. com/radiology).

Registered radiographer – A radiographer (radiologic technologist) who holds registration with the American Registry of Radiologic Technologists (ARRT).

Radiography role models – For the purpose of this study, this identifier was defined as role models in the field of radiography who hold a specific position and with whom students typically interact during the educational process. These radiography role models include radiography program director(s), clinical coordinator(s), and clinical instructor(s) or individuals who hold equivalent positions in radiography educational programs; staff registered radiographers; directors of medical imaging departments; as well as registered radiographers who are leaders of professional societies for radiographers.

Self-efficacy – An individual's belief in her effectiveness in situations or ability to attain desired outcomes (Bandura, 2000); the ability to succeed in a situation. For the purposes of this study, self-efficacy as a leader pertains to the belief that oneself can be effective in engaging in transformational leadership behaviors.

Technologist – An abbreviated term for a radiographer (radiologic technologist) who holds registration with the American Registry of Radiologic Technologists (ARRT).

Transformational leadership – Transformational leadership is a relational approach to leadership in which the leader employs a charismatic but personal approach with the goal of developing emotional bonds with followers that inspire them to function at higher levels (Hughes, Ginnet & Curphy, 2006). Transformational leaders are able to convey to followers a shared vision that facilitates attainment of higher goals and organizational change (Hughes et al., 2006). Additionally, transformational leaders assist individuals in realizing their inner potential as leaders and foster a sense of empowerment (Hughes et al., 2006)

Transformational leadership behaviors – For the purpose of this study, transformational leadership behaviors is a concept derived from a modified version of Kouzes and Posner's (2005) model of transformational leadership that includes five constructs: 1) Enabling Others to Act, 2) Modeling the Way, 3) Encouraging the Heart, 4) Inspiring a Shared Vision, and 5) Challenging the Process.

Research Paradigm

This study employed a post-positivist research approach for the purpose of understanding radiography students' perceptions of leadership in the field of radiography. Quantitative research methods were used to assess radiography students' perceptions of the transformational leadership behavior demonstrated by radiography role models and how these perceptions related to (1) students' perceptions of leadership opportunities in the field, and (2) students' perceptions of their own self-efficacy for leadership. For the purpose of this study, leadership demonstrated by radiography role models is a concept derived from the transformational leadership behaviors identified in Kouzes and Posner's (2005) model of transformational leadership and exhibited by program director(s), clinical coordinator(s), and clinical instructor(s) in radiography educational programs; staff registered radiographers; and directors of medical imaging departments.

Instrument

The instrument used for this study primarily centered on the Student Leadership Practices Inventory (Student-LPI) (Kouzes & Posner, 1998) that was modified by Arendt and Gregoire (2005) and Endress (2000) and further modified by me. The transformational leadership behaviors of radiography role models and students' self-efficacy for leadership were assessed by asking study participants to complete uniquely modified versions of the Student-LPI. The Student-LPI is comprised of constructs rooted in transformational leadership theory (Antonakis, Cianciolo & Sternberg, 2004; Northouse, 2007). The Student-LPI is derived from the Leadership Practices Model (non-student) that is grounded in Kouzes' and Posner's model of transformational leadership (Antonakis, Cianciolo & Sternberg, 2004; Northouse, 2007). Kouzes and Posner developed their transformational leadership model by analyzing content from case studies submitted by private- and public-sector managers and identifying recurring behaviors that the managers reported exhibiting when they were functioning as leaders at their "personal best" (Posner, 2004, p. 444). The LPI is comprised of five categories of leadership that include 1) Enabling Others to Act, 2) Modeling the Way, 3) Encouraging the Heart, 4) Inspiring a Shared Vision, and 5) Challenging the Process (Kouzes & Posner, 1998). Each of these five categories contains six descriptive statements for a total of 30 items (Kouzes & Posner, 1998). In a later study, Posner and Brodsky (1992) employed the same method to analyze college students' accounts of their leadership behaviors as Kouzes and Posner used for managers. Posner and Brodsky reported that college students practiced leadership behaviors comparable to managers and that the conceptual framework from which the LPI stemmed was applicable for creating a student version of the LPI (Posner, 2004). Consequently, the Student-LPI contains categories of leadership and descriptive statements that closely parallel those in the LPI.

For the purposes of this study, the modified version of the Student-LPI (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) that I used was an appropriate instrument for respondents to use to evaluate radiography role models for two reasons. First, this study is focused on students' perceptions of transformational leadership behavior. The Student-LPI (Kouzes & Posner, 1998) captures constructs that students equate to leadership behavior (Posner, 2004) and they are transformational in nature. Secondly, constructs in the Student-LPI (Kouzes & Posner, 1998) closely parallel those in the LPI which is used to evaluate behaviors of leaders (non-student). And, my rationale for using a modified version of the Student-LPI (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) for assessing students' self-efficacy for leadership in this study stems from the premise that students who demonstrate behaviors measured in the Student-LPI will feel efficacious as leaders (Kouzes & Posner, 1998).

The adapted version of the Student-LPI (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) that I used for this study is non-permissioned and reflects additional changes to previously adapted (permissioned) versions of the Student-LPI used by Endress (2000) and Arendt and Gregoire (2005). The purpose of using and transforming the earlier and previously adapted version of the Student-LPI (Arendt & Gregoire, 2005; Endress, 2000; Kouzes

& Posner, 1998) is specific to my particular research questions, context, and sample. Based on correspondence with the publisher of the Student-LPI (Jossey-Bass), Kouzes and Posner "did not design the Student-LPI to evaluate self-efficacy or capacity, but rather the frequency of actual behavior which is the foundation upon which The Five Practices rest" (E. Null, personal communications, January 22, 2014). Further, the publisher and authors of the Student-LPI indicated that they "do not encourage adaptation of the inventory to fit the context and any attempts to do so may invalidate the results." Information about Kouzes and Posner's Student Leadership Practices Inventory may be found at http://www.studentleadershipchallenge.com/About/research.aspx.

The instrument that I used for this study also facilitated assessment of student demographics (age, gender, race/ethnicity, and household income), radiography program characteristics (program sponsorship type and terminal award granted), and the gender of radiography role models with whom students worked. Further, the instrument enabled assessment of students' perceptions of other aspects of leadership in the field of radiography.

Theoretical Framework

In this study, assumptions about how the transformational leadership behaviors demonstrated by radiography role models relate to radiography students' perceptions of the transformational leadership behaviors of radiography role models, leadership opportunities in the field, and students' self-efficacy with regard to transformational leadership was informed by transformational leadership theory, identity and role formation theory, and a feminist perspective including constructs of power.

Transformational leadership is a relational approach to leadership in which the leader employs a charismatic but personal approach with the goal of developing emotional bonds with followers that inspire them to function at higher levels (Hughes, Ginnet & Curphy, 2006). Transformational leaders are able to convey to followers a shared vision that facilitates attainment of higher goals and organizational change (Hughes et al., 2006). Additionally, transformational leaders assist individuals in realizing their inner potential as leaders and foster a sense of empowerment (Hughes et al., 2006). The body of literature in the fields of radiography, nursing, athletic training, and student affairs suggest that both learning and work environments that employ tenets of transformational leadership result in favorable outcomes for students and employees that include enhanced learning, increased self-confidence, a sense of empowerment and self-actualization, and willingness to assume leadership roles (Curtis, Helion & Domsohn, 1998; Fortsch, Henning & Nielsen, 2009; Heller, Drenkard, Esposito-Herr, Romano, Tom &Valentine, 2004; Shertzer & Schuh, 2004; Vahey, Aiken, Sloan, Clark & Vargas, 2004; Westrope, Vaughn, Bott & Taunton, 1995). Since transformational leadership is known to be an effective leadership style for both health care students and health care employees, application of a transformational leadership theoretical framework was appropriate and relevant for this study. Ideally, radiography students learn transformational leadership from radiography role models who, themselves, are transformational leaders. Then these students, as tomorrow's leaders in the field of radiography, will model principles and practices of transformational leadership to the next generation of radiographers. Thus, a model of transformational leadership will be perpetuated.

Since the field of radiography is comprised predominantly of females (Patterson-Lorenzetti, 2002; P. McCullough, personal communication, December 16, 2013) who have historically functioned in a patriarchal healthcare system (Abramovitz, 1996) in which delimiting norms of professional roles for radiographers have been defined (Harris, 1995), application of role and identity formation and a feminist perspective were fitting for this study. Theories on role formation posit that individuals put themselves in positions defined by others, and in doing so act in a manner that others expect of the individual (Allen 2005). When applied to leadership, role theory posits that leaders may experience confusion and conflict in their role when expectations of leadership that are placed on an individual by others or by the organization do not align (Tsui, 1984). Theories on identity formation suggest that that the development of an individual's sense of self has "social origins" (Powers, 2004, p. 111) and is influenced by those with whom she has contact. The theory of identity verification posits that individuals desire for others to validate their role identity (Turner, 2003).

A medical imaging department has hierarchies of formal and informal authority and power. Radiography students attempt to negotiate the power dynamics in the clinical environment to maximize their success in achieving their academic goals. A key relationship that centers around authority and power and that is critical to student learning is the relationship between the radiologic technologist and radiography student. Radiologic technologists provide oversight and supervision of students in the clinical environment and therefore have varying degrees and types of power over students. The power that radiologic technologists have over students has potential to significantly help or hinder student learning and progress. Radiologic technologists therefore have potential to influence student perceptions of leadership in the profession of radiography.

Study Design and Research Questions

This study employed a post-positivist research approach that was quantitative in nature. This cross-sectional study attempted to address the following research questions:

What do radiography students perceive about the transformational leadership demonstrated by radiography role models during the radiography educational process?

What do radiography students perceive about leadership opportunities in the field of radiography?

What do radiography students perceive about their self-efficacy with regard to transformational leadership?

The Construct of Leadership

Although leadership is a nebulous and complex construct (Antonakis, Cianciolo & Sternberg, 2004; Hughes, Ginnett & Curphy, 2006), Antonakis, Cianciolo, and Sternberg (2004) proffer that leadership is the process of influencing that takes place between leaders and followers, as well as the resultant outcomes. Antonakis, Cianciolo, and Sternberg further contend that the influencing process is informed by the leader's "dispositional characteristics and behaviors, follower perceptions and attributions of the leader, and the context in which the influence process occurs" (Antonakis, Cianciolo & Sternberg, 2004, p. 5).

For this study, the concept of leadership was grounded in constructs of transformational leadership. Transformational leadership is a relational approach to leadership in which the leader employs a charismatic but personal approach with the goal of developing emotional bonds with followers that inspire them to function at higher levels (Hughes, Ginnet & Curphy, 2006). Transformational leaders are able to convey to followers a shared vision that facilitates attainment of higher goals and organizational change (Hughes et al., 2006). Additionally, transformational leaders assist individuals in realizing their inner potential as leaders and foster a sense of empowerment (Hughes et al., 2006)

This study used transformational leadership theory as a framework to explore relationships that existed between students' perceptions of the leadership demonstrated by radiography role models (program directors, clinical coordinators, clinical instructors, radiologic technologists, and department directors), and 1) students' perceptions of leadership opportunities in the field of radiography, and 2) students' perceptions of their self-efficacy with regard to transformational leadership.

CHAPTER 2

REVIEW OF LITERATURE

Introduction

Effective leadership is necessary for the profession of radiography to realize advancement in a health care environment that McAlearney (2010) contends is increasingly complex and volatile. Like other health care leaders, leaders in the field of radiography make decisions that drive distribution and utilization of limited resources and have significant impact on stakeholders. The profession of radiography would be prudent to ensure that effective measures are in place that prepare its members to assume leadership positions. Radiographers who have leadership acumen are more likely to be considered by the larger health care community as viable candidates for senior leadership positions in health care organizations. By investing in its members' leadership development, the profession of radiography will ensure that it has representation and a voice in organizational decision making that impacts the profession as a whole and its constituents.

As evidenced in empirical literature, some health care disciplines such as nursing and pharmacy demonstrate a high degree of interest in leadership development and succession in their professions and are researching and experimenting with leadership development models (Boyle, Beardsley & Hayes, 2002; Heller, Drenkard, Esposito-Herr, Romano, Tom & Valentine, 2004; Sherman, 2007; Sherman, Bishop, Eggenberger & Karden, 2007; Stichler, 2008; Tran, Fjortoft, Glosner & Sunberg, 2005; Wells, 2002). The profession of radiography would benefit from emulating nursing and pharmacy by researching, discussing, devising, and implementing a systematic model of leadership development and succession so there is a continual supply of competent leaders who can help the profession face future challenges. To do this, the profession of radiography must first understand the current state of leadership in the field and the factors that facilitate or hinder leadership development in radiographers. The profession must also be aware of its members' underlying perceptions of leadership in the field that drive the formation of leadership knowledge, attitudes, and competencies in radiographers. Further, the profession must be informed of the factors that influence these perceptions.

A radiographer's perceptions of leadership in the field may stem from the dynamics of the radiography educational process and the influence that these dynamics had on shaping her perceptions while she was a formative student. Radiography students, the future radiographers and leaders in the field, actively and passively learn about leadership during the radiography educational process. Perceptions that radiography students form as new and impressionable members in the profession may be deeply rooted and may have propensity to impact long-term leadership development and function. Therefore, understanding radiography students' perceptions of leadership that is modeled to them, perceptions of leadership opportunities in the field, and perceptions that they have of their own self-efficacy with regard to transformational leadership will shed light on steps the profession must take to facilitate leadership development in students and to prepare them as future leaders.

Unparalleled leadership opportunities in the field of radiography await current radiography students (K. Powers, personal communication, February 15, 2011). A 2011 assessment conducted by the American Society of Radiologic Technologists (ASRT) of the faculty development needs of radiologic technology educators revealed the mean age of program directors was 49.4 years and that approximately 50% intended to leave the profession in the next ten years. ASRT Director of Education, Kevin Powers, confirmed that there is an impending shortage of leaders in radiography education that will need to be filled (K. Powers, personal communication, February 15, 2011), Powers opined that the approaching exodus of seasoned educators from the profession of radiography will give the cohort of medical imaging students who are currently graduating the most opportunity of any to assume leadership roles. Radiography graduates must therefore have a base of leadership knowledge and skills upon which to build further leadership competencies and to assume leadership roles in the field.

Throughout the radiography educational process, students observe role models in leadership positions. Radiography educators, because of their close proximity to and high degree of involvement with students, are in the position serve as key role models and must therefore be aware of their potential to influence the long-term leadership development of students. By modeling positive leadership attitudes and behaviors, radiography educators may help radiography students form positive perceptions of leadership. The perceptions of leadership that radiography students develop will likely impact their development as future radiographers and radiography leaders. They will then be likely to perpetuate the same perceptions of leadership and leadership development, if positive or negative, in the next generation of radiography students. Kutz (2004), in his opinion editorial about leadership development in allied health professions, stated that "how people come to learn leadership is of key consequence" (Kutz, 2004, p. 1). This suggests that early interactions between radiography role models and students are critical to how and what students learn about leadership.

An empirical study of the perceptions of leadership that radiography students form as a result of radiography role model/student interactions will help the profession understand the role that radiography leaders may have in influencing leadership perceptions in students and possibly in the profession at large. This study will be informed by application of social theory, perspectives, and constructs. Transformational leadership theory, a feminist perspective including constructs of power, role theory and developing a sense of self, and the construct of self-efficacy will be used as a framework through which to better understand students' perceptions of leadership, leadership opportunities, and their own self-efficacy with regard to leadership. First, however, a review the structure and location of radiography programs and identification of radiography role models is warranted.

Structure and Location of Radiography Educational Programs

The profession of radiography has a strong technical element (Harris, 1995) and therefore has a history of being located in the sphere of vocational or technical education (Harris, 1995; U.S. Department of Labor, Bureau of Labor Statistics, 2010). Students who complete vocational educational programs are sometimes considered to be "trained" through applied knowledge rather than to be "educated" through imparted theoretical knowledge (Lehmann, 2009). Prior to the 1960's, radiography educational programs were housed in hospitals and clinics (Harris, 1995). College-based radiography programs emerged during the 1960's (Harris, 1995), and the majority of radiography programs are now associated with colleges and universities (ASRT, 2011). Radiography educational programs are offered at the associate, baccalaureate, and master's degree levels, but associate degree programs are the most prevalent (ASRT, 2011). Hospital-based radiography educational programs that award graduates a certificate or diploma still exist and are typically two years in length. These programs offer a viable and sound educational option for students.

Until 2009, individuals attending hospital-based radiography educational programs were not required to complete college course work. However, for the first time, in 2007, the *Radiography Curriculum* that is published by the American Society of Radiologic Technologists (ASRT) and is widely used by radiography educational programs that are accredited by the Joint

Review Committee on Education in Radiologic Technology included the requirement for students to complete 15 college credits (ASRT, 2007). In 2009, the American Registry of Radiologic Technologists (ARRT) mandated that as of 2015, candidates who sit for the credentialing examination in radiography must hold a minimum of an associate degree (ARRT, 2009). Discussion within the profession about the appropriate educational level for radiographers and the role of the hospital-based radiography program has occurred over the years and has been disparate (Adkins, 2008; Belinksy, Garcia, Keech & Matelli, 2003; Bower, 2010; Cruise & Cruise, 2001; Meyers & Wintch, 1993).

Student Selection of Program Type

Differences in the reasons that students choose hospital- or college-based radiography educational programs may play a role in influencing students' perceptions of leadership, perceptions of leadership opportunities in the field, and perceptions that they have of their self-efficacy with regard to transformational leadership. No empirical evidence could be found that explains if radiography students perceive the field of radiography as more being more vocationally or professionally oriented and why some students choose to attend educational programs that are housed in vocational institutions or hospitals while others choose to attend college based programs. Foskett and Hemsley-Brown (1999) maintain that young people, in general, form perceptions of careers based on their own experiences combined with input from adults and social media. Typically, the decision of an individual to pursue a career that entails vocational or technical education is based in pragmatism and suggests the most efficient use of resources in return for maximized outcomes (Lehmann, 2009). Socioeconomic status may therefore be a factor in a student's decision of the type of radiography program to attend (Lehmann). But, a search for empirical evidence or documented information on the demographics of radiography students enrolled specifically in hospital-based programs yielded no results. Further, students who choose vocational or technical educational programs do not necessarily do so because of a lack of ability to complete a college degree (Lehmann, 2009). Instead, these students may feel more socially-assimilated in vocational and technical program environments rather than college and university environments (Lehmann, 2009).

Influence of a College Environment

While the leadership development of college students is influenced by pre-college experiences including events in elementary, middle, and high school (Shehane, Sturevant, Moore & Dooley, 2012), the college experience also has potential to influence leadership development in students (Astin & Astin, 2000, Shehane, Sturevant, Moore & Dooley, 2012; and Shertzer & Schuh, 2004). Colleges and universities are increasingly emphasizing leadership development in college curricula and co-curricular activities (Astin & Astin, 2000; Cress, Astin, Zimmerman-Oster & Burkhardt, 2001). Leadership programs offered to college students are increasing in number and in scope and range from campus and community activities and leadership skills workshops to semester-long courses and full academic degrees in leadership (Micari, Gould & Lainez, 2010).

Additionally, there are other influential factors in the collegiate environment that may facilitate leadership development in students (Astin & Astin, 2000). Faculty, student affairs professionals, and college presidents (and other similar high-ranking college administrators such as provosts, deans, and vice-presidents) are key factors in leadership development in students (Astin & Astin, 2000; Shehane, Sturevant, Moore & Dooley, 2012). Moreover, high impact student learning practice opportunities at the college level such as “faculty mentoring, sociocultural discussions, community service, and involvement” (Shehane, Sturevant, Moore &

Dooley, 2012, p. 141) contribute to college students' understanding of leadership. Astin and Astin (2000) proffer that "each faculty member, administrator, and staff member is modeling some form of leadership and that students will implicitly generate their notions and conceptions of leadership from interactions inside the classroom and in the residence hall, through campus work and participation in student activities, and through what is taught intentionally and unintentionally across the educational experience" (Astin & Astin, 2000, p vi). College faculty, because of close interaction that they have with students, are uniquely positioned to model leadership to students and to encourage leadership development in students. Astin and Astin (2000) purport that faculty have ample opportunity to demonstrate behavior and attitudes that model positive leadership to students. Additionally, through facilitation of group work, college faculty are in a key position to also to facilitate in students development of transformational leadership skills including "collaboration, common purpose, division of labor, and respectful disagreement" (Astin & Astin, 2000, p. 34). Lastly, faculty members' participation in the overall governance of the academic environment in which they are collaboratively establishing academic standards and curricula; evaluating and hiring colleagues, and conducting scholarly research and activities, stands to positively impact leadership development in college students (Astin & Astin, 2000).

Student affairs professionals are also key in facilitating leadership development in college students (Astin & Astin, 2000). Student affairs personnel are tasked with linking curricular and co-curricular activities to foster the holistic development of college students. College students who are involved in academic and non-academic activities undergo increased personal development that includes enhanced leadership development (Astin, 1993; Kezar & Moriarity, 2000). In their 2001 longitudinal study of the outcomes of leadership development in college students, Cress, Astin, Zimmerman-Oster, and Burkhardt found evidence that students who participated in an intentional leadership development program showed growth in civic responsibility, leadership skills, multicultural awareness, understanding of leadership theories, and personal and societal values. The leadership development programs in which college students in the study by Cress et al. participated were located within student affairs divisions but included both curricular and co-curricular activities. Cress et al. (2001) purported that "all students who involve themselves in leadership training and education can increase their skills and knowledge," and that leadership potential exists in every student" (Cress, Astin, Zimmerman-Oster & Burkhardt, 2001, p. 23). Cress et al. emphasized the importance of offering leadership programs and activities in support of leadership development in students. Students in Komives', Longerbeam's, Owen's, Maniella'a, and Osteen's 2006 study of the process of how college students develop a leadership identify indicated that student affairs personnel helped students "identify foundational beliefs, synthesize their leadership philosophy, and anticipate transitions" (2006, p. 412). Komives et al. consequently labeled student affairs personnel as "meaning makers" for college students (Komives, Longerbeam, Owen, Maniella & Osteen, 2006, p. 412).

The shared governance model of leadership that is traditional in academic organizations and that is typically modeled by college presidents and other high-level college administrators also plays a key role in the leadership development in college students (Astin & Astin, 2000). A college president typically lead through a bottom-up approach in which she endeavors to impart her personal vision to others for the purpose of effecting change that supports her aspirations for the organization (Astin & Astin, 2000). The style of leadership typically employed by college presidents suggests a transformational approach to leadership that is collaborative and inclusive (Astin & Astin, 2000). Transformational leadership tenets practiced by college presidents can establish an organizational model of leadership in which all constituencies, including students, have opportunity for active involvement that facilitates their own leadership development.

Influence of General Education and Liberal Studies

The study of leadership is multidisciplinary in nature (Riggio, Ciulla & Sorensen, 2008) as evidenced by contributions made to the leadership literature from a variety of disciplines including political science, psychology, business, education, history, sociology, anthropology, military sciences, and others (Riggio, Ciulla & Sorensen, 2008). Although most leadership coursework taught in college leadership programs in America is grounded in behavioral, social, and management sciences (Riggio, Ciulla & Sorensen, 2008), a comprehensive leadership program will facilitate student competencies that include cultural, ethical, and philosophical understanding; creativity; and written and oral communication skills (Zimmerman-Oster & Burkhardt, 2000). Inclusion of a wide array of competencies in a leadership program suggests the benefit of liberal education in leadership development. The Association of American Colleges and Universities (AACU, 2002) purported that liberal education is the optimal means of preparing students to meet the demands of today's society by promoting "intellectual honesty, responsibility for society's moral health and social justice, active participation as a citizen of a diverse democracy, discernment of the ethical consequences of decisions and actions, and deep understanding of one's self and respect for complex identities of others, their histories, and their cultures" (AACU, 2002, p. xii). Although a review of the literature produced little empirical information about the relationship between liberal education and leadership development, a study conducted by Seifert, Goodman, Lindsay, Jorgensen, Wolniak, Pascarella & Blaich (2008) suggests that liberal education contributes to positive leadership outcomes in students. Seifert et al. reported that students who had liberal education experiences consistently had positive outcomes in eight dimensions of socially responsible leadership including “consciousness of self, congruence, commitment, collaboration, common purpose, controversy with civility, citizenship, and change” (Seifert, Goodman, Lindsay, Jorgensen, Wolniak, Pascarella, & Blaich, 2008, p. 122).

Transformational Leadership

Conceptualization of leadership has morphed throughout history (Antonakis, Cianciolo & Sternberg, 2004; Northouse, 2007), but certain leadership theories are currently active and prominent. The trait theory of leadership focuses on the leader and suggests that leadership is restricted to “exceptional individuals” (Atonakis et al, 2004, p. 6) who have certain attributes such as intelligence, self-confidence, and sociability that make them effective leaders (Northouse, 2007). The contingency theory of leadership takes into account the leader, the followers, and the situation (Hughes, Ginnett, & Curphy, 2006, p. 361). Contingency leadership theory posits that effective leaders assess followers and situations and use various leadership approaches to achieve desires results (Hughes et al., 2006). Transformational leadership, sometimes referred to as charismatic leadership, emphasizes vision and charisma in leaders (Antonakis et al., 2004) and is explained through numerous perspectives. Transformational leadership stems from the influential work of James McGregor Burns (1978). Burns made distinctions between the concept of management that focuses on transactional exchanges between agents and the concept of leadership that emphasizes transformational exchanges in which the leader aims to transform followers by giving them individual consideration and by striving to meet their higher needs (Burns, 1978). Burns proffered that management, or transactional leadership, is based on exchanges between leaders and followers that are grounded in economic results. Conversely, transformational leadership, stemming from German sociologist's Max Weber's construct of "noneconomic sources of authority" (Weber, 1947), suggests that leader/follower interaction occurs from dynamics unrelated to compensation. Burns' model of transformational leadership suggests that leaders inspire and motivate followers to higher levels of personal and professional development.

Bass (1985) built on Burns' (1978) work on transformational leadership and created the Multifactor Leadership Questionnaire (MLQ). The MLQ measures transformational and transactional leadership as distinct components (Antonakis, Cianciolo & Sternberg, 2004). The MLQ is comprised of four scales of transformational leadership including "idealized influence (or charisma), individualized consideration, intellectual stimulation, and inspirational motivation (Antonakis, Cianciolo & Sternberg, 2004, p. 175). Bass' model of transformational leadership posits that leaders who practice transformational leadership behaviors transform followers into dedicated and motivated team members who achieve optimal outcomes through collective performance (Bass 1985).

Kouzes and Posner developed a model of transformational leadership that focuses on five transformational leadership behaviors that include 1) Enabling Others to Act, 2) Modeling the Way, 3) Encouraging the Heart, 4) Inspiring a Shared Vision, and 5) Challenging the Process (Kouzes & Posner, 2005). Kouzes and Posner developed their transformational leadership model by analyzing content from case studies submitted by private- and public-sector managers and identifying recurring behaviors that the managers reported exhibiting when they were functioning as leaders at their "personal best" (Posner, 2004, p. 443). While Kouzes' and Posner's model implies that vision is necessary for effective leadership, it also emphasizes empowerment of followers, celebrating followers' achievements, and the leader as a role model (Antonakis, Cianciolo & Sternberg, 2004).

Although several other approaches to transformational leadership exist, in general, key behaviors of transformational leaders include communicating a vision, empowering followers, demonstrating caring and respect toward followers, constructing cultures that effect change and support goal achievement, and modeling and promoting values (Antonakis, Cianciolo & Sternberg, 2004). Findings from empirical studies in the disciplines of radiologic technology, nursing, athletic training, and student affairs suggest that use of a transformational leadership lens for this current study is relevant and appropriate since transformational leadership has been shown as being an effective leadership style in college/university student learning environments, health care educational environments, and health care workplace environments (Curtis, Helion & Domsohn, 1998; Fortsch, Henning & Nielsen, 2009; Heller, Drenkard, Esposito-Herr, Romano, Tom & Valentine, 2004; Shertzer & Schuh, 2004; Vahey, Aiken, Sloan, Clark & Vargas, 2004; Westrope, Vaughn, Bott & Taunton, 1995).

Leadership Role Models for Radiography Students

Individuals in the field of radiography who serve as primary role models for radiography students usually hold formal positions in one of three areas including radiography education, health care administration, and radiography professional societies. Radiography students typically interact to varying degrees with individuals in these leadership positions. In some educational programs, interaction between some or all of the radiography role models may occur frequently. Radiography students begin to observe attitudes and behaviors modeled by these leaders early in the educational process and, based on observations, will likely begin to form perceptions of what it means to be a radiographer and a leader in the field.

Identification of Radiography Role Models

Radiography role models fulfill their leadership roles in an environment of health care that is in constant flux (Johnson, 2005). Changes in political, organizational, and social policies and trends drive changes to radiography education that create new and additional stressors for educators (Killion, 2009). Rapid improvements to technology and resulting changes to curricular mandates, increased academic degree requirements for program directors and for student certification eligibility, increased competition for clinical practicum sites and student enrollment, and a growing awareness and expectation of program officials as academicians who should conduct scholarly research are examples of stressors with which radiography educators must contend (Judd & Perkins, 2004: Temme, Daniels, Rush, Legg, Metcalf & Adams, 2009). In smaller radiography educational programs, program officials must sometimes manage these stressors while in close proximity to and while having a high degree of direct contact with radiography students. Consequently, attitudes and behaviors displayed by radiography program officials as they respond to the challenges and stressors of administering the educational program may be highly visible to radiography students.

Typically, three formal educator/leader roles exist in radiography educational programs that are accredited by the Joint Review Committee on Education in Radiologic Technology and include the program director, clinical coordinator, and clinical instructor (JRCERT, 2014a). These three positions are assigned different levels of formal leadership within the educational program, but individuals in all three roles interact significantly with radiography students either directly or indirectly. It is unknown if radiography leaders in programs that do not hold programmatic accreditation by the JRCERT have the same formal educator/leader positions. However, like JRCERT accredited programs, programs that are not JRCERT accredited must have a program director verify that graduates have satisfied the minimum didactic and clinical competency requirements for eligibility for the primary certification examination in radiography that is administered by the American Registry of Radiologic Technologists (ARRT, 2012b). As such, radiography program officials serve as the gateway through which many students enter and experience the profession, including the clinical environment, for the first time. For many students, the first meaningful glimpse into the field of the radiography is formed and guided by the program director, clinical coordinator, or clinical instructor.

Program Director

In radiography educational programs that are accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT), the program director is charged with administrative oversight of the program (JRCERT, 2014a) and, consequently, holds a high-level, formal leadership position within the context of the educational program. The role of a program director requires a significant degree of task orientation (Tolley Gurley & Calloway, 2011; Turley, 2004) to complete management duties that entail organizing, planning, and implementing policies and procedures, among others. The role of a program director also requires a significant degree of relational orientation (Turley, 2004) to effectively satisfy leadership requirements of the position such as motivating, supporting, negotiating, and influencing. Program directors significantly impact students' educational experiences (Turley, 2004). The program director influences what students do, what they learn and when they learn it, and with whom they interact.

Clinical Coordinator and Clinical Instructor

The clinical coordinator and clinical instructor interact closely with students in the clinical environment (Curtis, Helion & Domsohn, 1998; Fortsch, Henning & Nielsen, 2009).

The clinical learning environment is, at times, stressful (Giordano, 2008) and emotionally-charged (Fortsch et al., 2009). The experiences that health care students have in the clinical environment may be intense and life-altering in positive or negative ways. Commonalities exist in the literature of various health care disciplines regarding dynamics between students, clinical coordinators, and clinical instructors while in the clinical environment. Findings of studies of nursing, athletic training, and radiography students suggest that students rely heavily on the guidance of clinical instructors and clinical coordinators in terms of learning and emotional support (Curtis et al., 1998; Fortsch et al, 2009.; Giordano, 2008; Livsey, 2009).

Curtis, Helion, and Domsohn (1998) reported that athletic training students rated nurturing by clinical instructors as being critically helpful to learning in the clinical environment. Livsey (2009) contended that strong clinical leadership positively impacted nursing students' sense of self-efficacy. Livsey also purported that a positive and supportive clinical learning environment is mediated by strong clinical leadership and supports meaningful experiential learning and professional development in nursing students. Radiography students reported experiencing increased self-confidence, improved learning, and reduced anxiety when clinical instructors were patient and encouraging (Fortsch, Henning & Nielsen, 2009). Athletic training students were "profoundly" affected by their clinical supervisors (Curtis, Helion & Domsohn 1998, p. 249). Radiography clinical coordinators and clinical instructors, like those in nursing and athletic training, play important and unique roles in mediating positive clinical learning experiences for students.

Clinical Staff

Registered radiologic technologists fulfill roles as clinical staff in radiography educational programs accredited by the Joint Review Committee on Education in Radiologic

Technology (JRCERT, 2014a). Radiologic technologists are typically charged with understanding, supporting, and maintaining the policies and procedures of the educational program. Radiologic technologists are also usually charged with supervising radiography students in the medical imaging department and therefore typically work closely and frequently with students. While the leadership positions that radiologic technologists hold in the radiography educational process may be considered as informal positions, technologists are important members of the overall team that is responsible for the education of students (Fortsch, Henning, & Nielsen, 2009; Tolley Gurley & Calloway, 2011). Radiography students spend a significant number of hours in the clinical environment throughout the educational program (Fortsch et al., 2009) and therefore spend a great amount of time under the supervision of technologists. In some radiography educational clinical environments, technologists are thought to "set the direction and tone of the clinical experience" (Fortsch, Henning & Nielsen, 2009, p. 118). In a study by Fortsch et al. (2009), students reported that technologists can facilitate student learning and self-confidence in the clinical environment by being supportive, nurturing, and patient. Students in Fortsch's et al. study also reported that technologists can impede student learning by not providing suggestions for improvement of clinical performance, by showing favoritism, and by being disrespectful to students. In some radiography programs, technologists interact with students early in the educational process when they are likely to be highly impressionable and extremely needy of help and support in the clinical setting. These dynamics suggest that technologists have a high degree of influence on and power over students.

Director of the Medical Imaging Department

The director of a medical imaging department (radiology administrator) is responsible for a broad range of functions within the department (Tolley Gurley & Calloway, 2011). The director provides oversight of departmental finances, strategic planning, policy setting, ensuring compliance with state and federal regulations, and day-to-day departmental operation including staffing and equipment and supplies (McDonald, 2008). Department directors must work to establish genuine relationships both within the department and the larger organization, inspire subordinates, establish and maintain positive morale, and recognize and be sensitive to the unique needs of diverse groups within the department (McDonald, 2008). The director of the medical imaging department may or may not be a registered radiologic technologist. In some hospital organizational structures, oversight of the medical imaging department is provided by individuals with backgrounds in other disciplines. Nevertheless, within the overall hierarchical administrative structure of a medical imaging department, the department director and radiologists typically have the most authority (Tolley Gurley & Calloway, 2011). Consequently, the location of department director in the administrative hierarchy of the imaging department suggests that she is well positioned to serve as an influential radiography role model to radiography students and to inspire them to consider a leadership role as a future career goal (McDonald, 2008).

Leaders of Professional Societies

Radiography students who are active in professional societies such as the American Society of Radiologic Technologists (ASRT) and its state and regional affiliates have opportunities to observe and learn from prominent local, regional, and national leaders in their profession. Leadership behaviors that students will see in action in professional societies include association governance, scholarly activities, and generalized promotion of the profession (Mata, Latham & Randsome, 2010). The level of engagement that radiography students have with leaders of professional societies likely depends on the degree of involvement that the student's educational program and its affiliated clinical sites have with professional societies at state and national levels.

Influence of Role Models on Students

Radiography role models, in aggregate, are likely to play a critical role to influencing numerous developmental aspects of radiography students as future health care professionals. The nature of the relationship between radiography role models and radiography students in the radiography educational process is informed by social theorists, Charles Cooley's and George Herbert Mead's theories on the development of self and role development suggest that the development of an individual's sense of self has social origins (Allen, 2005; Cooley, 2909; Mead, 1934; Powers, 2004) and is influenced by those with whom she has contact ("caregivers") (Powers, 2004, p. 114). The degree of influence depends on length, frequency, and level of intimacy of the interaction with others (Allen, 2005; Powers, 2004). Mead posited that primary caregivers have a key mediating effect between society and the individual (Mead, 1934). Infants learn the meaning of words and gestures from their caregivers and children learn important social behavior and how to take on roles (Mead, 1934). When applied to the radiography educational process, Cooley's and Mead's assertions about one's sense of self and role development imply that radiography role models are the allegorical caregivers of radiography students. Consequently, radiography role models will influence radiography students' sense of self as future radiographers and leaders, as well as students' understanding of social and professional norms in the imaging department and in the larger field of radiography. The degree of influence will be substantial since the length, frequency, and level of intimacy of interactions between radiography role models and radiography students is usually significant (Mead, 1934). Perceptions that radiography students form early in the radiography educational process will likely establish in them a baseline understanding of leadership in the profession through which future information will be interpreted and upon which future beliefs will be built.

Role Models as Primary Caregivers to Students

When considered from Charles Cooley's and George Herbert Mead's theories on sense of self and role development and the construct of a caregiver as an influential figure (Allen, 2005; Powers 2004), several role models could be considered as the primary caregiver for radiography students. The program director is a key figure in the radiography educational process. Program directors are required by the Joint Review Committee on Education in Radiologic Technology (JRCERT) to provide administrative oversight of the radiography educational program and are charged to "assume the leadership role in the continued development of the program" (JRCERT, 2014a, p. 43). The program director significantly impacts students' educational experiences (Turley, 2004) and influences all aspects of the students' experience throughout the educational process. But, the clinical coordinator, clinical instructor, and radiologic technologists interact with students in the clinical environment to a greater degree than the program director. Based on the intense reliance that students have on the leaders in the clinical environment and the resulting profound impact of clinical experiences on students (Curtis, Helion & Domsohn, 1998; Fortsch, Henning & Nielsen, 2009; Giordano, 2008; Livsey, 2009), the clinical coordinator, clinical instructor, or radiologic technologist stand to be identified as the primary caregivers to radiography students and hence the role model who influences students the most.

Health Care Students' Perceptions of Leadership

The body of radiography literature is limited and empirical information on radiography students' perceptions of leadership is sparse. Nevertheless, findings from a study of radiography students by Schmidt (2006) warrants consideration of how students develop a sense of self and an identity as student radiographers and future leaders. Further, information from a study of dietetic students will be extrapolated to radiography students and will provide insight into the way in which students form perceptions of leadership and of themselves as leaders.

Radiography Students' Self-Perceptions

In Schmidt's (2006) study, students from two community college programs in Southern California were asked a series of questions about themselves as radiographers and about the profession in general. Schmidt reported in her concluding remarks that students were, overall, "positive about their training, the education received thus far, and their future" (Schmidt, 2006, p. 304). But poignant and negative observations, beliefs, and perceptions expressed by students in Schmidt's study about being a radiography student and the field of radiography, in general, necessitates specific consideration. Students in Schmidt's study perceived that the position for which they were being prepped, that of a diagnostic radiographer, was looked upon by others in the organization as a "grunt" (Schmidt, 2006, p. 328) who lacks expertise. Students in Schmidt's study perceived that professional development in specialized areas of the medical imaging sciences such as computed tomography and magnetic resonance imaging was necessary to garner respect in the medical imaging department and in the organization (Schmidt, 2006) and to be accorded upward career mobility. And although students in Schmidt's study thought the actual duties of a radiographer require knowledge of sophisticated technology while the duties of nurses are servant-like relative to patient care, radiography students believed that nursing is a more highly esteemed profession than radiography (Schmidt, 2006).

Additionally, aspects of gender equity and female subordination surfaced in accounts from female students in Schmidt's (2006) study. Chafetz' (1988) theory of gender stratification posits that in society, the division of labor is based on whether a person is male or female. Males have an advantage in the division of labor because they have access to more resources and therefore gain power over females (Chafetz, 1998). Female students in Schmidt's (2006) study reported sometimes feeling pressured, because of their gender, to perform mammography (radiographic examination of the breast) and to take formal courses in mammography even though they were not interested in mammography. Further, some female students reported that they lacked female leader role models in the profession (Schmidt, 2006). As such, female students in Schmidt's study questioned if leadership opportunities would exist for them in their future careers (Schmidt, 2006).

Moreover, students in Schmidt's (2006) study reported that perceptions they had about themselves as health care practitioners were diminished significantly when they learned that the profession of radiography does not meet requirements to be considered a true profession in accordance with position classification standards of the Office of Personnel Management (U.S. Department of Labor, 2010). Students in Schmidt's study perceived an overall lack of respect from within the health care organizational environment and assigned themselves a devaluing moniker of "just techs" that, in their minds, situated them at a lower professional status amid other health care professionals - particularly nurses (Schmidt, 2006, p. 204).

Dietetic Students' Self-Perceptions with Regard to Leadership

Arendt and Gregoire (2005) studied leadership behaviors and perceptions in 283 undergraduate dietetic students. Findings of this study supported the benefit of academic leadership preparation relative to increased leadership practices in students. Arendt and Gregoire reported a significant difference in three out of five self-rated leadership practices in dietetic students who had academic leadership preparation compared to dietetic students who did not have preparation. A compelling finding of Arendt and Gregoire's (2005) study was the high level of confidence that dietetic students reported in their perceived leadership abilities. When asked to rate themselves on 30 leadership action statements using a scale of 1 to 5, all dietetic students rated themselves with scores of 3 or higher (Arendt & Gregoire, 2005). Further, 69% of students believed they were perceived as leaders in their work environment, while 76% believed they were perceived as leaders in their home environments (Arendt & Gregoire, 2005).

Application of social theory to Schmidt and Arendt and Gregoire. Studies such as Arendt's and Gregoire's (2005) and Schmidt's (2006) are not generalizable to the entire population of dietetic students or radiography students because they are just two accounts. And, high leadership self-ratings by students in Arendt's and Gregoire's (2005) study may be partially explained by the construct of social desirability. Social desirability posits that favorable bias will occur in responses when individuals self-report and may therefore distort self-report measures (Schriesheim, 1979). Regardless, findings of these studies suggest that health care students form perceptions of leadership of their professions and themselves and, based on findings from Schmidt's study, it is logical to assume that students' perceptions are derived from both active and passive learning.

When constructs of Charles Cooley's and George Herbert Mead's theories of role development and developing a sense of self (Allen, 2005; Cooley, 1909; Mead, 1934; Powers 2004) are applied to the formation of leadership perceptions in students in Schmidt's (2006) and Arendt's and Gregoire's (2005) studies, a logical assumption holds that radiography and other health care students will form perceptions of leadership of their profession and themselves based on what is taught to them actively or passively by their primary caregivers (in this sense, radiography role models). And, when a feminist perspective is intermingled with role theory and the construct of developing a sense of self, it is reasonable to expect that when learning in an environment of gender stratification that suggests that males are granted personal and professional advantages over females, both male and female students may learn to accept such gendered social constructs as status quo and may tolerate and perpetuate them in their professional lives. Further, perceptions of leadership learned by health care students stand to be deeply rooted and carried forward into their professional lives if interactions between students and their role models are lengthy, frequent, and close, as is typically so with radiography students and radiography role models.

Dynamics of the Radiography Educational Program

There are factors in the radiography educational process that are pertinent to understanding how radiography students form perceptions of leadership in the field, perceptions of radiographers as leaders, perceptions of leadership opportunities in the field, and perceptions that students have of their self-efficacy with regard to transformational leadership. Some of these factors may impact students directly while other factors may impact the radiography role models which, in turn, will likely indirectly impact students. Factors that are relevant to this study include 1) leadership modeled by radiography role models, 2) gender bias in the radiography educational environment, and 3) power dynamics in the radiography clinical educational environment.

Leadership Modeled by Radiography Role Models

Radiography students, as future clinicians and leaders, are likely to emulate the leadership of role models that they observed as students. Through the phenomenon of perpetuity, radiography role models, as a collective, may have a broad and significant impact on the attitudes and behaviors of leaders in the profession at large. Turley (2004) affirmed this assumption in her analysis of leadership in radiation therapy educational programs. Turley asserted that “by shaping the knowledge, skills, and attitudes of radiation therapy students, radiation therapy program directors are shaping the profession as a whole” (Turley, 2004, p. 15). Consideration should therefore be given to factors that shaped leadership development in the radiography role models since they are likely to be perpetuating what they know and have learned about leaders to radiography students.

Task Orientation versus Relationship Orientation of the Profession

The technical roots and task-orientation of the profession of radiography typically produces radiographers who are task efficient, but who may lack other important skills necessary for the position to which they are appointed (Forbes and Prime, 2000; K. Powers [personal communication, February 15, 2011]; Tolley Gurley & Calloway, 2011). In the body of leadership literature, task orientation is sometimes associated with the role of a manger and relationship orientation is sometimes associated with the role of a leader (Hughes, Ginnett, and Curphy, 2006). Opinions differ in leadership theory as to the degree of differentiation, if any, between leaders and managers and if one person can effectively fulfill both roles (Antonakis, Cianciolo & Sternberg, 2004). Kotter (1990) argues that although both managers and leaders are important for organizational effectiveness, a manager’s role is to ensure the smooth operation of the organization through planning and organizing, while a leader’s role is to set the direction of an organization by establishing a vision and garnering buy-in from others by persuading, motivating, and inspiring them. Application of leadership/management theoretical models to the roles of radiographers, if assumed to be task oriented, suggests that radiographers, in general, have characteristics more congruent with the role of a manager than a leader.

The role of a program director requires a significant degree of task orientation to complete management duties (Turley, 2004). The Joint Review Committee on Education in

Radiologic Technology assigns to program directors tasks of assuring effective program operations, overseeing ongoing program assessment, participating in budget planning, maintaining current knowledge of the professional discipline and educational methodologies through continuing professional development, and periodic review and revision of course materials (JRCERT, 2014a, p. 43). Task-oriented behaviors suggest use of a management, or transactional, approach to leadership (Hughes, Ginnet & Curphy, 2006). Transactional leadership can effectively facilitate the achievement of a team's or organization's goals, but transactional leadership can also foster highly bureaucratic environments that render employees and teams inflexible and unable to efficiently respond to change (Hughes et al., 2006).

Nevertheless, a transactional leadership approach may be appropriate, and even beneficial, in certain circumstances in the radiography educational process. Application of transactional leadership by radiography role models may benefit radiography students who are novices in the clinical environment. Transactional leadership involves the leader's use of systematic approaches for goal accomplishment that help followers "behave in both a consistent and efficient manner" (Hughes, Ginnet & Curphy, 2006, p. 391). Fostering consistency and efficiency in the clinical practice of new radiography students facilitates their learning while augmenting patient safety.

Relational orientation. Relational approaches of leadership suggest a transformational leadership style in which the leader employs a charismatic but personal approach with the goal of developing emotional bonds with followers that inspire them to function at higher levels (Hughes, Ginnet & Curphy, 2006). Transformational leaders are able to convey to followers a shared vision that facilitates attainment of higher goals and organizational change (Hughes et al., 2006). Additionally, transformational leaders assist individuals in realizing their inner potential as leaders and foster a sense of empowerment (Hughes et al., 2006). A transformational leadership approach will help radiography program directors and other radiography role models to more effectively develop in radiography students a sense of self-confidence, empowerment, and self-actualization as emerging health care professionals. Additionally, radiography role models who employ a transformational leadership approach will likely foster critical thinking skills in radiography students in the clinical environment that will aid them in performing atypical radiographic procedures and delivering reasoned care that meets patients' individualized needs. Further, radiography role models who employ a transformational leadership approach will inspire radiography students to explore, establish, and pursue higher personal and professional goals (Hughes et al., 2006).

Duality of the Leadership Roles of Radiography Role Models

While use of a transformational style of leadership has propensity to be beneficial to radiography role models in terms of leadership effectiveness and to students in terms of personal development, use of a transformational leadership style may also result in role confusion. Transformational leadership is participatory in nature and includes characteristics that align with female behavior including "caring, supportive, and considerate behavior" (Antonakis, Cianciolo & Sternberg, 2004, p. 301). Transformational leadership practiced by nurse leaders in Fritz' and Brown's (1998) study was shown to empower nurse subordinates. But role models who wish to foster empowerment in their subordinates or in students (the majority of whom are female) through participative leadership behaviors are at risk of being stereotypically cast as less effective leaders (Madden, 2005). Paradoxically, however, female leaders who practice a more authoritative style of leadership that is more characteristic of male leaders are also at risk of having their leadership rated unfavorably (Antonakis et al., 2004).

Further, there are times during the radiography educational process that necessitate a transactional approach to leadership. It is not uncommon for radiography role models to be in a positon in which they must assert firm authority and rationality for the safety of students and of patients. The dichotomous role of radiography role models in which they fluctuate between relational and task-oriented leadership suggests that use of both transactional and transformational leadership styles may be warranted in the radiography educational process.

Returning Adult Students

A growing number of adult students are returning to the post-secondary level classroom (Kenner & Weinerman, 2011). According to the National Center for Education Statistics (NCES) of college-aged students enrolled between 1997 and 2011, 49% were age 24 years and younger, 51% were age 25 to 34 years, and 23% were 35 years and older (U.S. Department of Education, National Center for Education Statistics [NCES], 2014). Students age 35 and older are projected to account for the largest increase (23%) in enrollment from 2011 through 2022 (U.S. Department of Education, National Center for Education Statistics [NCES], 2014). This is in comparison to a projected nine percent enrollment increase for 18 to 24 year-old students in the same timeframe and 20% increase in enrollment of students age 25 to 34 (U.S. Department of Education, National Center for Education Statistics [NCES], 2014). Information on the age groups of students enrolled in radiography educational program in the United States could not be found, but according to the American Society of Radiologic Technologists (2013), 74% of graduates of radiography, nuclear medicine, and radiation therapy programs earned an academic degree. Therefore, it stands to reason that age demographics of college students reported by the NCES may be extrapolated to radiography educational programs. This suggests that approximately half of the students enrolled in radiography educational programs are age 25 years and over and that enrollment of these returning adult students will continue to increase.

Returning adult students are comprised primarily of individuals who have been displaced from their jobs, discharged armed forces veterans who delayed college enrollment while serving, and adults who have earned their GED and who aspire to earn a college degree (Kenner & Weinerman, 2011). Adult learners contend with substantive challenges that typically do not impact traditional students including "financial independence, full-time employment, dependents, and the need for part-time enrollment" (Kenner & Weinerman, 2011, p. 88). Knowles proffered that there are four characteristics of adult learners: 1) They are autonomous learners and desire to be involved in the learning process, 2) They draw upon their life experiences, including past mistakes, and use them as a base from which to learn in the present, 3) They seek knowledge and learning experiences that are immediately applicable to their jobs and personal lives 4) They learn most optimally through a problem-solving approach rather than a content-centered approach (Knowles, 1984). Additionally, adult learns bring into the classroom learning styles and life experiences that may either help or hinder their ability to achieve their academic goals (Kenner & Weinerman, 2011). Mackerarcher (2007) purported that adult learns have "an established sense of self and an inclination to protect this self from perceived threats that might arise in the learning interactions" (Mackerarcher, 2007, p. 39). Brown, Collins, and Duguid (1989) suggest that adult learners must feel safe in the learning environment. Adult learners must also be able to relate to the learning activity. Kidd (1973) opined that individuals strive to align learning experiences to their sense of self. If the individual is unable to achieve alignment, the learning experience is either ignored or is assigned a contorted meaning (Kidd, 1873). Adult learners also need to know that they are considered to be responsible, independent learners. McClusky (1970) proffered that the most critical component of adult learning is that the learner perceives autonomy in her learning endeavors. Adult learners who do not perceive that they hold the status of a responsible, independent learner may not readily participate in learning opportunities (Mackerarcher, 2007). Conversely, Linares (1999) suggests that a dichotomy may exist in the adult learning process in that while many adult learners are self-directed in their personal lives, they may experience "confusion and bewilderment when demands are placed on them in the educational environment" (Linares, 1999, p. 407).

A review of medical imaging sciences literature produced little empirical evidence that tenets of adult learning theory are considered as critical components in the education of radiologic technology students. A 2008 review of literature related to clinical education in radiologic technology and athletic training by Giordano supports that the field of radiography is contemplating the quality of clinical education of its students. Research in the fields of radiologic technology and athletic training consistently emphasize the criticality of a quality clinical educational experiences and the importance of the role that clinical instructors have on students (Giordano, 2008). Evaluations of clinical sites, quality time with clinical staff, promoting a positive and encouraging environment, granting students leeway to work independently, and the ability of clinical instructors to use various teaching methods based on student personality were cited by Giordano as methods of educating health care students in clinical environments. Giordano purported that clinical instructors are expected to be outstanding communicators, good teachers, and good clinicians, but that they often receive no formal training in their role as an instructor and may therefore mimic the instructional styles of individuals who taught them. Giordano touched on aspects of application of adult learning theory to clinical education of students by suggesting that clinical instructors must be good communicators and must be able to recognize various learning styles in students. Further, Giordano suggested that proper training of clinical instructors will result in improved clinical education. In an assessment of the clinical education of physical therapy students in Canada with the goal of improving student experiences, Strohschein, Hagler, and May (2002) content that the clinical education model would benefit from providing formal training on instructional methodology to clinical instructors. Strohschein et al. opined that while there are numerous outstanding physical therapy clinical instructors and positive clinical experiences for students, "it may be due more to clinicians' intuition and natural abilities as educators than to their effective, consistent approach to the clinical education process" (Strohschein et al, 2002, p. 171).

In addition to the paucity of research that exists relative to empirical data on educational methodology used in clinical instruction of radiography students, a review of the radiologic sciences literature also did not produce empirical research that addressed if radiography educators are knowledgeable of or apply learning theory in the didactic instruction of students.

Gender Bias in the Radiography Educational Environment

Women frequently experience gender-based hurdles as they work toward career advancement (Kawakami, White & Langer, 2000). The population of medical imaging professionals in the United States is largely demographically female, and senior hospital administrators and radiologists are typically mostly male (American College of Healthcare Executives [ACHE], 2012; Baker, Barry, Chaudhry, & Hubbi, 2006; McCullough, personal communication, December 16, 2013; Radiological Society of North America, 2005). A 2011 survey by the American Society of Radiologic Technologists of program directors in radiologic technology educational programs revealed that 69% who responded to the question about sex indicated they were females compared to 31% who indicated they were males. Given the prevalence of females in the field of radiography, consideration of dynamics in radiography educational programs through application of a feminist perspective is germane. Feminist theory, grounded in conflict theory, focuses on gender inequality, material inequality, power imbalances, and socially constructed definitions of gender (Calhoun, Gerteis, Moody, Pfaff & Virk, 2002). A feminist perspective suggests that women suffer oppression through “blocked opportunities, denial of rights, and sex discrimination” (Abramovitz, 1996, p. 22).

Radiography educational programs are typically housed either in health care organizations or post-secondary academic institutions – both historically having fostered male-dominated environments (Harris, 1995; Madden, 2005; P. McCullough, personal communication, December 16, 2013; Patterson-Lorenzetti, 2002) and both stereotypically fitting Acker’s (1990) theory of gendered organizations. To label an organization as gendered indicates that “advantage and disadvantage, exploitation and control, action and emotion, and meaning and identity are patterned through and in terms of a distinction between male and female, masculine and feminine” (Acker, 1990, p. 146). Acker argues that a pervasive masculinized epistemology has been perpetuated in organizations and, although usually obscure, shapes the structure and function of organizations – even in organizations that are conceptualized as being gender-neutral.

Gender Bias in Health Care Organizations

The emergence of the health care system as a gendered entity was facilitated by the overarching patriarchal mindset that pervaded American society in the late nineteenth and early twentieth centuries (Abramovitz, 1996). As a reflection of the social norms of the time that were grounded in and endorsed male domination and female subordination, high-profile positions that were key in the public health movement such as physicians, researchers, board members, and policy makers were held by males (Abramovitz, 1996; Trattner, 1994). Overrepresentation of males solidified the acceptance of a health care system in which males held "important" roles and made "important" decisions that benefited primarily males (Abramovitz, 1996). As in other professions, women in health care professions were thought suitable only for roles that were considered to be less important (such as nursing) and were therefore subordinated to males (Abramovitz, 1996). Power imbalances still exist in health care organizations and result in issues of discrimination and sexual harassment of women who hold various positions in the organizational hierarchy including clinicians, administrators, and physicians (Fiedler & Hamby, 2000; Gardner & Johnson, 2001; Madsen & Blide, 1992).

Gender Bias in Academe

In a 2004 presidential address to State University of New York at Postdam, President Margaret Madden purported that while progress has been made toward gender equality in academe, women and men in academe do not yet hold equal status (Madden, 2005). Madden cited a 2000 report by the American Psychological Association (APA) Task Force on Women that indicates that gender discrimination still exists in the academic environment – although it is less obvious. The report from the APA Task Force on Women (2000) posits that women in higher education face gender-based issues such as discrimination in resource distribution, denied access to certain types of research opportunities, overwhelming amounts of committee work, and less frequent appointment to senior administrative positions (APA, 2000).

Gender bias that is inherent in academic organizations (Madden 2005) may increasingly impact radiography educational programs. In response to the 2015 associate degree mandate for registry examination eligibility established by the American Registry of Radiologic Technologists, an increasing number of radiography educational programs may transition from non-degree granting programs in health care organizations to degree-granting programs in academic organizations. If this occurs, more radiographers will hold positions as faculty in academic organizations. Consequently, radiographers (who are predominantly female) may be supplanted from one gendered organization (Acker, 1990) to another. It is likely that female radiographers who are acclimated to the gendered work environment of health care organizations will carry learned norms into their positions in academic work environments thereby perpetuating patterns of male dominance and female subordination. These imbalances of power along gender lines may be further fueled by potential power imbalances in academia that stem from academic degree hierarchies that may place master's prepared radiographers at a lower status than others in the institution who hold doctoral degrees.

Stereotyping Women Leaders

Goodwin and Fiske (2001) purported that American professional women are often stereotypically classified as being competent, but not nice and not feminine. Accordingly, female radiography role models who display stereotypical feminine characteristics such as warmth, nurturing, niceness, and caring risk losing credibility as being strong, effective leaders (Goodwin & Fiske; Kawakami, White, & Langer, 2000; Madden, 2005). Conversely, female radiography role models who display stereotypical masculine characteristics such as assertiveness or athleticism risk being disliked for nonconformity to stereotypical female characteristics (Goodwin & Fiske, 2001; Madden, 2005). Gender stereotyping relative to leadership in radiography education creates a dichotomous role for female radiography role models. Female radiography leaders must strive to effectively administer and lead educational programs. This may require a more masculine leader style in order to be considered by others as a credible in this administrative leadership role. Meanwhile, female radiography leaders must simultaneously strive to meet the needs of radiography students by assimilating to the role of a nurturing caregiver that is stereotypically construed as feminine.

Implications of Gender Bias for Radiography Students

Gender bias that exists in health care has potential to negatively impact radiography students. While demographic information on radiography students is difficult to find, a logical assumption holds that, in general, demographics of students enrolled in college-based radiography programs are similar to demographics that describe other college students relative to age, race/ethnicity, and socioeconomic background. However, the ratio of female to male students in both hospital and college radiography programs is likely to be greater than the ratio of female to male students in college programs. Statistics from the National Center for Educational Statistics (U.S. Department of Education, 2013) indicated that in 2012, 57% of students enrolled in colleges were female. Information about the female to male ratio of radiography students must be extrapolated from the overall gender ratio of the profession of radiography. In 2009, 72% of registered radiographers were female (Reid, 2010).

The intersection of an impressionable student population that is largely female and that is forming their sense of identity as future radiologic technologists with a historically gendered health care environment (Acker, 1990) is concerning. Adding to this concern is that individuals who model a sense of professional identity to radiography students are likely to be females who formed their sense of professional identity and perceptions of leadership in similar patriarchal environments. A feminist perspective suggests that there is significant opportunity for patterns of male dominance and female subordination to be perpetuated in female students, as well as in minority students. These students will have a masculine bias to their perceptions of leaders and leadership in the field of radiography, and their future leadership development potential will be inhibited. Further, male radiography students in these circumstances will carry learned norms associated with gender inequality into their future work environments and leadership roles thereby perpetuating a gendered work environment and disadvantaging female radiographers.

Power Dynamics in the Clinical Educational Environment

Clinical staff, including radiologic technologists, who work with radiography students in the clinical environment play an important role in the radiography educational process (Tolley Gurley & Calloway, 2011). The role of the radiologic technologist is similar to that of the nursing clinical preceptor who is typically a staff nurse charged with providing instruction to nursing students at the bedside (Baltimore, 2004). Initial clinical experiences and relationships that nursing students establish with nursing clinical preceptors shape perceptions that students have of their future profession (Lockwood-Rayermann, 2003; Lofmark & Wikblad, 2001; Myrick & Yonge, 2002). Cahill (1996) purported that relationships that nursing students establish with clinical personnel can “make or break” (Cahill, 1996, p. 792) the clinical experience of the student. Literature in radiography, nursing, and athletic training clearly indicates that students reported positive clinical experiences in which they experienced affirming learning opportunities when they had positive clinical leaders who demonstrated supportive, accepting, and helpful behaviors and attitudes toward students (Curtis, Helion, & Domsohn, 1998; Fortsch, Henning, & Nielsen, 2009; Giordano, 2008; O’Driscoll, Allan, & Smith, 2010).

Nevertheless, working with students in a clinical environment can be, at times, challenging on numerous levels for clinical staff. Health care professionals who work with students in the clinical environment must contend with increasingly heavy workloads, increasing needs of acutely-ill patients, shortages of personnel, and changes in the health care industry and organizations that trickle down to the department level and impact daily operations (Zilembo &

Monterosso, 2008). Zilembo and Monterosso purported that a dichotomy exists in the Australian nurse clinical preceptor model in that the individuals who are expected to teach and guide nursing students may not have the adequate training or desire to do so. The same dichotomy may exist in the radiography clinical education model in that some technologists may lack the knowledge, skills, and desire necessary to effectively supervise and instruct students in the clinical environment. Fortsch, Henning, & Nielsen (2009) assert that technologists and students would benefit from professional development opportunities made available to technologists who provide clinical instruction to students.

Power Undercurrents in the Clinical Environment

The dynamics of leadership are informed by consideration of the construct of power. Although leadership entails aspects of power, power does not necessarily equate to leadership (Hughes, Ginnett & Curphy, 2006). The types of leadership positions that radiologic technologists have in the radiography educational program may range from informal to formal based on the structure and philosophy of the particular educational program with which the technologist is associated. Regardless, since radiologic technologists provide oversight and supervision of students in the clinical environment, they therefore have varying degrees and types of power over students. Students may therefore be likely to consider radiologic technologists as leaders regardless of if the technologist holds a formal or informal leadership position. And although Hughes, Ginnett, and Curphy proffer that power does not necessarily equate to leadership, leadership and power as unrelated constructs may be unclear to students. In other words, radiography students may consider anyone who has power over them to be a leader.

The power that technologists hold in their positions relative to students can be used constructively or destructively. Once such example of technologists using their power constructively occurred when a surgeon became irate with a student in an operating suite because the student inadvertently moved a piece of imaging equipment that had been previously carefully positioned. The surgeon berated the student and supervising radiologic technologist and ordered the student be removed from the surgical suite. The student left the surgical suite distraught. The technologist advocated on behalf of the student informing the surgeon that the student's action was a minor infraction that was in no way detrimental to the patient or the staff, but was instead an inconvenience to the surgeon. The radiologic technologist argued that the student should therefore be afforded latitude because of her status as a student. The radiologic technologist escorted the reluctant and intimidated student back into the surgical suite and informed the surgeon that not only would the student remain in the surgical suite, but that she would continue to operate the imaging equipment for the surgical procedure under the direct supervision of the technologist. The radiologic technologist's power over the student was used constructively to convey her trust and confidence in the student's ability, so much so that the technologist openly risked her own professional stature by asserting herself to a physician in a tense situation.

Conversely, examples of radiologic technologists using their power over students in a destructive manner would be in situations when technologists do not provide supportive and friendly guidance to students in the clinical environment or dole out correction to a student in an overly harsh manner. In such circumstances, students may feel alienated and may fail to achieve clinical competencies because they are too intimidated to ask the technologist for assistance out of fear that they will be evaluated unjustly.

Students as Leaders

A 2004 study by Shertzer and Schuh revealed that college students' leadership perceptions and involvement in leadership were mediated primarily by two factors that were 1) students' understanding of the definition of leadership, and 2) factors that either empowered or constrained students' beliefs about their leadership ability. Shertzer and Schuh argued that the way that a student defines leadership is likely to impact if they pursue leadership roles. Students in Shertzer's and Schuh's study defined leadership according to personal characteristics, legitimized positions of authority, formal titles, and internal motivating factors. Requisites of a leader were defined by students as intelligence, motivation, extroversion, empathy, charisma, influence, ethics, networking ability, and desire for control and power (Shertzer & Schuh, 2004) Findings from Shertzer's and Schuh's study imply that if a discrepancy exists between a student's perceptions of leadership characteristics and their own personal characteristics, the student may not feel efficacious as a leader and may not pursue leadership opportunities.

Students in Shertzer and Schuh's (2004) study also indicated that certain factors contributed to their beliefs about leadership that either empowered them to or constrained them from aspiring to leadership positions. Factors included, "support from others, opportunities, background, and environment" (Shertzer & Schuh, 2004, p 122). Support for students in Shertzer's and Schuh's study came in the form of encouragement from and interaction with role models, advisors, and faculty members. Students who were recipients of this level of support reported that their leadership confidence was raised (Shertzer & Schuh, 2004) Additionally, opportunities to get involved in leadership and acting on an opportunity created empowering leadership beliefs in students (Shertzer & Schuh, 2004) Students reported that just one leadership opportunity was often all that was needed to open the door to several more (Shertzer & Schuh, 2004).

Conversely, students in Shertzer and Schuh's (2004) study identified three factors that constrained their leadership beliefs including "lack of capabilities, lack of confidence, and lack of opportunities" (Shertzer & Schuh, 2004, p. 124). Students who perceived that they lacked the capabilities to become a leader reported that they did not feel "smart enough" (Shertzer & Schuh, 2004, p. 124). These students compared themselves to other student leaders and deemed themselves as less qualified for leadership. Diminished confidence as a constraining factor of leadership beliefs in students was linked to introversion, perceptions of unpopularity, and lack of access to social networks (Shertzer & Schuh, 2004). Lack of opportunity as a constraining factor of leadership beliefs in students stemmed from their perceptions that they did not have access to leadership opportunities because they were not invited to participate in activities at the level of a leader (Shertzer & Schuh, 2004). Students reported believing that they were not asked to assume leadership roles because others perceived them as not being capable (Shertzer & Schuh, 2004).

The Role of Self-efficacy in Student Leadership Development

The construct of self-efficacy is grounded in an individual's belief in her ability to be successful in a situation or a task (Bandura, 2000). Bandura (1995, p. 2) explains perceived self-efficacy as "beliefs in one's capabilities to organize and execute the courses of action required to manage prospective situations." Beliefs about one's self efficacy drives one's thoughts, feelings, self-motivation, and actions (Bandura, 1995). Influential factors that can increase one's self efficacy include 1) mastering ever-changing challenging experiences through perseverance, 2) observing models who are similar to themselves persevering and succeeding in experiences, 3) persuasion from others of one's capability to succeed, encouragement to try, and provision of opportunities that will likely result in success, and 4) a positive physical and psychological status (Bandura, 1995). Transformational leadership behaviors have been shown to mediate self-efficacy in followers (Schyns, 2001, Kark & Van Dijk, 2007).

In her study of college students' self-efficacy for relational leadership, Endress (2000) reported a positive relationship between student participation in a leadership development program and student efficacy for relational leadership. Similar to dietetic students in Arendt's and Gregoire's (2006) study, students in Endress' study who completed a leadership program had a higher sense of self-efficacy relative to relational leadership than students who did not complete the program. The importance of students being encouraged by their instructors to engage in leadership is supported in Endress' study. Students who are encouraged by a faculty member to pursue leadership development have higher self-efficacy for leadership (Endress, 2006) and are more likely to demonstrate leadership behaviors (Bardou, Byrne, Pasternak, Perez, & Rainey, 2003).

A study by Zimmerman-Oster and Burkhardt (1999) suggests that all students have leadership potential that can be developed. Sherman (2005) asserted that, under the right conditions, future nursing leaders can be developed. Garza (2000) reported that 10 years after completing a student leadership development program, participants perceived that the program helped them with job acquisition and inspired them to pursue graduate level degrees. The potential for lasting positive effects of leadership development programs is further supported by findings of study conducted by Posner (2009). Posner analyzed the effects of a leadership development program on behaviors of college students in their freshman year and then again in their senior year. Controlling for effects of maturation, Poser found statistically significant higher scores in four out of five leadership behaviors in students who completed the leadership program compared to students in a control group who did not complete the program. Findings from these empirical studies suggest that formalized leadership programs for radiography students will facilitate their leadership development. Equally important, however, is that student leadership development programs may mediate in radiography students' self-efficacy for leadership (Endress, 2000). Findings from these empirical studies also imply that by implementing formal leadership development programs for student radiographers, the field of radiography has the potential to "grow our own" leaders (Sherman, 2005; Zimmerman-Oster & Burkhardt, 1999). This aspiration is tempered, however, by findings from an empirical study by Rand (2004) of leadership development in students. Rand reported that leadership programs had no statistically significant long-term effects and that belief by others of a student's leadership capabilities did not impel the student to be more active in leadership behaviors.

Professional Society Membership and Student Leadership Development

Professional societies such as the American Society of Radiologic Technologists (ASRT) and the Pennsylvania Society of Radiologic Technologists (PSRT) provide leadership development opportunities for radiographers and radiography students. Membership in professional societies fosters leadership as a result of opportunities that members have to network with and learn from prominent local, regional, and national leaders (Mata, Latham, and Ransome, 2010). Access that members have to the association's collective "intellectual capital, expertise, and professional competency" (Herman, 2005, p. 257) may help them realize personal and professional empowerment (Mata et al., 2010). Equally important, however, is that membership in professional societies helps solidify the identity of the profession among its members by establishing professional standards and by creating a forum for individuals with common professional interests and goals (Herman, 2005; Mata et al., 2010).

Student membership in professional societies augments classroom and clinical learning and promotes professional development by granting students access to a supportive group of peers with a common professional purpose (Simon, Webster & Horn, 2007). Professional association membership provides a unique opportunity for students for networking, conference participation, mentoring, and career exploration (Mata, Latham, and Ransome, 2010; Simon, Webster & Horn, 2007). Equally important is that students who are active in professional societies have opportunities to see prominent local, regional, and national leaders in their profession and to see leadership in action through association governance, scholarly activities, and generalized promotion of the profession (Mata et al., 2010). Besides being merely spectators to the leadership activities of professional societies, students usually have the opportunity to participate. The importance of students having the opportunity to participate in leadership activities is supported by findings of Shertzer's and Schuh's (2004) study that suggests that opportunities for students to get involved in leadership created empowering leadership beliefs in the students. Further, students in Shertzer's and Schuh's study reported that having as few as one leadership opportunity was likely to open up numerous doors for other leadership opportunities.

Introducing radiography students to radiography professional societies at an early stage in the educational process may benefit students by helping them establish a professional identity and sense of belonging. Radiography students, like most students, are typically striving to establish a sense of self as a professional (Tolley Gurley & Calloway, 2011). Social theorist, Emile Durkheim, proffered that interaction that occurs in large groups fosters a sense of belonging and shared meaning and purpose that may have a powerful and lasting impact (Allan, 2005). This phenomenon was evidenced by Simon, Webster, and Horn (2007) who, as student social workers with the encouragement and support of their faculty mentor, presented at an international conference in their field. Afterward, Simon and her fellow students reported feelings of a “newfound sense of professionalism, credibility, and belonging (Simon et al., 2007, p. 12). The highly positive experience that these students had from participating in the conference inspired and motivated them to engage in other meaningful student professional activities (Simon et al., 2007). The profession of radiography stands to also benefit when radiography students are introduced early to radiography professional societies because students who join professional societies typically continue their membership throughout their careers (Gonzales & Scarcella, 2001).

Radiography students who actively participate in professional societies may form positive perceptions of radiographers as leaders, of leadership opportunities in the field, and of their own self-efficacy with regard to transformational leadership and may be more apt to pursue leadership opportunities in the field.

Research Questions

Based on the review of literature and the theoretical framework of this study, the following questions are explored.

Research Question One

What do radiography students perceive about the transformational leadership behaviors demonstrated by their radiography role models?

RQ1.A. How do radiography students rate the transformational leadership of their radiography role models?

RQ1.A.i. Do radiography students rate the transformational leadership of their role models differently relative to the position of the role model (program director, clinical coordinator, clinical instructor, radiologic technologist, or department director)?

RQ1.B. Do radiography students rate the transformational leadership of their role models differently relative to other variables in this study?

RQ1.B. i. Do radiography students rate the transformational leadership of their role models differently relative to the gender of the role models in each position (program director, clinical coordinator, clinical instructor, radiologic technologist, or department director)?

RQ1.B. ii. Do radiography students rate the transformational leadership of their role models differently relative to the type of radiography program the student attended (hospital/technical/military programs versus college/university programs)?

RQ1.B. iii. Do radiography students rate the transformational leadership of their role models differently relative to the type of terminal award received (certificate or diploma versus associate or bachelor's degree)?

RQ1.B. iv. Do radiography students rate the transformational leadership of their role models differently relative to the students' gender?

RQ1.B. v. Do radiography students rate the transformational leadership of their role models differently relative to the students' age?

RQ1.B. vi. Do radiography rate the transformational leadership of their role models differently relative to the student's ethnicity/race?

RQ1.B. vii. Do radiography students rate the transformational leadership of their role models differently relative to the student's annual household income?

RQ1.B.viii. Do radiography students rate their role models differently relative to students' perceptions of if the profession of radiologic technology and its members, as a whole, are leaders?

Research Question Two

What do radiography students perceive about leadership opportunities in the field of radiography?

RQ2.A. What leadership opportunities in the field do radiography students identify?

RQ2.B. Do radiography students perceive leadership opportunities differently relative to the leadership ratings of their role models (program director, clinical coordinator, clinical instructor, radiologic technologist, or department director)?

RQ2.C. Do radiography students' perceptions of leadership opportunities in the field relate to other variables in this study?

RQ2.B. i. Do radiography students perceive leadership opportunities differently relative to the gender of the role models in each position (program director, clinical coordinator, clinical instructor, radiologic technologist, or department director)?

RQ2.B. ii. Do radiography students perceive leadership opportunities differently relative to the type of radiography program the student attended (hospital/military programs versus college/technical programs)?

RQ2.B. iii. Do radiography students perceive leadership opportunities differently relative to the type of terminal award received (certificate or diploma versus associate or bachelor's degree)?

RQ2.B. iv. Do radiography students perceive leadership opportunities differently relative to the students' gender?

RQ2.B. v. Do radiography students perceive leadership opportunities differently relative to the students' age?

RQ2.B. vi. Do radiography students perceive leadership opportunities differently relative to the student's ethnicity/race?

RQ2.B. vii. Do radiography students rate their role models differently relative to the student's annual household income?

RQ2.B.viii. Do radiography students perceive leadership opportunities differently relative to students' perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders?

RQ2.C.ix. Do radiography students perceive leadership opportunities differently based on how they rate their own self-efficacy with regard to transformational leadership?

Research Question Three

How do radiography students perceive their own self-efficacy with regard to transformational leadership?

RQ3.A. How do radiography students rate their own self-efficacy with regard to transformational leadership?

RQ3.B. Do students' perceptions of their self-efficacy with regard to transformational leadership relate to their perceptions of the transformational leadership behaviors of their radiography role models?

RQ3.C. Do radiography students' perceptions of their self-efficacy for transformational leadership scores relate to other variables in this study?

RQ3. C. i. Do radiography students rate their own self-efficacy with regard to transformational leadership differently relative to the gender of the role models in each position (program director, clinical coordinator, clinical instructor, radiologic technologist, or department director)?

RQ3. C. ii. Do radiography students rate their self-efficacy with regard to transformational leadership relative to the type of radiography program the student attended (hospital/military programs versus college/technical programs)?

RQ3. C. iii. Do radiography students rate their self-efficacy with regard to type of terminal award received (certificate or diploma versus associate or bachelor's degree)?

RQ3. C. iv. Do radiography students rate their own self-efficacy with regard to transformational leadership differently relative to the students' gender?

RQ3. C. v. Do radiography students rate their own self-efficacy with regard to transformational leadership differently relative to student age?

RQ3. C. vi. Do radiography students rate their own self-efficacy with regard to transformational leadership relative to the student's race/ethnicity?

RQ3. C. vii. Do radiography students rate their own self-efficacy with regard to transformational leadership relative to the student's annual household income?

RQ3.B.viii. Do radiography students rate their own self-efficacy with regard to transformational leadership relative to students' perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders?

Conclusion

The profession of radiography, as a whole, bears the responsibility of ensuring that it has a continual supply of competent leaders who can help the profession face future challenges in an environment of health care that is in constant flux (Johnson, 2005) and is increasingly complex and volatile (McAlearney, 2010). To ensure sustainable effective leadership, the profession of radiography must, as suggested to the profession of nursing, "establish a culture of leadership" (Heller, Drenkard, Esposito-Herr, Romano, Tom & Valentine, 2004, p. 205). Establishing and implementing a systematic model of leadership development and succession will facilitate a culture of leadership within the profession of radiography and ensure sustainable effective leadership.

A logical place to implement a program of leadership awareness and development is in the radiography educational program. Upon completion of the radiography educational program, graduates should have, at minimum, positive perceptions about leadership in the field of radiography and about leadership opportunities in the field of radiography. Graduates should also have an awareness of their own self-efficacy for leadership that has been guided by formal leaders in the radiography educational process. By ensuring that graduates of radiography programs have the requisite leadership awareness upon which to develop future leadership knowledge, skills, attitudes, and competencies, the profession of radiography will be growing its own leaders (Sherman, 2005; Zimmerman-Oster & Bukhardt, 1999). To inform discussion about a model of leadership development and succession that begins with radiography students, the field of radiography must have an understanding of the current status of leadership awareness and development in radiography students as well as perceptions that current radiography students have of leadership in the field, as these perceptions will likely facilitate or hinder their future leadership development.

Numerous elements of the current radiography educational process are likely influencing student's perceptions of leadership in the field, leadership opportunities in the field, and perceptions that students have of their own self-efficacy with regard to transformational leadership. Potential factors relevant to this study include 1) leadership modeled by radiography role models, 2) gender bias in the radiography educational environment, 3) power dynamics in the radiography clinical educational environment, and 4) the support and encouragement to practice leadership that is being given to students by radiography and meaningful leadership opportunities. Analysis of the dynamics of the educational process and how they relate to student perceptions of leadership will facilitate in the profession of radiography, at large, the following: A heightened awareness of the implications of modeling leadership to students that will aid the profession in determining what, if anything, must be done to ensure that leadership is being positively modeled by both formal and informal leaders at all levels in the radiography educational process; a better understanding of overarching norms and values held by individuals, departments, and organizations that infiltrate the culture of the radiography educational program and what must be done to ensure a positive learning environment for students;

increased mindfulness of the need to encourage, support, and empower all radiography students to practice leadership; and a higher level of awareness of the value of providing ample and diverse leadership opportunities to students including participation in professional societies.

CHAPTER 3

METHODOLOGY

Purpose

The purpose of this study was to better understand leadership development among professionals in the field of radiography by analyzing the perceptions that recent graduates of radiography educational programs had about the transformational leadership behaviors of their radiography role models, of leadership opportunities in the field, and of their own self-efficacy with regard to transformational leadership. In an effort to better understand leadership awareness in radiography students with the intent of informing a model of leadership development and succession for the field of radiography, the purpose of this study was two-fold. First, this study described perceptions that radiography students, as reported by graduates of radiography educational programs, had of leadership in the field based on their evaluation of the transformational leadership behaviors demonstrated by radiography role models during the radiography educational process. Second, this study described relationships that existed between radiography students' perceptions of the transformational leadership behaviors demonstrated by radiography role models and the perceptions that radiography students had of (a) leadership opportunities in the field of radiography, and (b) students' sense of their own self-efficacy with regard to transformational leadership. Results were used to identify if the behavior of role models in the radiography educational process were related to radiography students' perceptions of leadership in the field and to make suggestions about how role modeling that occurs during the radiography educational process may be enhanced to support and encourage leadership development and succession by students as future radiography professionals.

Research Design

This study examined relationships between radiography students' perception of the transformational leadership behaviors exhibited by radiography role models, perceptions of leadership opportunities in the field, and students' own self-efficacy with regard to transformational leadership. This study attempted to address the following research questions:

What do radiography students perceive about the transformational leadership behaviors demonstrated by their radiography role models?

What do radiography students perceive about leadership opportunities in the field of radiography?

How do radiography students perceive their own self-efficacy with regard to transformational leadership?

For the purpose of this study, transformational leadership behaviors of radiography role models were identified through application of modified measures of adapted versions of Kouzes and Posner's (2005) five constructs that they identify as central to transformational leadership: 1) Enabling Others to Act, 2) Modeling the Way, 3) Encouraging the Heart, 4) Inspiring a Shared Vision, and 5) Challenging the Process. These constructs emerged as Kouzes and Posner analyzed content from case studies submitted by private- and public-sector managers and identified recurring behaviors that the managers reported exhibiting when they were functioning as leaders at their "personal best" (Posner, 2004, p. 444). Kouzes and Posner used these five dimensions as the framework for the Leadership Practices Inventory (LPI). The five dimensions in the LPI measure constructs of transformational leadership and specific supporting behaviors (Posner, 2004).

The LPI was designed for leaders to self-rate their leadership behaviors and also for subordinates to rate the behaviors of their leader. After creating the Leadership Practice Inventory, Posner and Brodsky (1992) employed the same method of analysis to evaluate college students' accounts of their leadership behaviors as Kouzes and Posner used to evaluate managers. Posner and Brodsky reported that college students practiced comparable leadership behaviors to managers and that the conceptual framework from which the LPI stemmed was applicable for creating a student version of the LPI (Posner, 2004). Consequently, the Student-LPI contains the same leadership dimensions as the LPI and descriptive items that very closely parallel those in the LPI. These constructs and behaviors are described as follows:

Enabling Others to Act – "what leaders do to make it possible for followers to take action; fostering collaboration as opposed to competition, and support followers in their personal development" (Atonakis, Cianciolo, & Sternberg, 2004, p. 178).

Modeling the Way – "how leaders set examples through their own behaviors; helping followers accomplish large-scale goals on a step-by-step basis to achieve small wins" (Atonakis, Cianciolo, & Sternberg, 2004, p. 178).

Encouraging the Heart – "recognizing followers' contributions and finding ways to celebrate their achievements" (Atonakis, Cianciolo, & Sternberg, 2004, p. 178).

Inspiring a Shared Vision – "focuses on what leaders do to construct a future vision and build follower support for that vision" (Atonakis, Cianciolo, & Sternberg, 2004, p. 178).

Challenging the Process – "searching for opportunities and experimenting, even taking sensible risks, to improve the organization" (Atonakis, Cianciolo, & Sternberg, 2004, p. 178).

Each of these five dimensions in the LPI contains six descriptive indicators of transformational leadership behaviors for a total of 30 items in the instrument. The LPI measures frequency of transformational behaviors (Posner, 2004). The Student-LPI measures transformational leadership using a 5-point Likert-type scale with the following response categories: 1) rarely or seldom, 2) once in a while 3) sometimes, 3) sometimes, 4) often, and 5) very frequently (Kouzes & Posner, 1998, 2006a, and 2006b).

For the purpose of this study, radiography role models are defined as individuals who hold specific positions in the radiography educational program and with whom students typically interact during the radiography educational process. Radiography role models in this study are individuals who are associated with a radiography educational program "accredited by a mechanism acceptable to ARRT" (American Registry of Radiologic Technologists, 2014, para.3, https://www.arrt.org/Certification/Radiography) relative to establishing eligibility for candidacy for certification in radiography. These individuals include program director(s), clinical coordinator(s), and clinical instructor(s), or individuals who hold equivalent positions in radiography educational programs; staff registered radiographers; and directors of medical imaging departments. Radiographers who are leaders of professional societies for radiographers were also initially identified as radiography role models for this study but were dropped from analyses because responses on returned surveys indicated that students had little exposure to these individuals.

The sample population for this study was 1,821 radiography graduates who 1) graduated from a radiography educational program that was "accredited by a mechanism acceptable to the ARRT" (American Registry of Radiologic Technologists, 2014, para. 3, retrieved from https://www.arrt.org/Certification/Radiography) relative to establishing eligibility for candidacy for certification in radiography and that awarded a certificate or diploma or an associate's or higher degree; 2) took and passed the primary certification examination in radiography that is offered by the American Registry of Radiologic Technologists (ARRT) as a first-time candidate in 2012; 3) provided an email address to the ARRT as part of the primary certification examination application process; and 4) indicated to the ARRT, as part of the primary certification examination application process, willingness to be included in research correspondence. The ARRT provided to me a list containing the email addresses of individuals who met the aforementioned criteria. The individuals on this list served as my sampling frame. I imported data from the ARRT list into the online survey and data management program, Qualtrics. Via email correspondence sent through Qualtrics, I invited individuals on the list to participate in the study by completing the online survey.

This study employed a cross-sectional descriptive survey research design. The sample population of radiography educational program graduates who met all criteria for inclusion in the study was spread over a large geographical region. The ability to collect data and correspond electronically with study participants facilitated cost- and time-effective data collection that took place over an approximately four-week period from early June through early July of 2013. Data collection entailed asking students to retrospectively report their perceptions of leadership at the time of graduation from the radiography educational program. The descriptive character of this research project supported the goals of the study that were to "describe the nature of existing conditions" (Walliman, 2005, p. 116) relative to relationships that exist between the transformational leadership behaviors exhibited by radiography role models during the radiography educational process and radiography students' 1) perceptions of leadership opportunities in the field of radiography, and 2) and their own sense of self-efficacy with regard to transformational leadership.

Development and Measurement of Variables

Independent Variable

The independent variable in this study was students' perceptions of transformational leadership behaviors exhibited by radiography role models during the radiography educational process. I conceptualized the independent variable in this study from transformational leadership theory and theories of role formation and developing a sense of self, findings of prior research in the field of radiography and related health care fields, as well as research in the field of education. I operationalized transformational leadership using an adapted version of Kouzes' and Posner's (1998) Student Leadership Practice Inventory (Student-LPI) to evaluate the independent variable that included the following sub-scales 1) Enabling Others to Act, 2) Modeling the Way, 3) Encouraging the Heart, 4) Inspiring a Shared Vision, and 5) Challenging the Process. These five constructs were derived from transformational leadership behaviors that were demonstrated by both college student leaders and a variety of public and private sector managers when they were at their self-reported best as leaders (Kouzes & Posner, 1998; Posner, 2004; Kouzes & Posner, 2006a and 2006b).

Assessing the independent variable. For the purpose of this study, students' perceptions of the transformational leadership behaviors of radiography role models were assessed through application of an adapted version of Kouzes and Posner's (2005) measure of five dimensions of transformational leadership that I modified specifically for this study. Use of a modified version of the Student-LPI (Kouzes & Posner, 1998) by respondents in this study to evaluate radiography role models from the perspective of a student is appropriate since this study is interested in students' perceptions of transformational leadership behavior. The Student-LPI captures constructs that students equate to leadership behavior (Posner, 2004). And, the Student-LPI stems from the constructs of the Leadership Practices Inventory (non student) that is grounded in Kouzes' and Posner's model of transformational leadership (Antonakis, Cianciolo & Sternberg, 2004; Northouse, 2007). Both the Student-LPI and the LPI consist of the same five dimensions of transformational leadership identified by Kouzes and Posner (1998, 2005, 2006a, and 2006b). And, the Student-LPI contains descriptive statements that closely parallel those in the LPI. The adaptations and modifications that I made to the Student-LPI for use in my study are described throughout this chapter. The complete questionnaire is contained in Appendix A.

I asked respondents to rate the transformational leadership of each of the categories of professional role models (program directors, clinical coordinators, clinical instructors, registered radiologic technologists, and department directors) using a five-point Likert-type scale ranging from zero to four with zero equaling, "never" and four equaling, "always." Other response categories in the scale (one, two, and three) did not have descriptive labels. Each item also included a response category of "not applicable." Consequently, there were six response categories for each item in my questionnaire. This rating scale differed from the scale of one to five that Kouzes and Posner employed in their 1998 version of the Student-LPI. Item response categories in Kouzes' and Posner's (1998, 2006a, and 2006b). Student-LPI are formatted so one equals "rarely or seldom," two equals "once in a while," three equals "sometimes," four equals "fairly often," and five equals "very frequently." In the effort to make response categories more definitive, I provided a "not-applicable" option that Kouzes and Posner (1998, 2006a, and 2006b) did not employ, and I used response categories such as "never" as opposed to Kouzes and Posner's "rarely or seldom" and "always" as opposed to Kouzes and Posner's "very frequently."

Recoding response categories of modified Student-LPI for ratings leadership of radiography role models. To facilitate statistical analyses, I recoded the ratings by students of transformational leadership of radiography role models obtained from the modified version of the Student-LPI (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998). In Qualtrics and in IBM SPSS, responses for this variable were numerically coded as 1 through 6 with a value of 1 representing a response of "not applicable," a value of 2 representing a response of "0 – never," and a value of 6 representing a response of " 4 -always"). So that "not applicable" would not be treated as interval data when analyzing and reporting measures of central tendency, the category of "not applicable" was recoded as a missing value. Further, to facilitate statistical computation, I recoded the remaining five values for this variable as 1 (never) through 5 (always).

Composite variables for role model leadership scores. I calculated a composite leadership score for each leader from all 30 items, as rated by each respondent. I termed these composite scores "composite role model leadership scores." Composite role model leadership scores were formulated by averaging only items that were provided by respondents so as not to impute responses. I used these composite scores to calculate an overall average score for each of the five groups of role models (program director, clinical coordinator, clinical instructor, radiologic technologist, department director) across the five dimensions of the Student-LPI (Kouzes & Posner, 1998). I did not calculate an overall average score for each of the five groups of role models within the five dimensions of the Student-LPI because scores for the 30 items in the adapted version of the Student-LPI (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) that I used in my study for radiography role models did not factor into the five dimensions of the Student-LPI.

Dependent Variables

The dependent variables in this study were 1) perceptions that radiography students had of leadership opportunities in the field of radiography, and 2) perceptions that radiography students had of their own self-efficacy with regard to transformational leadership. For the purpose of this study, leadership opportunities in the field of radiography included formal and informal leadership opportunities that typically exist for radiographers. Students were asked to rate leadership opportunities and their own self-efficacy for transformational leadership at the time of graduation from their radiography program. Development of the dependent variables stemmed from transformational leadership theory, role-theory and development of a sense of self, the construct of self-efficacy, and findings of prior research in the field of radiography or related health care and education disciplines.

Assessing students' perceptions of leadership opportunities in the field. To assess radiography students' perceptions of the types of leadership opportunities that exist in the field of radiography for the purpose of this study, I developed a list of typical leadership opportunities that exist for radiography professionals. Face validity of this list is supported by the 23 years of experience that I have in various work environments as a radiologic technologist who is registered with the American Registry of Radiologic Technologists and as an educator. Additionally, as part of the pilot testing of the instrument that I used in my study, the list of leadership opportunities that I created was reviewed by two highly-seasoned radiologic technologists who have several years of experience in both education and in clinical environments. Items on the list of opportunities included the following: 1) serving on committees in the work environment, 2) mentoring new technologists; 3) mentoring students; 4) committee work in professional societies such as the Pennsylvania Society of Radiologic

Technologists or the American Society of Radiologic Technologists; 5) officer positions (president, secretary, treasurer, et cetera) in professional societies such as the Pennsylvania Society of Radiologic Technologists or the American Society of Radiologic Technologists; 6) formal leadership positions in a medical imaging department such as lead technologist, supervisor, manager, or department director; 7) formal leadership opportunities in radiography education such as program director, clinical coordinator, or clinical instructor; 8) formal leadership opportunities in a health care organization such as vice-president, senior vice-president, president, or chief executive officer (CEO); and 9) formal leadership opportunities in academic institutions such department chairperson or dean.   Included in this list was an option of "no opportunities" and "other opportunities." For other opportunities, respondents could write in leadership opportunities that they thought existed but were not included in the list.

New variables created for "leadership opportunities in the field." The 11 leadership opportunities that were included in the instrument and that respondents were asked to identify suggest that leadership opportunities in the field fall into four categories that are arguably progressive in nature. To facilitate understanding of how radiography students perceive leadership opportunities relative to this progression, I first created four new categories that represented each level of opportunity. These four categories were derived from the original variable, "leadership opportunities in the field" and included, 1) no opportunities, 2) "narrow range" of opportunities, 3) "wider range" of opportunities, and 4) "widest range" of opportunities. I categorized the original 11 opportunities into these four categories based on the 23 years of experience that I have in various work environments as a radiologic technologist who is registered with the American Registry of Radiologic Technologists and as an educator.

I theorized that respondents who identified leadership opportunities that I later categorized in the "narrow range" category think that leadership opportunities that exist in the field of radiography are relatively limited in scope. I conceptualized "narrow range" leadership opportunities as activities and roles that entail radiologic technologists serving on committees in the work environment and in professional societies and providing interpersonal leadership to coworkers and students through mentoring. This category also included other leadership opportunities in the field that respondents anecdotally provided in the survey. "Other opportunities" identified by respondents included opportunities in the specialty areas of medical imaging. One respondent identified "helping to build a start-up facility" in the "other" leadership opportunities category. To summarize, the "narrow range" leadership opportunities category included 1) serving on committees in the work environment, 2) mentoring new technologists, 3) mentoring students, 4) committee work in professional societies such as the Pennsylvania Society of Radiologic Technologists or the American Society of Radiologic Technologists, and 5) "other leadership opportunities."

The next category of opportunities that I created included opportunities in the narrow range but added opportunities that were more complex in nature. I termed this next category, "wider range" opportunities for leadership. I theorized that respondents who identified leadership opportunities that I classified in the "wider range" category think that leadership opportunities that exist for radiographers are relatively broader in scope. I posited that "wider range" opportunities entail activities of radiologic technologists who are in positions to provide oversight and to make decisions at the departmental level (or equivalent) that affect other radiographers, radiography education, and the field of radiography with resulting impact that ranges from minor to major. These additional leadership opportunities are broader in scope and included 1) officer positions in professional societies (president, secretary, treasurer, et cetera), 2) formal leadership positions in a medical imaging department (lead technologists, supervisor, manager, or director), and 3) formal positions in radiography education (clinical coordinator, clinical instructor, program director).

Finally, I created the fourth and final category that I called, "widest range" opportunities for leadership. Opportunities in this category included opportunities in the narrow and wider ranges, but also included additional opportunities that are even greater in complexity and responsibility. I conceptualized that respondents who identified leadership opportunities that I categorized into the "widest range" think that the array of leadership opportunities that exist in the field is the most diverse and includes the most broad and complex opportunities. These individuals would recognize leadership opportunities across the entire span of opportunities at the narrow, wider, and widest ranges. I conceptualized "widest range" opportunities to add the activities of radiologic technologists who are in positions to provide oversight and to make decisions at an organizational level that affect other radiographers, radiography education, the field of radiography, and the overall health care team in which radiographers function with resulting impact that typically ranges from intermediate to major. These additional leadership opportunities that are broadest in scope relative to this study and were categorized by me into the "widest range" of leadership included 1) leaders in academic organizations (dean, department chair), and 2) leaders in health care organizations (vice president, senior vice president, or chief executive officer).

To assign each case to a leadership opportunity category, I visually examined each case in the IBM SPSS data set. The leadership opportunities were displayed sequentially in spreadsheet fashion in the data base according to the leadership opportunity. Scanning each case from left to right and depending on how many opportunities each respondent identified, I was able to easily determine how a respondent's answers to this question "qualified" for inclusion into one of the four leadership categories that I created. For example, for a respondent to be included in the category, "widest range," she had to have identified at least one opportunity in the "narrow range" category and one opportunity in the "wider range" category. I assigned each case a numeric value based on the highest level of leadership opportunity they identified with 1 equaling "no opportunity, "2 equaling "narrow range" opportunity, 3 equaling "wider range" opportunity, and 4 equaling "widest range" opportunity. The overwhelming majority of respondents who indicated that opportunities existed in a higher opportunity category also identified at least one opportunity in each of the lower categories. For example, for me to assign a respondent to the "widest range" category, she had to identify one or more leadership opportunities in the narrow range category and also one or more opportunities in the wider range category. There were four respondents (two percent) whose responses to the question about leadership opportunities did not follow this pattern. Since there were only four of these cases, they were coded according to the highest leadership opportunity category in which they identified an opportunity. There were five cases in which respondents indicated that "no opportunities" for leadership existed but then went on to identify opportunities in one or more of the other categories. Because of their conflicting responses, I was unable to discern if these five respondents did or did not consider opportunities to exist in the field. Consequently, these five cases were coded as missing so as not to impute responses. The overwhelming majority of respondents who demonstrated a pattern of identifying leadership opportunities that aligned with the rationale that I used to create these four new categories supports the validity of the categories.

I then created a new variable for each of the four levels of opportunity. I coded each respondent as either selecting that particular leadership opportunity or not selecting that particular leadership opportunity. The original coding that I used for the four new leadership opportunity variables was 1, “selected,” and 2, “did not select.” Each respondent was represented as “selected” in only one of the four leadership opportunity variables. In the other three leadership opportunity variables, that respondent was represented as “did not select.”

Assessing the dependent variable, perceptions that radiography students have of their self-efficacy with regard to transformational leadership. To assess perceptions that radiography students have of their self-efficacy with regard to transformational leadership, I modified the Student-LPI (Kouzes & Posner, 1998) in a similar manner as Endress (2000). For use in her study of self-efficacy for relational leadership of college students, Endress (2000) modified each item in the Student-LPI by adding prefixes of “I can” so items measured self-efficacy relative to leadership behaviors rather than frequency of engagement in leadership behaviors. And, although Kouzes and Posner never intended the Student-LPI to be used as a measure of self-efficacy as per instructions of the publisher of the Student-LPI (E. Null, personal communications, January 22, 2014), like Endress, I applied the instrument to that purpose in my study so that I could make comparisons between the radiography students in my study and college students in her study. Nevertheless, my use of the Student-LPI in this manner is unendorsed by Kouzes and Posner.

Endress heeded Bandura’s (1997) recommendation to measure self-efficacy by asking respondents to “rate the strength of their belief in their ability to engage in the behavior” (Endress, 2000, p. 116) using an 11-point Likert- type scale that ranged from 0 to 10 with a score of 0 indicating “cannot do” followed by 1 through 10 with a score of 10 indicating “can do.”

Bandura (1997) posited that scales with a greater number of steps allow for greater sensitivity in assessing and differentiating information (Bandura, 1997, p. 44). Self-efficacy response categories in my study were also represented with value labels of "0 – cannot do" followed by whole numbers that ended with "10 – can do." Responses were recorded in Qualtrics and imported into IBM SPSS on a scale of 1 to 11 with 1 equaling "cannot do and 11 equaling "can do."

While Endress also followed Bandura's (1997) recommendation to ask respondents to rate their capabilities at the present time, I asked respondents in my study to rate their capabilities at the time of graduation from the radiography educational program. To remind respondents to do this, I added a statement at the end of each of the thirty modified Student-LPI (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) items that read, "Rate yourself at time of graduation." This retrospective method of self-rating was intended to diminish the effects of history and maturation on respondents' ratings of self-efficacy for transformational leadership that could have been a factor if a significant amount of time elapsed between the date of graduation and completion of the questionnaire. Use of a retrospective method of self-rating was logical and prudent for this study although the study employed a cross-sectional research design. Cross-sectional research designs do not support inferences of causality and therefore threats to internal validity are rendered as non- applicable because of the researcher's lack of ability to control events (Monette, Sullivan, & DeJong, 2008).

Composite variables for student self-efficacy for leadership scales. Similar to the composite scores that I calculated for radiography role models, I also calculated a composite score for self-efficacy with regard to transformational leadership for each respondent. This score was based on responses to items in the modified version of the Student-LPI (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) that respondents used to rate their own self-efficacy with regard to leadership. I termed this score the "composite student self-efficacy for leadership score." This composite score was calculated based on the average of responses that ranged from 1 (cannot do) to 11 (can do) for the 30- items in the modified Student-LPI (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998). Most respondents answered all 30 items for self-efficacy, but all respondents answered 25 or more items. Individual composite student self-efficacy for leadership scores were calculated based on an average of the number of items answered so as not to impute responses where data were missing.

Recoding response categories of modified Student-LPI for self-efficacy ratings. So that I could compare composite role model leadership scores to composite student self-efficacy for leadership scores, I adjusted the latter scores. This was necessary because the scales used to rate these two variables were different. (The scale used to rate leadership in radiography role models ranged from 1 to 5 and the scale used for students to rate their own self-efficacy with regard to transformational leadership ranged from 1 to 11.) To assure greater equivalency of the two scales, I adjusted composite student self-efficacy for leadership scores by a multiplier of 0.45454545. I then calculated an average composite student self-efficacy for leadership score.

Validity and reliability of the Student-LPI. Because I used a modified non-permissioned version Kouzes and Posner's (1998) Student-Leadership Practices Inventory (Student-LPI) (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998), validity and reliability cannot be assured from the previously tested versions, so I tested validity and reliability as described in the Results Chapter that follows. Additionally, because I have adapted and applied the Student-LPI in ways not previously tested or intended by the originators, the validity and reliability results reported in my study do not reflect on the validity and reliability of the Kouzes and Posner LPI or Student-LPI. Additionally, the validity and reliability of the modified version of the Student-LPI that I used cannot be established from previous studies using the original Student-LPI. Still, it is helpful to note that the Student-LPI has been used and developed in various empirical studies and has demonstrated validity across a range of student populations including college students and health care students (Posner, 2004). Other scholars who have made (permissioned) modifications, which I extended in this study, include Endress (2000) and Arendt and Gregoire (2005). I briefly describe their studies and results in relation to validity and reliability.

Arendt and Gregoire (2005) conducted a study of leadership in dietetic students and used leadership action statements adapted from Posner and Brodsky (1992) that match the Student Leadership Practices Inventory (Kouzes & Posner, 1998). Arendt and Gregoire conducted factor analysis with Varimax rotation and reported that no other model provided a better factor structure. Arendt and Gregoire reported lower reliability in leadership dimensions in their study than reported by Kouzes and Posner (1998) with scores of .55 for Challenging, .76 for Inspiring, .62 for Enabling, .67 for Modeling, and .73 for Encouraging. Arendt and Gregoire noted, however, that lower reliability may have stemmed from alterations to the action items. Arendt and Gregoire also reported that there have been similar issues with reliability with different instruments in other studies of dietetic studies.

In studies of leadership effectiveness of fraternity and sorority chapter presidents, presidents who frequently practiced each of the five transformational leadership behaviors identified on the Student-LPI were rated as being the most effective presidents as evaluated by executive committees of the fraternities and sororities. Similar results occurred in leadership evaluation of college resident advisors (Posner, 2004). Face validity of the modified version of the Student-LPI being used for this study is supported because constructs that the Student-LPI measures reflect transformational leadership principles and this study is analyzing radiography student perceptions' of transformational leadership in radiography role models and in themselves. Transformational leadership behavior is deemed to be important for the success of college students, health care students, and health care workers. Findings from empirical studies in the disciplines of radiologic technology, nursing, athletic training, and student affairs suggest that use of transformational leadership practices is known to be effective in college/university student learning environments, health care educational environments, and health care workplace environments (Curtis, Helion & Domsohn, 1998; Fortsch, Henning & Nielsen, 2009; Heller, Drenkard, Esposito-Herr, Romano, Tom & Valentine, 2004; Shertzer & Schuh, 2004; Vahey, Aiken, Sloan, Clark & Vargas, 2004; Westrope, Vaughn, Bott & Taunton, 1995). Additionally, Hair, Anderson, Tatham and Black (1998) indicate that the validity and reliability of the Student-LPI meet acceptable psychometric standards.

Reliability of the Student-LPI modified for self-efficacy assessment. Endress (2000) reported Cronbach's alpha reliability scores for each of the five scales of the Student-LPI relative to her self-efficacy self-assessment of students as follows: Enabling Others to Act, .88; Modeling the Way, .95; Encouraging the Heart, .93; Inspiring a Shared Vision, .95; and Challenging the Process, .90.

Consideration of reliability and validity of the LPI relative to the Student-LPI. Information on the reliability and validity for the LPI is more readily available than for the Student-LPI (Kouzes & Posner, 1998). Posner and Brodsky (1992), when researching the constructs of the LPI in college students, reported that college students practiced leadership behaviors comparable to the behaviors of managers in Kouzes and Posner's earlier research

(Posner, 2004). Posner and Brodsky contended that the conceptual framework from which the LPI stemmed was applicable for creating the Student-LPI (Posner, 2004). Because the Student-LPI and the LPI Instrument were created by the same researchers using the same conceptual framework, information on the reliability and validity of the LPI should be considered when assessing the reliability and validity for the Student-LPI.

Vito and Higgins (2010) used the LPI to assess leadership in law enforcement personnel as evaluated by raters and self-raters. Internal consistency among the five dimensions of the LPI was reliable for the entire sample in Vito's and Higgin's study, but reliability was lower when measured only for self-raters. Vito and Higgins purported that the LPI was uncertain for law enforcement in terms of reliability. Vito and Higgins also indicated, however, that their sample size of self-raters was small. Vito and Higgins conducted confirmatory factor analysis on the LPI and reported that the model was a good fit that had significant factor loadings. Vito and Higgins purported that the LPI showed discriminant and convergent validity and was a valid instrument for measuring leadership in the field of law enforcement.

Pugh (2009) used the LPI to assess leadership in principals in Mississippi as rated by the principals and by others. Pugh purported that the LPI showed high correlation in all dimensions between raters and self-raters. Pugh reported that the LPI was very strong in both concurrent validity and reliability relative to educational environments.

Kass and Grandzol (2011) used the third edition of the LPI-Self (Kouzes & Posner, 2003) to assess leadership in MBA students in Pennsylvania and characterized the LPI as a "thoroughly-tested instrument" (p. 47, 2011). Kass and Grandzol reported internal reliability scores ranging from 0.70 to 0.90. Kass and Grandzol also contended that scores from tests of the validity of the LPI (Kouzes & Posner, 2009) supported the validity of the LPI for MBA students in their study.

The LPI had lower validity and reliability ratings when used for studies in other countries. Sandbakken (2004) reported that the LPI had weak discriminant validity when used to assess leadership in Norwegian MBA students and that it discriminated between only three factors and not five. Carless (2001) used the LPI to evaluate leadership in low-level and mid-level managers in Australia. Carless supported Sandbakken's contention that the LPI is weak in discriminant validity and proffered that the LPI measures a broad and higher order construct of transformational leadership. Cultural differences in various countries in which these studies were conducted may explain discrepancies that were found in the validity and reliability of the LPI.

Control Variables

There are a number of characteristics of radiography students, radiography role models, and radiography education programs that may relate to radiography students' perceptions of radiography role models' leadership, of leadership opportunities in the field of radiography, and of students' self-efficacy with regard to transformational leadership. Some of these characteristics may relate to demographic and other qualities of students and radiography role models while some may relate to the characteristics of the educational program and process. Control variables that were of primary interest for this study are identified in the remaining paragraphs of this section and are presented in the order in which they are included in analysis.

Student characteristics. Student characteristics consisted of sociodemographic variables and included gender, age, race/ethnicity, and annual household income.

Gender of student. To operationalize gender of students, I asked respondents in this study if they were a woman, a man, or if they identify differently/neither. These categories were coded 1, 2, and 3, respectively. There were no respondents who chose the third category, so I dichotomized this variable into 1) woman, and 2) man. In the final data set, there were two cases that did not report gender. These cases were not included in analyses related to gender.

Age of student. I collected data on age of students via an open-ended item in which I asked respondents to write in their age in years at the time they completed the survey.

"Age" recoded. To facilitate interpretation of data and understanding of the demographics of students, I collapsed the variable, "age" into three categories. The three new age categories were 1) under age 25, 2) age 25 – 35, 3) and over age 35. These categories are from the National Center for Education Statistics, (U.S. Department of Education, 2014). Three incremental categories for this variable allows for conceptualization of respondents' age in comparison to other respondents and for understanding respondents' location in terms of life experiences that may impact leadership their perceptions of leadership.

Race/ethnicity of student. In this study, I obtained respondents' race/ethnicity by asking them to select from the following categories: 1) Asian American/Pacific Islander, 2) Black/African American, 3) Caucasian/White, 4) Hispanic/Latino, 5) Middle Eastern/ Arab, 6) Native American/Native Alaskan, and 7) other. The last category ("other") was an open-ended category in which respondents could write in a race/ethnicity that was not represented by the first six categories in this item.

"Race/ethnicity" recoded. The majority of respondents identified White as their sole race/ethnicity (74%, n = 120). I therefore collapsed "race/ethnicity" into two categories: 1) White, and 2) non-White. Two respondents (1%) did not provide their race ethnicity. One of these two respondents did not answer this question and the second respondent chose "other" and then provided anecdotal information that she preferred not to disclose her race/ethnicity. Both of

these cases were considered as missing data. All but four respondents in the non-White category identified only as "non-White." Two respondents that were recoded into the non-White category identified as both Black and White; one identified as Black, White, and Native American; and one identified as "other" but went on to anecdotally indicate that she was "mixed." In summary, there were 41 non-White respondents (25%).

Household income of student. To measure annual household income at the time of graduation from the radiography program, the questionnaire included three response categories: 1) under $50,000, 2) $50,000 to $100,000, and 3) over $100,000. According to the U.S. Census Bureau (U.S. Department of Commerce, 2013b) the median United States household income in 2012 was $51,371. I included three response categories to facilitate making relative comparisons of the household income of students in my study to the 2012 median household income in the United States by being below, at, or above the median, broadly speaking. But, very few respondents had household incomes in the highest income category (6%, n = 9). Therefore, to facilitate statistical analyses, I collapsed "household income" into two categories: 1) under $50,000 per year, and 2) $50,000 per year and over.

Program characteristics. Descriptions of the variables that characterized the radiography programs that students attended included program type and terminal award received.

Program type. I documented the type of program attended by asking respondents to select from the following categories: 1) hospital-based, 2) technical school, 3) college or university-based, 4) military, and 5) other. The last category ("other") was an open-ended category in which respondents could write in the type of program they attended that was not captured by the first four categories in the item.

"Program type" recoded. Upon review of returned questionnaires, I recoded program type into 1) hospital, technical, or military program, and 2) college or university program. First, I deleted cases in my data set that had a significant amount of missing data. I then recategorized two respondents (1.2%) who selected "other" for *program type.* Respondents in both instances provided anecdotal information that specified that they were dually enrolled in a hospital-based program while also completing a bachelor's degree. Based on the typically small, intimate environment of hospital-based programs in which students usually have close contact with their radiography role models and the potentially strong influence that these dynamics may have on students' perceptions of leadership, I categorized these two students as hospital-based. There were three respondents (1.8%) who indicated they attended a military radiography educational program and 26 (16%) respondents who indicated that they attended a technical program. To facilitate sound statistical analysis, I combined hospital, technical, and military cases into one category and left college and university programs as the second category for this variable. My rationale for doing this was that hospital, technical, and military programs are all likely to more strongly emphasize the technical aspect of radiography from the perspective of "training" in comparison to an emphasis by colleges and universities to holistically educate students, as discussed previously.

Terminal award received (certificate, diploma, associate degree, or bachelor's degree). I recorded terminal award received by asking respondents to choose one of the following categories: 1) certificate or diploma, 2) associate degree, 3) bachelor's degree, and 4) other. The last category ("other") was an open-ended category in which respondents could write in a terminal award they received that was not captured by the first four categories in this item.

"Terminal award received" recoded. Upon review of returned questionnaires, I recoded terminal award received 1) certificate or diploma and 2) associate or bachelor's degree. The majority of respondents in this study earned a degree (86%, n = 140). Of those who earned a degree, 86% (n = 120) earned an associate degree. Of the 26 respondents who attended a technical program, 23 (88%) indicated that they earned an associate degree whereas the remaining three respondents (12%) who attended a technical program earned a certificate. Distinctions were not made in this study as to whether the degrees that students earned, either at the associate or baccalaureate level, were degrees in applied sciences. Consequently, it was not possible to make reasonable assumptions about the curricular structure and content of the degree programs that students completed in terms of breakdowns of general (liberal) education course work versus technical/clinical course work in radiography. I therefore dichotomized the variable, "terminal award received" into two categories entitled, "degree" and "certificate." In doing this, I collapsed responses of associate degree and bachelor's degree into one category. My intent for combining associate and bachelor's degrees was to evaluate if completion of any amount of general (liberal) education course work impacts students' perceptions of leadership. As previously stated, however, I could not reliably determine how many credits of general (liberal) education comprised associate and bachelor's degree programs as, based on my professional experience in higher education, each program differs. Additionally, since 2009, individuals who complete hospital-based radiography programs in which they are awarded a certificate (non-degree) have been required to complete a minimum of 15 credits of college-level general education course work. Moreover, depending on the individual circumstances of students, it is not unusual for those who attend hospital-based programs to have completed significantly more than the required minimum 15 credits of college-level general education

course work even though they may not have earned an academic degree. Therefore, differentiating with a high level of confidence between the number of liberal education credits that radiography students complete based solely on the type of terminal award they received from their radiography program is difficult. Nevertheless, for the purposes of this study, differentiation is made strictly along the lines of degree versus non-degree (certificate or diploma) and the general assumption is that those with academic degrees have completed more liberal education credits.

Gender of radiography role models with whom respondents worked. I operationalized gender of radiography role models with whom students worked by asking respondents to identify if each of the categories of radiography role models with whom they worked were 1) all women, 2) all men, 3) majority women, 4) majority men, or 5) not applicable. A category of "equal women and men" was not provided as a response but should have been since it likely would have been an appropriate choice for some respondents.

"Gender of role models" recoded. The category of "not applicable" for this variable did not yield meaningful data because I could not determine if a response of not applicable meant that the respondent did not work with anyone in that particular role, that the gender representation in a role model category was relatively evenly distributed, or something else altogether. Consequently, data from this category was omitted from analyses and treated as missing and I collapsed the variable, "gender of role models" into "all women or majority women" and "all men or majority men."

Student perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders. One of the items in the questionnaire used in this study asked respondents the following question, "When you think about the profession of radiography as a whole, do you perceive its members, in general, to be leaders?" The intent of this question was to elicit from respondents their perceptions of leadership in the overall field of radiologic technology and not just the radiography role models that I identified in my study. The rationale for asking this question was to have data that would enable me to triangulate, in a broad manner, feedback that respondents gave about their perceptions of leadership based on other items in my questionnaire. Additionally, this broad question was intended to gauge perceptions of leadership in the field of participants in this study relative to radiography students in Schmidt's 2006 study who indicated that they perceived that the position for which they were being prepared, that of a diagnostic radiographer, was looked upon by others in the organization as a "grunt" (Schmidt, 2006, p. 328) who lacks expertise.

I measured whether students perceived people in the profession of radiography, as a whole, as leaders by asking respondents to indicate, "1) yes, 2) no, and 3) not sure" in response to "When you think about the profession of radiography as a whole, do you perceive its members, in general, to be leaders?" For categories 2 and 3, respondents were asked to briefly state why, in an open-ended response space, they chose that answer.

"Are radiographers leaders"? recoded.   Because this variable had many more "yes" responses (81%, n = 132) compared to "no" responses (8%, n = 13) and "not sure" responses, I dichotomized the variable into "yes" as one category and "no" and "not sure" as the second category. Combining the "no" and "not sure" categories strengthened soundness of statistical analyses of this variable.

Sampling and Data Collection

Data for this study was derived from an online survey that I administered to graduates of radiography programs who took the certification examination in radiography that is offered by the American Registry of Radiologic Technologists (ARRT) as a first-time candidate in 2012. The survey was administered and data collected through use of an online survey and data management program called Qualtrics.

Sampling Strategy

The unit of analysis for this study was radiography students (recent program graduates). The sample population for this study was a convenience sample comprised of individuals who met the following criteria: 1) graduated from a radiography educational program that was "accredited by a mechanism acceptable to ARRT" (American Registry of Radiologic Technologists, 2014, para.3, retrieved from https://www.arrt.org/Certification/Radiography) relative to establishing eligibility for candidacy for certification in radiography and that awarded a certificate or diploma or an associate's or higher degree; 2) took and passed the primary certification examination in radiography that is offered by the American Registry of Radiologic Technologists (ARRT) as a first-time candidate in 2012; 3) provided an email address to the ARRT as part of the primary certification examination application process; and 4) indicated to the ARRT willingness to be included in research correspondence as part of the primary certification examination application process. Email addresses of individuals who met these qualifications were provided to me by the ARRT via a list in the form of an Excel spreadsheet. Prior to being given access to the spreadsheet, I signed a formal contract with the ARRT in which I agreed to comply with all ARRT requirements and restrictions for use of the mailing list information relative to this research study. There were 12,341 first-time examinees who took the ARRT primary certification examination in radiography in 2012 (J. Reid, personal communication, March 25, 2013). Of that number, 1,821 met all aforementioned criteria for inclusion in this study. The discrepancy between the number of first-time examinees and the number of individuals who met the criteria for inclusion in this study resulted primarily because a large majority of individuals did not provide an email address to the ARRT or did not consent to be included in research correspondence (or both) (J. Reid, personal communication, March 28, 2013). Also, the ARRT does not add an individual's email address to its records until the individual becomes registered (J. Reid, personal communication, March 28, 2013).

Survey Instrument

For this study I devised a survey questionnaire based on a non-permissioned adaptation of the Student Leadership Practices Inventory (Student-LPI) Observer Instrument and the Student Leadership Practices Inventory (Student-LPI) Self Instrument (Kouzes & Posner, 1998). My adaptations to the Student-LPI (Kouzes & Posner, 1998), were extensions of modifications made to the Student-LPI in studies conducted by (a) Endress (2000) in which self-efficacy for relational leadership of college students was analyzed and (b) Arendt and Gregoire (2005) in which leadership in dietetic students was studied. The questionnaire that I devised for this study contained a welcome and introduction that was followed by four sections of questions. Information about the content of the questionnaire is described in the following paragraphs. The questionnaire is contained in Appendix A.

Welcome and Informed Consent. The introductory email message with a link to the survey that was sent to recruit participants, along the home page of the online questionnaire for this study contained informed consent information about the study. This consisted of brief information about processes including the length of time necessary to complete the questionnaire, risks of participation in the study, benefits and compensation for participation in the study (there was no compensation), assurance of confidentiality of responses and anonymity of participants, identification of the primary researcher as a doctoral candidate and the faculty sponsor, procedures for contacting the researcher or faculty sponsor with questions, information on voluntary participation, informed consent procedures, and identification of Institutional Review Board approval.

Section One of Instrument. The first section of the questionnaire began with instructions for completing the questionnaire. Respondents were then asked to provide information about year of graduation and radiography educational program characteristics including program type, terminal award received, and programmatic accreditation by the Joint Review Committee on Education in Radiologic Technology (JRCERT). The last question in Section One was two-part. The first part asked respondents about gender of their radiography role models. The second part asked about the number of role models with whom students worked in each category of leaders.

Section Two of Instrument. The second section of the questionnaire asked respondents to assess the transformational leadership behaviors of their radiography role models by completing a modified, non-permissioned version of the Student Leadership Practices Model - Observer Instrument (Student-LPI) (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998). The adaptations to the Student-LPI that I made in Section Two are based on the permissioned version of the Student-LPI that Arendt and Gregoire (2005) used. Arendt and Gregoire's removed the word, "organization" from several items in the Student-LPI. For example, they changed, "I support decisions that people in our organization make on their own" to "I support decisions that people make on their own." For some items, Arendt and Gregoire replaced "organization with "group." Additionally, Arendt and Gregoire made grammatical editorial changes for structural purposed (Arendt & Gregoire, 2005, p. 1291). I used Arendt and Gregoire's adapted version of the Student-LPI with the exception of changing one statement from “I break projects and work into manageable steps” to “I break work into reasonable steps.” My rationale for changing this item is that in some circumstances in a clinical health care environment, certain projects simply may not be manageable for students even thought they are reasonable. I then added qualifiers to two statements. I changed “Gives others a great deal of freedom and choice in deciding how to do their work” to “Gives others a great deal of freedom and choice, when possible, in deciding how to do their work.” I modified this item because radiography students administer ionizing radiation and require close monitoring and oversight by registered radiologic technologists who, when working one on one with radiography students, assume ultimate responsibility for clinical processes.

Section Three of Instrument. In the third section of the questionnaire, I asked respondents to assess their self-efficacy with regard to transformational leadership by completing a modified, non-permissioned version of the Student Leadership Practices Inventory – Self Instrument (Student-LPI) (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998). The adaptations to the Student-LPI that I made in Section Three are based on the permissioned version of the Student-LPI that Endress (2000) used and were discussed in detail earlier.

Section Four of Instrument. The fourth section of the questionnaire contained a total of nine items. The first three items in this section were questions that I developed to assess respondents' perceptions of radiographers as leaders and of leadership opportunities in the field of radiography. The first question in Section Four evaluated, on a very basic level, respondents' perceptions about radiographers, in general, as leaders. The second question in Section Four of the questionnaire identified leadership opportunities for radiographers. Respondents were asked to check each leadership opportunity that they thought existed for them at the time of graduation from the radiography program or future as a radiologic technologist. The third question in

Section Four was a broad and culminating question that asked respondents to identify the individual from whom they, as radiography students, learned the most about positive leadership in the field of radiography. A list of all individuals identified as radiography role models for the purposes of this study were included as well as an “other” option so respondents could identify other individuals from whom they learned about leadership. Respondents were asked to rank the individuals from whom they learned the most about positive leadership in the field of radiography. Respondents were asked to assign a ranking of one to the person from whom they learned the most. Respondents were also given the option to indicate that they, as a radiography student, did not learn about positive leadership in the field of radiography from anyone.

The last five questions in Section Four asked for demographic and background information of students, including past formal instruction in leadership and past leadership experience. Questions about past leadership experience and leadership education asked respondents to rate the level of formal leadership education and experience they had prior to starting their radiography education. Response categories for leadership education and experience both had the same response categories of “none, low, medium, and high.”

Demographic items in Section Four inquired about student gender, age, race/ethnicity, and annual household income.

Pilot testing of Instrument. I asked ten individuals to participate in pilot testing of the survey instrument in May 2013. Of the ten individuals whom I asked to participate, four complied. Two individuals were students enrolled in a baccalaureate degree medical imaging science program. One of these two students was a traditional-age student at the sophomore level and the second student was a returning adult student at the junior level. Students participating in the pilot test of the survey instrument were not participants in the study. The third individual who participated in the pilot test was a master's-prepared radiologic technologist who was also the program director of a hospital-based school of radiologic technology that affiliates with a college. This individual has over 27 years of experience as a registered radiologic technologist and over 24 years in radiologic technology education. The fourth individual who participated in the pilot test was a registered radiologic technologist with 24 years of experience in a clinical environment in which she holds the role as lead technologist. In this role, she works with administrators in the imaging department, radiographers, and radiography students.

I asked individuals who participated in the pilot test to complete an online version of the questionnaire via the online survey and data management program, Qualtrics, so as to identify potential electronic obstacles that might hinder completion of the online questionnaire, assess ease of use of the questionnaire, and evaluate length of completion time. I asked for feedback about instructions, content, clarity, applicability, and typographical and grammatical errors. I received suggestions from three pilot test participants to reword some items in the instrument for clarity and correct some spelling errors. Two individuals commented that the survey was lengthy.

IRB Approval

I obtained approval from the Institutional Review Board (IRB) for the Protection of Human Subjects of Indiana University of Pennsylvania before data collection. I adhered to the protocol approved by the IRB. Other than an email address that respondents voluntarily provided to the American Registry of Radiologic Technologists because they agreed to be included in research correspondence, I had no other identifying information about respondents. The data collection method assured anonymity to participants with responses being recorded separately from their email addresses or any other identifying information.

Data Collection Procedures

To establish a pool of study participants, I asked the American Registry of Radiologic Technologists (ARRT) for access to contact information in the form of email addresses of registered radiologic technologists who, as part of the primary certification examination application process, indicated to the ARRT willingness to be included in research correspondence. I requested from the ARRT that individuals who met the following criteria be included on the list sent to me: 1) graduated from a radiography educational program that is "accredited by a mechanism acceptable to ARRT" (American Registry of Radiologic Technologists, 2014, para. 3, retrieved from https://www.arrt.org/Certification/Radiography) relative to establishing eligibility for candidacy for certification in radiography and that awards a certificate or diploma or an associate's or higher degree; 2) took and passed the primary certification examination in radiography that is offered by the American Registry of Radiologic Technologists (ARRT) as a first-time candidate in 2012; 3) provided an email address to the ARRT as part of the primary certification examination application process; and 4) indicated to the ARRT willingness to be included in research correspondence as part of the primary certification examination application process. After signing a formal contract with the ARRT for use of the data relative to my research project and upon receiving subsequent approval by the ARRT, I imported the 1,821 email addresses included in the ARRT's list that was in the form of an Excel spreadsheet into the online survey and data management program (Qualtrics).

In early June of 2013, I electronically sent the survey questionnaire via email to the 1,821 individuals who were included in the list provided to me by the American Registry of Radiologic Technologists (ARRT). Along with the survey questionnaire, I sent an informational email message to prospective participants that introduced myself, briefly explained the purpose of the study, invited them to participate, identified the length of time necessary to complete the questionnaire, assured confidentiality and anonymity of respondents, explained the elements of informed consent procedures, and notified them that non-respondents would receive periodic reminder email messages. I also provided instructions on how to opt out of the study along with a link for doing so, and I provided a link to the online questionnaire. I asked potential participants to complete and submit the questionnaire within one week. I sent three reminder email messages to non-respondents via Qualtrics, the online survey and data management program used in this study, each week for three weeks after the first invitation was sent. Collection of data ceased in early July of 2013.

Sample size and response rate. There were 12,341 first-time examinees who took the ARRT primary certification examination in radiography in 2012 (J. Reid, personal communication, March 25, 2013). Of that number, 1,821 met all aforementioned criteria for inclusion in this study. Of the 1,821 individuals who were asked to participate in this study, 242 returned the questionnaire resulting in response rate of approximately 13.3%. I imported the 242 cases into IBM SPSS Statistics 21 for data analysis. After exploring the data, I identified and removed 79 cases that had no values or that were poignantly incomplete and unusable for the study. This left 163 viable cases in the data set and resulted in a final response rate of 9%.

Data Preparation

Missing and Unusual Data

Prior to statistical analysis, I evaluated the data set following suggestions for data cleaning identified by Monette, Sullivan, and DeJong (2008). I ran frequency distributions and visually inspected the data set and, as indicated previously, found 79 cases with missing data. Ten of the 79 cases had no data and were therefore dropped. The remaining 69 cases had an inadequate amount of data or were missing key data that were directly related to my research questions in terms of the modified 30-item Student-LPI (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) scale used to rate the transformational leadership of the radiography role models. Only cases in which respondents answered 51% or more of the questions of the modified Student-LPI (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) were kept. According to Monette, Sullivan, and Dejong, "missing data can result in misleading statistical conclusions" (Monette, Sullivan & Dejong, 2008, p. 198). Additionally, Streiner (2013) contends that "testing for differences between completers and non-completers is often a ritual we feel obligated to perform, but is one that rarely yields any useful information," (Streiner, 2013, p. 89). I therefore subsequently also dropped the 69 cases from the data set. This left 163 viable cases. One case of the remaining 163 cases initially suggested response set bias. For this case, the respondent answered all 30 questions about each of the radiography role models in the Student-LPI with the highest score of six and answered all questions about himself in the Student-LPI with the highest score of 11. But, when I analyzed responses he gave for all other items, variation was evident that indicated that he answered items with thought and intent. I therefore did not remove this case from the data set. I removed anecdotal data when it wasn't appropriate or helpful. For two cases, respondents who were asked to identify their age in years, gave a numerical values followed by "years old" and "years." I deleted this unnecessary information.

Although I employed a high level care and consideration in data cleaning, Streiner argues that doing anything with missing data, whether imputing data or deleting cases means that "we have made a decision about how they should be treated" (Streiner, 2013, p. 95.)

Recategorizing responses. I reviewed frequency distributions to identify variables with values that were out of range or were otherwise illogical. For variables that had questionable data, I used the search query in IBM SPSS to expose individual cases with values that were suspect. Through visual examination and use of search queries in IBM SPSS, I identified inconsistent and irrational data (Monette, Sullivan & Dejong, 2008, p. 371). Based on responses, it was obvious that some respondents misunderstood certain questions. The two questions for which inconsistent responses were most obviously given were *program type* and *award received*. I reviewed all responses to ensure that answers for *program type* reasonably aligned with and supported answers given for *award received*, but some responses were inconsistent. For example, when asked to indicate the type of radiography program attended and the highest award received from the program, a respondent indicated that she completed a hospital based program and that the highest award she received was not the expected terminal award of the certificate of completion or diploma, but instead was an award from the Joint Review Committee on Education in Radiologic Technology. For this and six other cases in which a response was clearly inconsistent with the intent of the question and for which I could make a strong argument for re-categorizing the response while maintaining the integrity of the data, I recategorized the response. I recategorized the program type of four cases (2.4%) and the award received for three cases (1.8%, n = 163). Details of these cases are in endnotes in Appendix B. Conversely, in instances for which a response seemed inconsistent with the intent of the question but for which I could not re-categorize the response without assurance of compromising the integrity of the data, I did not re-categorize the response.

Variables Omitted from Analyses

In this section I discuss variables and cases that did not warrant additional statistical analyses.

Year of graduation. Fourteen respondents indicated that they graduated from their radiography educational program in years other than 2012. Years of graduation other than 2012 were 1985, 2007, 2008, 2010, 2011, and 2013. One respondent erroneously indicated that she graduated in "202." A reasonable assumption holds that this person made a typo and graduated in 2012. I reassigned this case to the modal category of 2012. Regardless, since the overwhelming majority of respondents (93%, n = 152) indicated they graduated in 2012, this item was not used for analyses due to lack of variation. This data is not central to my research questions and was asked primarily to negate potential effects of history. Additionally, I asked survey participants to respond to questions based on their perceptions at the time of graduation from the radiography educational program.

Educational program's accreditation status. An overwhelming majority of respondents (95%, n = 155) indicated that the radiography educational program from which they graduated was accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT). Only three respondents indicated that the program from which they graduated was not JRCERT accredited and five respondents did not know. Consequently, data from this item was not used in analyses due to lack of variation.

Number of radiography role models with whom respondents worked and leaders of professional societies. The item that inquired about the number of radiography role models with whom respondents worked was asked primarily because of the possibility that differences in exposure to the numbers of individuals in these roles might have had an influence on perceptions of leadership. Data collected for this variable did not yield highly useful information except that of 163 final cases in my data set, 91 respondents (56%) indicated they did not work with any leaders of professional societies and 9 additional respondents (6%) did not answer this item. This resulted in only 63 (38%) of respondents indicating that they worked with one or more leaders of professional societies. The low number of responses for leaders of professional societies suggests that students do not have adequate interaction with these types of role models to make judgments about their leadership. Data collected for this item was not useful and I therefore dropped this variable from statistical analyses.

"From whom did you learn the most about leadership?" This item identified each of the radiography role models included in this study and asked respondents to rank in order the individual from whom they, as a student, learned the most about positive leadership in the field of radiography. An option of "other" was included that allowed respondents to identify other influential leaders. An option of "I did not learn positive leadership from anyone while I was a radiography student" was also included. Respondents were to rank the individuals on the list from one to seven with one being assigned to the person from whom they learned the most. Respondents who believed that they did not learn positive leadership from anyone were instructed to check the corresponding response. The intent of this item was to ask respondents about leadership influences using a different approach. Data received on this item was unusable because of diverse methods that respondents used to answer this question. I was unable to confidently interpret meanings of responses to this question and therefore omitted the question from analysis.

Prior leadership education and experience. Items that asked respondents to rate their *level of formal leadership education* and *formal leadership experience* prior to starting their radiography educational program also are omitted from analysis. My intention for including these two items in the study was to use these data to determine if leadership that was learned prior to starting the radiography educational process may have influenced students' perceptions of leadership in their role models and in the field of radiography. Nevertheless, the definitions of "leadership experience" and "leadership education" were ambiguous. These items did not serve as valid measures and did not yield meaningful data. I therefore dropped from analyses the two items regarding previous leadership education and experience.

Data Analysis Plan

After cleaning my data, I conducted numerous data analyses including factor analysis for validity and reliability scaling. I also conducted routine exploratory data analyses at the univariate level followed by in-depth statistical analyses at the bivariate and multivariate levels. I used measures of association in accordance with levels of measurement of data (nominal, ordinal, or interval) to describe the strength of relationships between variables.
Details of these analyses are identified in the remainder of this chapter.

Factor Analysis, Validity and Reliability

I conducted principal component analysis for validity and conducted reliability scaling for the Student-LPI scores for each of the five radiography role models in this study for which respondents answered 30 items via the modified, non-permissioned version of the Student Leadership Inventory (Student-LPI) (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) that I used. I reviewed factor loadings to evaluate if indicators factored together logically and if they should have been grouped together or dropped. I ran Cronbach's alpha reliability testing on the final version of my scales and indices. Results of validity and reliability analyses are reported in Chapter 4.

Univariate Statistical Analyses

I conducted routine exploratory data analyses for the independent and dependent variables. These analyses included frequency distributions, descriptive statistics to analyze measures of central tendency and measures of spread. I used this information to summarize and describe characteristics of the sample, roles models, and radiography programs and to characterize the dependent and independent variables. To further detect potential complications with my data prior to conducting bivariate and multivariate analyses (Hamilton, 1992), I visually inspected the distribution of variables for skewness, kurtosis, and outliers via exploratory data analyses that included histograms with normal curve overlays, boxplots, and quantile plots. The variable, composite self-efficacy for leadership score had outlying scores that resulted in high skewness and kurtosis values (skewness = 2.398; kurtosis = 7.445). I used a scatterplot to determine cut points and dropped six cases with scores below 3.75. This corrective measure resulted in skewness of -1.489 and kurtosis of 1.696 which normalized the distributional shape of the variable.

Bivariate and Multivariate Statistical Analyses

Ritchey (2000) proffers that "to predict future events is to understand them" (p. 155). To explore relationships between variables in my study, I conducted bivariate and multivariate statistical analyses using an .05 level of significance for all analyses. Bivariate analyses facilitates understanding of relationships between two variables and suggests that consistent changes in one variable that consistently relates with another variable allows for prediction of phenomena (Ritchey, 2000).

Multivariate regression analyses provide information, beyond information provided by bivariate analyses, that enables us, to different degrees, to estimate changes in values of the dependent variable in a population (Monette, Sullivan, & DeJong, 2008; Ritchey, 2000). Figure 1 visually demonstrates the conceptual model that I used in regression analyses.

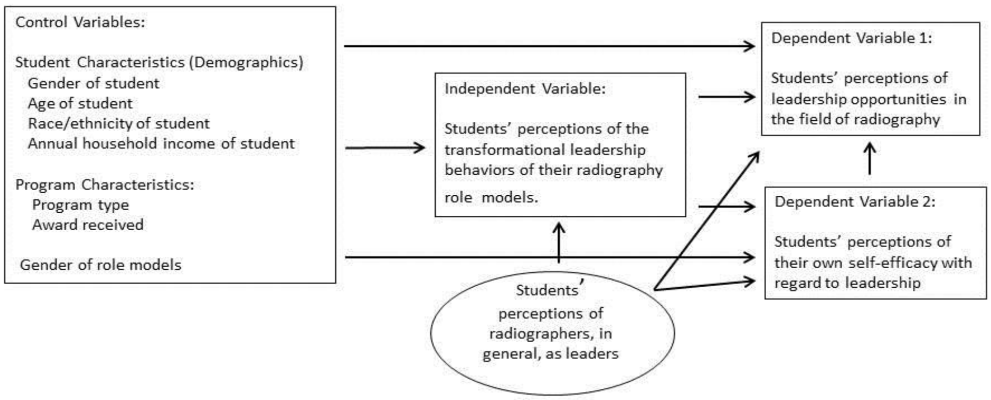

Figure 1. Conceptual Model of Factors that Influence Students' Perceptions of Role Models. Conceptual model of factors that influence students' perceptions of the transformational leadership behaviors of their radiography role models and how these perceptions and other factors might then influence students' perceptions of leadership opportunities in the field of radiography and students' perceptions of themselves as future leaders.

The following sections explain the plan I used for exploring relationships between variables using bivariate and multivariate statistical analyses by research question. Results are reported in Chapter 4.

Analyses for Research Question One. "What do radiography students perceive about the transformational leadership behaviors demonstrated by their radiography role models?" To test Research Question One, I used two-group differences of means tests and one-way ANOVAs based on attributes of the variables including levels of measurement and the number of categories. To test for differences in the means between composite role model leadership scores of the five groups of radiography role models, I conducted one –way ANOVAs with Scheffe post hoc tests that showed how leadership scores of each type of leader compared to all other types of leaders. I used independent samples t-tests to test for differences in means of composite role models leadership scores of the five role models and nominal/ordinal control variables that were categorical. Since the variable, "student age," had three response categories, I used one-way ANOVAs with Scheffe post hoc tests.

To identify factors that accounted for students' perceptions of the transformational leadership of radiography role models, I ran a series of ordinary least squares regression analyses following a systematic process. OLS is an appropriate statistical method for these analyses given the ordered nature of the dependent variables (Hamilton, 1992). I first controlled for student sociodemographic variables (gender, age, race/ethnicity, and household income at the time of graduation from the radiography program). Secondly, I expanded the model to include programmatic characteristics (program type and terminal award received). Next, I added to the model variables that characterized role models (role model gender). Finally, if warranted, I compiled from the first three models all variables that were statically significant at the .05 level of significance significant and included them in a final regression model. I followed these procedures for each of the five radiography role models. Following the principle of parsimony that suggests that the final predictive model in regression analysis should achieve the best "balance of simplicity and fit" (Hamilton, 1992, p. 72), I analyzed the theoretical and statistical soundness of each model to determine the best predictive model that explained statistically significant relationships between the independent variable (student perceptions of the transformational leadership behaviors of their radiography role models) and control variables in this study.

Research Question Two. "What do radiography students perceive about leadership opportunities in the field of radiography?" I tested differences in means between students' perceptions of leadership opportunities in the field and transformational leadership of radiography role models. Since composite role model leadership score was treated as a continuous variable, I used independent samples t-tests for composite role model leadership score and each of the four leadership opportunity variables (no opportunity, narrow range of opportunity, wider range of opportunity, and widest range of opportunity). All other variables for Research Question Two were categorical, so I used cross-tabulation tables and chi-square tests to test at the bivariate level. Cross tabulation tables "report frequencies (not proportions) of joint occurrences of attributes" (Ritchey 2000, p. 421). The chi-square statistic reports the difference between the actual and expected frequencies of occurrences (Ritchey, 2000).

At the multivariate level, I used logistic regression analyses to explore statistically significant relationships between students' perceptions of leadership opportunities in the field and other variables included in this study. Logistic regression is an alternative statistical approach that is appropriate to use for categorical dependent variables (Hamilton) and is useful in "predicting the probability that something will happen," (Hamilton, 1992, p. 217). Hamilton posits that logistic regression offers a "more realistic model for probabilities" (Hamilton, 1992, p. 221) than OLS. Similar to Research Question One and Research Question Three, I systematically regressed the dependent variable, "students' perceptions of leadership opportunities in the field" on all potential predictor variables in this study to analyze relationships. And, I also kept only statistically significant predictor variables and eliminated models that were non-significant until I established, based on theoretical and statistical soundness and the principle of parsimony, the final model that demonstrated best fit of actual and predicted values.

Research Question Three. "How do radiography students perceive their own self-efficacy with regard to transformational leadership?" To statistically analyze Research

Question Three, I used an analysis plan similar to the plan that I used for Research Question One. To test for differences in the means between students' perception of their own self-efficacy for leadership and their perceptions of the transformational leadership of their role models, I used Pearson product-moment correlations. I used independent samples t-tests to test for differences in means of composite student self-efficacy for leadership score and nominal/ordinal control variables that were categorical. To test student's self-efficacy for leadership and student age, I used one-way ANOVAs with Scheffe post hoc tests.

I used OLS regression with the goal of determining the best predictive model for students' perceptions of their own self-efficacy with regard to leadership. As with Research Question One, I ran a series of OLS regression analyses following a systematic process in which I first controlled for student sociodemographic variables (gender, age, race/ethnicity, and household income at the time of graduation from the radiography program), followed by program characteristics (program type and terminal award received), and then variables that characterized role models (role model gender and composite role model leadership score). As warranted, I compiled from the four models all variables that were statically significant at the .05 level of significance significant and included them in a final regression model, if warranted. I then analyzed the theoretical and statistical soundness of each model to determine the model that best accounted for factors that influence students' perceptions of their own self-efficacy for leadership.

Summary

Methodology described in this chapter followed a logical approach for statistically analyzing the perceptions that radiography students had of the transformational leadership behaviors of their radiography role models and how such perceptions impacted students' perceptions of opportunities in the field of radiography and their own self-efficacy with regard to leadership (Hamilton, 1992; Monette, Sullivan, & DeJong, 2008; Ritchey, 2000). I used univariate statistics to characterize the data and bivariate and multivariate statistics to describe relationships between the independent variable and dependent variables. For dependent variables that were nominal or ordinal in nature, I used use chi-square tests to analyze relationships between variables, as appropriate. For interval data, I examined relationships while controlling for effects of student, role model, and program characteristics using multiple regression analyses in the form of ordinary least squares and logistic regression analyses. Although I used inferential statistics to explain relationships between variables, the cross-sectional design used for this study does not support inference of causality. The statistical analyses that I used enabled me to describe factors in my study that influence leadership development in radiography students. This information may be useful to the field of radiography at large in developing a model of leadership development and succession for its members. The comprehensive model of data collection, data preparation, data cleaning, and data analyses that I employed, as described in this chapter, supported my research goals.

CHAPTER 4

RESULTS

Introduction

The purpose of this study was two-fold. First, this study described perceptions that radiography students, as reported by radiography program graduates, had of leadership in the field based on their evaluation of the transformational leadership behaviors demonstrated during the educational process by radiography role models. These role models were individuals who held the position of program director, clinical coordinator, clinical instructor, radiologic technologist and imaging department director. Second, this study described relationships that existed between radiography students' perceptions of the transformational leadership behaviors demonstrated by radiography role models and perceptions that radiography students had of (a) leadership opportunities in the field of radiography, and (b) their own self-efficacy with regard to transformational leadership.

In this chapter I will discuss results from statistical analyses of my data including factor analysis and reliability scaling of the instrument that I used and characteristics of the sample, roles models, and radiography programs. I will also characterize the dependent and independent variables and present results of bivariate and multivariate analyses in relationship to my research questions.

Factor Analysis of Instrument

To assess validity of the modified version of the modified version of the modified Student-LPI (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) that I used in my study, I conducted principal component factor analysis using IBM SPSS to analyze how the 30 items in the measure factored into the five dimensions of transformational leadership in the

Student-LPI (Kouzes & Posner, 1998). I factor analyzed the 30 items in the modified Student-LPI (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) for each of the types of radiography role models and for students' rating of self-efficacy for leadership. In no case did the 30 items factor into the expected five dimensions of the Student-LPI (Enabling Others to Act, Modeling the Way, Encouraging the Heart, Inspiriting a Shared Vision, and Challenging the Process) (Kouzes & Posner, 1998). Instead, in this sample, the items factored unidimensionally into Enabling Others to Act. In some cases the factor analysis produced more than one factor with an eigenvalue over 1, but the items comprising the second factor loaded strongly on the first factor, as well, and the second factor accounted for little variation (less than 10%). Therefore, rather than having five different sub-scores for the Student-LPI, I computed a single composite score for each role model type and for students' self-rating that reflects an average of valid responses to the items. Results of the factor analysis are reported in Table 1.

Table 1

Factor Analyses of Student-LPI (Kouzes and Posner, 1998) Items for Role Models

	Factor Loadings on Sole Dimension of Leadership for Items by Role Model Type					
S-LPI Item	Program Directors	Clinical Coordinators	Clinical Instructors	Radiology Technologists	Department Directors	Students Self
Enabling Others to Act						
1. Treats others with dignity and respect.	.624	.811	.719	.764	.723	.336
2. Fosters cooperative rather than competitive relations	.793	.812	.755	.771	.792	.424
3. Supports decisions	.687	.822	.784	.825	.772	.506
4. Includes others in planning	.656	.747	.666	.780	.673	.482
5. Gives others freedom and choice	.671	.762	.753	.780	.753	.646
6. Provides others leadership opportunities	.799	.830	.798	.817	.783	.694
Modeling the Way						
1. Follows through on promises and commitments	.760	.808	.794	.758	.771	.310
2. Sets personal example	.782	.863	.796	.749	.807	.543
3. Shares their beliefs about how things can be run most effectively	.725	.775	.734	.668	.596	.771
4. Talks about values and principles	.775	.788	.771	.767	.770	.690
5. Ensures group set goals plans	.886	.908	.787	.826	.845	.820
6. Breaks projects into steps	.793	.880	.821	.853	.881	.738
Encouraging the Heart						
1. Praises people	.865	.880	.796	.760	.840	.663
2. Gives support and appreciation	.899	.915	.880	.817	.917	.721
3. Makes sure that people are recognized	.870	.903	.878	.856	.872	.732
4. Encourages others	.874	.911	.886	.868	.888	.745
5. Tells others about our good work	.856	.864	.840	.864	.841	.794
6. Celebrates accomplishments publicly	.727	.739	.757	.735	.832	.772

	Program Directors	Clinical Coordinators	Clinical Instructors	Radiology Technologists	Department Directors	Students Self
Inspiring a Shared Vision						
1. Shows enthusiasm and excitement	.900	.912	.839	.842	.885	.731
2. Is upbeat and positive	.872	.911	.856	.804	.779	.629
3. Looks ahead and communicates	.872	.906	.824	.869	.855	.728
4. Describes to others our capabilities	.844	.895	.816	.790	.865	.771
5. Talks about how interests can be met by working toward a common goal	.864	.900	.855	.830	.844	.793
6. Speaks with conviction about the higher purpose and meaning	.840	.856	.841	.823	.835	.715
Challenging the Process						
1. Looks for ways to improve projects or tasks	.926	.922	.881	.848	.890	.743
2. Looks for opportunities that challenge	.886	.888	.820	.812	.859	.780
3. Keeps current on events and activities	.817	.889	.857	.816	.845	.719
4. Asks, "What can we learn from this experience?"	.853	.832	.872	.851	.868	.666
5. Lets others experiment and take risks	.728	.723	.740	.742	.788	.524
6. Takes initiative with experimenting	.708	.750	.815	.806	.818	.770
Eigenvalue	19.642	21.622	19.658	19.411	20.118	13.817
% of Variance	65.472	72.074	65.527	64.702	67.061	46.055
Cronbach's alpha	.980	.986	.981	.981	.983	.953

Reliability Scaling

I obtained Cronbach's alpha reliability scores for the modified version of the Student-LPI used in my study (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) relative to each of the five radiography role models' leadership scores and the students' rating of their own self-efficacy with regard to transformational leadership. Table 1 identifies factor loadings and

Cronbach's alpha scores for the radiography role models' and respondents' composite scores on the 30 items of the Student-LPI. Cronbach alpha scores support the method of data preparation I used and my decision to keep cases if a minimum of 51% of items in the 30-item Student-LPI scale were answered. Even though some cases had fewer answered items, they were equally as powerful as cases with a larger number of answered items as demonstrated by the high Cronbach's alpha scores.

It is important to highlight that the version of the Student-LPI (Kouzes & Posner, 1998) used for this study is a non-permissioned adaptation of previously adapted (but permissioned) versions of the Student-LPI used by Endress (2000) and Arendt and Gregoire (2005). In correspondence, the publisher of the Student-LPI (Jossey-Bass) noted that Kouzes and Posner "did not design the Student-LPI to evaluate self-efficacy or capacity, but rather the frequency of actual behavior which is the foundation upon which The Five Practices rest" (E. Null, personal communications, January 22, 2014). Further, the publisher indicated that Kouzes and Posner "do not encourage adaptation of the inventory to fit the context and any attempts to do so may invalidate the results" (E. Null, personal communications, January 22, 2014). Consequently, the adaptations of the items used in this study are used in a different way than Kouzes and Posner intended. As such, factor loading scores and Cronbach's alpha scores for reliability are not necessarily reflective of how the Student-LPI would perform with other samples and in other research. Factor analysis and reliability scores of this study in no way impact other researchers' claims about the psychometric properties of the Student-LPI or the LPI (Kouzes & Posner, 1998).

Descriptive Statistics

The survey for this study was sent in May 2013 to 1,821 individuals who graduated from a radiography educational program that was "accredited by a mechanism acceptable to the ARRT" (American Registry of Radiologic Technologists, 2014, retrieved from https://www.arrt.org/Certification/Radiography) and who took and passed the primary certification examination in radiography offered by the ARRT as a first-time candidate in 2012. Of the 1,821 questionnaires sent, 242 were returned resulting in a response rate of approximately 13.3%. Seventy-nine cases were removed from the data set because they were unusable because of large amounts of missing data. This left 163 viable cases and resulted in a final response rate of 9% of the entire sample population.

Control Variables

I conducted descriptive statistics for control variables divided into sociodemographic characteristics of the respondents and data about program characteristics. The majority of students in this study were women (61.5% n = 99), were age 25 to 35 (45%, n = 72), were Caucasian (74.5%, n = 120), and had annual household incomes at the time of graduation from their radiography program of under $50,000 (71%, n = 109). Relative to program characteristics, the majority of students in this study attended a radiography program that was housed in a college or university (63%, n = 103) and received an academic degree at either the associate or baccalaureate level (86%, n = 140). Descriptive data on students and their programs are displayed in Table 2 and are discussed in further detail in the sections that follow.

Table 2

Descriptive Data for Students and Programs

	n	Mean or %	Standard Deviation	Min.	Max.
Control Variables					
Characteristics of Students and Role Models					
Age of students in years	159	33	9.492	21	62
Age of students by category					
24 years of age and under	33	21%			
25 - 35 years of age	72	45%			
Over 35 years	54	34%			
Gender of students					
Woman	99	61.5%			
Man	62	38.5%			
Race/Ethnicity of students					
White	120	74.5%			
Non-White	41	25.5%			
Annual household income of students while in radiography program					
Under $50,000 per year	109	71%			
$50,000 and over per year	45	29%			
Characteristics of Radiography Educational Program					
Program type					
Hospital, technical, or military	60	37%			
College/university	103	63%			
Terminal award received					
Certificate or Diploma	23	14%			
Associate or Bachelor's Degree	140	86%			

Student age. The majority (45%, *n* = 72) of respondents in this study were in the 25 to 35 years of age category with the average age being 33.4 years (*n* = 159). These findings align with statistics reported by U.S. Department of Education, National Center for Education Statistics (U.S. Department of Education, National Center for Education Statistics [NCES], 2014) that indicate that from 1997 through 2011, the largest group of enrolled college-age students in the United States was age 25 to 35. The number of adult students who are returning to the post-secondary level classroom will continue to grow (Kenner & Weinerman, 2011) with students over age 35 having the largest projected increase in enrollment (23%) from 2011 until 2022 compared to a nine percent projected increase in enrollment for students age 18 to 24. These national enrollment statistics suggest that, on average, approximately half of the students currently enrolled in radiography educational programs are age 25 years and over and that enrollment of returning adult students will continue to increase.

Student gender. Females accounted for 61.5% (n = 99) of respondents in this study. Information could not be found on the gender composition of radiography students in radiography educational programs in the United States, but information about the number of radiologic technologists who were registered by the American Registry of Radiologic Technologists (ARRT) provides insight. In 2009 (Reid, 2010), 72% of ARRT-registered radiologic technologists were female. These statistics follow historical patterns that indicate female predominance in the profession of radiologic technology (Patterson-Lorenzetti, 2002). Additionally, the National Center for Educational Statistics reported that in 2012, 57% of students enrolled in colleges were female (U.S. Department of Education, National Center for Education Statistics [NCES], 2013). Findings of the gender breakdown of students in this study are reflective of relevant enrollment data at the national level.

Race/Ethnicity of students. The majority of students in this study (74.5%, n = 120) were White. In 2011, 61% of enrolled college students were White (U.S. Department of Education, National Center for Education Statistics [NCES], 2014). This reflects a decreasing trend in enrollment of White students from 84% in 1976. Trends in college enrollment of minority students during the same time period reflect increases with the most prominent increase being in enrollment of Hispanic students which rose from 4 to 14% followed by an increase in

African-American students which rose from 10 to 15% (U.S. Department of Education, National Center for Education Statistics [NCES], 2014).

Annual household income of students. Seventy-one percent (*n* = 109) of students in this study had annual household incomes at the time of graduation from their radiography program of under $50,000. The median annual income for all families in the United States in 2012 was $62,241 (U.S. Department of Commerce, Census Bureau, 2013a). For families who had adults residing in the household who were the typical age of individuals with college-aged children, the median annual household income was $78, 236, (U.S. Department of Commerce, Census Bureau, 2013a). The annual household income of students in this study at the time of graduation from their radiography program was lower. This may be explained by the large percentage (79%, *n* = 126) of respondents who were age 25 and over and who were less likely to have their parents' earnings reflected in their annual household income.

Program type. The majority of students in this study (63%, *n* = 103) completed a radiography educational program that was housed in a college or university. Thirty-seven percent (*n* = 60) completed programs sponsored by hospitals, technical schools, and the military. Of all study respondents (*n* = 163), 19% (*n* = 31) attended hospital programs, 16% (*n* = 26) attended technical programs, and 2% (*n* = 3) attended a military program. There are approximately 615 radiography educational programs that are accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT, 2014b). Of these 615 programs, approximately 148 (24%) are listed as certificate programs and approximately 140 (23%) can be clearly identified on the JRCERT website as being sponsored by healthcare organizations (JRCERT, 2014b). The remaining eight programs are offered in facilities identified as universities, technical centers, or occupational centers (JRCERT, 2014b). This suggests that the percentage of students in this study who attended a hospital-based radiography educational program (19%) is similar to the percentage of JRCERT-accredited programs in radiography that are sponsored by health care organizations (23%). Determining if the ratio of students in this study who completed radiography educational programs housed in colleges or university is not possible because reliable information could not be found about the number of baccalaureate-level radiography programs. Unlike certificate-granting radiography programs housed in health care organizations that must have JRCERT-accreditation to effectively function, programs offered in colleges and universities are not necessarily bounded by JRCERT accreditation because they have other accreditation options (ARRT, 2013). Additionally, there are a number of partnership models and degree-granting models that exist relative to radiography education that allows students who have attended a hospital-based program to earn an academic degree.

Terminal award received. Eighty-six percent (n = 140) of students in this study earned an academic degree. Of those who earned a degree, 86% (n = 120) earned an associate degree. Of the respondents who attended a technical program, 88% (n = 23) indicated that they earned an associate degree whereas the remaining 12% (n = 3) of respondents who attended a technical program earned a certificate. Approximately 23% of radiography educational programs that are accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT, award certificates (JRCERT, 2014b). Further, of all associate degrees, bachelor's degrees, and degrees lower than the associate level (certificates) that were granted by post-secondary institutions in 2012, 33% were certificates, 19% were associate degrees, and 48% were bachelor's degrees (U.S. Department of Education, 2014). The number of students in my study who earned certificates does not represent the number of certificate programs accredited by the

JRCERT, and it is markedly lower than the number of certificates granted by post-secondary institutions.

Gender of role models. There were more females in all five of the role model categories in this study. These findings align with data from a 2011 survey by the American Society of Radiologic Technologists of program directors in radiologic technology educational programs that indicated that 69% were female and 31% were male. This suggests that for every one male program director, there were 2.2 female program directors. In this study, for every one student who worked with predominantly male program directors (n = 54) there were 1.8 students who worked with predominantly female program director (n = 99). As the status of the role model's position increased, more students reported working with predominantly men in that role model position. For every one student who worked with predominantly male radiologic technologists, 7.6 females worked with predominantly female radiologic technologists. But, for every one student who worked with predominantly male department directors, 1.5 worked with predominantly female department directors.

The gender of radiography students and radiography role models are important topics given that health care and academic organizations are historically gendered and exude a patriarchal mindset – even if it is less obvious and the organization is conceptualized as being gender-neutral (Acker, 1990; Abramovitz, 1996). Schmidt (2006) reported that female radiography students in her study indicated that they lacked female leader role models in the profession and questioned if leadership opportunities would exist for them in their future careers. Findings of this current study do not suggest that gender issues clearly or consistently factored into students' perceptions of leadership, of leadership opportunities in the field, or of their own self-efficacy with regard to transformational leadership.

"Are radiographers, in general, leaders?" This variable, *are radiographers, in general, leaders?* was included in the questionnaire for this study only as an item of interest and results of statistical analyses of this variable served only as "value added." This question was intended to garner an overall leadership rating for all radiologic technologists, as a collective, including educators, administrators, clinicians, leaders of professional societies, and others. The question was not intended to focus only on radiologic technologists who were categorized as one of the five role models in this study. Nevertheless, wording of the item on the questionnaire referenced "the profession" and also "radiologic technologists," and may have therefore resulted in a variety of interpretations by respondents. The anecdotal comments related to this question that were made by respondents indicated that they were referring specifically to radiologic technologists who were categorized as one of the five role models in this study. Hence, this item may not be a reliable measure and may not reflect students' perceptions of the leadership of all members of the radiography profession as was the original intent of the question. Among students who were 24 years of age and under, 97% (n = 32) perceived radiologic technologists as leaders, 85% (n = 61) of students between the ages of 25 and 35 perceived radiologic technologists as leaders, and 67% (n =36) of students over the age of 35 perceived radiologic technologists as leaders. Respondents who answered "no" or "not sure" to this question were asked to explain their response. Thirty-one respondents provided anecdotal information and of the 31, 18 respondents were in the over age 35 years group. Seventeen of the 18 respondents who answered "no" or "not sure" to this question provided anecdotal information. For the sake of comparing and contrasting responses from students who perceived that radiologic technologists, in general, are leaders to those who did not know or who were not sure, soliciting anecdotal information from all respondents would have been beneficial.

Anecdotal responses to the question, "*Are radiologic technologists, in general, leaders?"* are displayed in Table 3.

Table 3

Anecdotal Information for Radiographers as Leaders

Age Group

Age Not Given

Are radiologic technologists, in general, leaders?

Not sure	*Most of the RTs out in the field felt like we were replacing them.*

24 Years and Younger

Are radiologic technologists, in general, leaders?

Not sure	*I feel like it was a very dog eat dog world. Everything was, people were competitive and mostly concerned about their own welfare unless they had developed a friendship with someone. But I chose "not sure" (to this question) because when it actually came down to the welfare of the patient, everyone would collaborate pretty well to get the job done.*

25 - 35 Years of Age

Are radiologic technologists, in general, leaders?

Not sure	*I felt many saw it as just a job.*
Not sure	*Few had potential to be good leaders and liked to teach. Some just put up with the students and taught enough for good workflow, good teachers but not leaders. And few were threaten by the students having more knowledge and skills and this affected their way of teaching and our learning.*
Not sure	*I feel that many people have the idea that Radiologic Technology is "just a job," and that idea unfortunately creates a generation of so-called "button pushers." On the other hand, I have had an opportunity to work with several people that are passionate about their chosen career, enthusiastic about new ideas, and very conscious about dose creep, safety and shielding, and protection as a whole. Patient care varies from person to person, but I think that I am a better person for having had training with various types of technologists.*
Not sure	*There were many Technologists that I had worked with as a student who always complained about this field, at some point I felt as if this isn't for me too but in the end, I have no regrets. Just being a student is hard as it is and to hear almost everyone stating that they would have chosen a different career was hard.*
Not sure	*For the most part, yes, but there were a couple techs that could be difficult to work with. They had problems with the techs and students.*
Not sure	*Everyone has different ideas concerning what they want out of life.*
Not sure	*I felt half the techs were good leaders or had the potential to be and half I felt did not.*

No	*Didn't really think about that, but now that I am in the field, rad techs can be very good leaders. Many can if that is what they want out of life.*
No	*Not all techs can be leaders - just fact.*
No	*Not everyone wants to take that initiative to influence others.*
No	*Most seemed apathetic.*

<u>Over 35 Years of Age</u>

<u>Are radiologic technologists, in general, leaders?</u>

Not sure	*Some seem jaded by years of dealing with patients.*
Not sure	*Some yes, some it's just a job.*
Not sure	*A few techs were bad.*
Not sure	*Some techs were willing to be in this role and some considered it an obligation.*
Not sure	*Everybody had very different personalities.*
Not sure	*It depends on the individual. Not all are leaders.*
Not sure	*So many of them were negative towards us a students, it is hard to believe they could be decent leaders.*
Not sure	*They don't always and do not like change, new ideas.*
No	*Lack of integrity.*
No	*As a veteran I know from experience that not everyone is a leader, especially a good leader.*
No	*A lot of negativity.*
No	*Because most of them were prejudice.*
No	*From my limited perspective, techs are very independent. Their social status was based on certifications held, and speed in performing exams; not a formal leadership role.*
No	*Most just doing their job.*
No	*I did not observe any leadership.*
No	*RTs felt their employment was threatened by top performing students. They continuously spoke of how the market is saturated and to move on.*
No	*I found veterans to be very judgmental and not willing to be patient allow us to learn at our pace.*

Independent and Dependent Variables

Independent Variable

The independent variable in this study was the transformational leadership behaviors exhibited by radiography role models during the radiography educational process. In this study, respondents rated the leadership behaviors of five primary types of radiography role models (program directors, clinical coordinators, clinical instructors, radiologic technologists, and department directors) through use of a non-permissioned adapted version of the Student-Leadership Practices Inventory (Student-LPI) (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) using a five-point scale ranging from "never" to "always." Based on mean composite role model leadership scores, students rated program directors highest in transformational leadership with a mean composite score of 4.25 (n = 157). Radiologic technologists were rated lowest with a mean composite score of 3.62 (n = 162).
Composite leadership scores for all radiography role models in aggregate varied from scores of 1 to 5 with radiologic technologists having the widest range (1 to 5) and program directors having the narrowest range (1.5 to 5). Respondents rated the leadership behaviors of all radiography role models in aggregate greater than 3.0 on a scale of 1 to 5 with the lowest mean score of the five leaders being for radiologic technologists (M = 3.62, n = 162).

To evaluate if students rated transformational leadership of radiography role models differently according to the position held by the radiography role models (program directors, clinical coordinators, clinical instructors, radiologic technologist, department directors), I conducted one-way ANOVAs with Scheffe post hoc tests. Results indicated statistically significant differences in some role models' mean composite leadership scores. Students did not rate the transformational leadership scores of program directors, clinical coordinators, and clinical instructors statistically significantly differently. Program directors and clinical coordinators were rated statistically significantly higher than radiologic technologists and department directors, and clinical instructors were rated statistically significantly higher than radiologic technologists but not department directors.   The mean composite leadership scores of radiologic technologists and department directors was not statistically significant different.

Table 4 shows measures of central tendency and spread for composite role model leadership scores of all radiography role models. Composite student self-efficacy for leadership scores is also included in Table 4 for parsimony.

Table 4

Measures of Central Tendency and Spread for Role Model Leadership and Student Self-Efficacy Scores

Radiography Role Models	n	Mean	Standard Deviation	Minimum	Maximum
Program Directors	157	4.25	0.79	1.5	5
Clinical Coordinators	155	4.15	0.86	1.1	5
Clinical Instructors	161	4.04	0.85	1.1	5
Radiologic Technologists	162	3.62	0.88	1	5
Department Directors	130	3.82	1.01	1.2	5
Student/Respondent	157	4.79	0.27	3.86	5

Table 5 shows results of comparisons of composite role model leadership scores of all radiography role models.

Table 5

Comparison of Composite Role Model Leadership Scores

Students' Ratings of:	**Program Directors**	**Clinical Coordinators**	**Clinical Instructors**	**Radiologic Technologists**	**Department Directors**
Mean Composite Leadership Scores	4.25	4.15	4.04	3.62	3.82
Differences in Means					
Program Director					
Clinical Coordinators	.10				
Clinical Instructors	.21	.11			
Radiology Technologists	.63***	.53***	.42**		
Department Directors	.43**	.33*	.22	.20	

* $p < .05$, ** $p < .01$, *** $p < .001$

Respondents were asked to identify if the number of radiography role models with whom they worked in each role model category were predominantly women or men. In all five radiography role model categories, the majority of students indicated that they worked with all or majority women. Figure 2 displays the proportion of students who worked with predominantly women versus predominantly men for each radiography role models category.

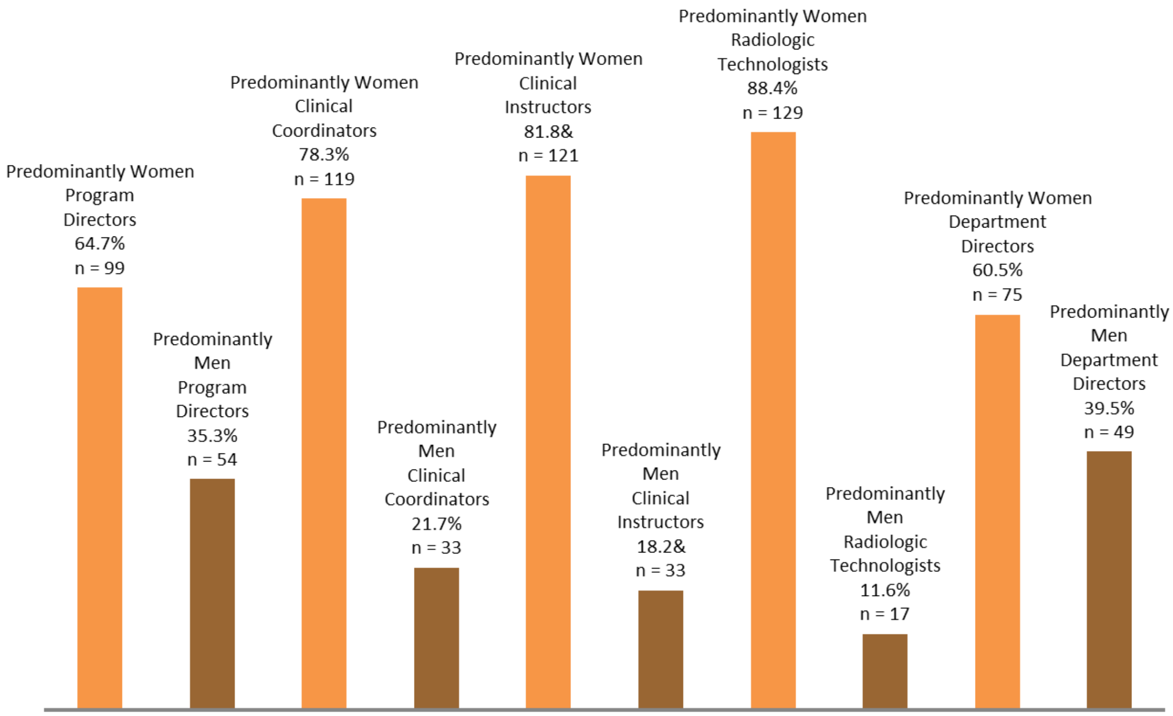

Figure 2. Comparison of Gender of Radiography Role Models with Whom Students Worked

Women were most predominant among radiologic technologists, with 88.4% of students reporting that they worked with all or mostly women. For every one student who worked with predominantly men in the radiologic technologist role (*n* = 17), 7.6 students worked with predominantly women in the radiologic technologist role (*n* = 129). Women were least predominant among department directors, with 60.5% of students reporting that they worked with all or mostly women. For every one student who worked with predominantly men in the department director role (*n* = 49), 1.5 students worked with predominantly women in the department director role (*n* = 75).

Distribution of the Dependent Variables

The dependent variables in this study were 1) perceptions that radiography students have of leadership opportunities in the field of radiography and 2) perceptions that radiography students have of their own self-efficacy with regard to transformational leadership.

Leadership opportunities in the field of radiography. Leadership opportunities in the field of radiography were evaluated by asking respondents to review a list of formal and informal leadership opportunities in the field that were included in the questionnaire for this survey. Respondents were asked to check all opportunities that they thought existed for them at the time of graduation from their radiography program or in the future. The list also included an option of "none" as well an open ended item in which respondents could write in other opportunities that were not included on this list.

The category of leadership opportunities in the field that was identified by the largest number of respondents was *mentoring students* (74.8%, n = 122) followed by *mentoring new technologists* (50.9%, n = 83). Categories of opportunities that were identified the least number of times were *committee work in professional societies; no opportunities; officer positions in professional societies; formal leadership positions in health care organizations* such as vice-president, senior vice-president, president, or chief executive officer; *formal leadership positions in academic organizations* such as dean or department chair; and *other opportunities.* For *other opportunities,* respondents indicated that they thought leadership opportunities existed in the specialty areas of medical imaging including computed tomography (CT), angiography, magnetic resonance imaging (MRI), mobile radiography, and radiation therapy. One respondent identified the opportunity to help build a start-up facility. Figure 3 depicts the frequency of all individual leadership opportunities identified by respondents.

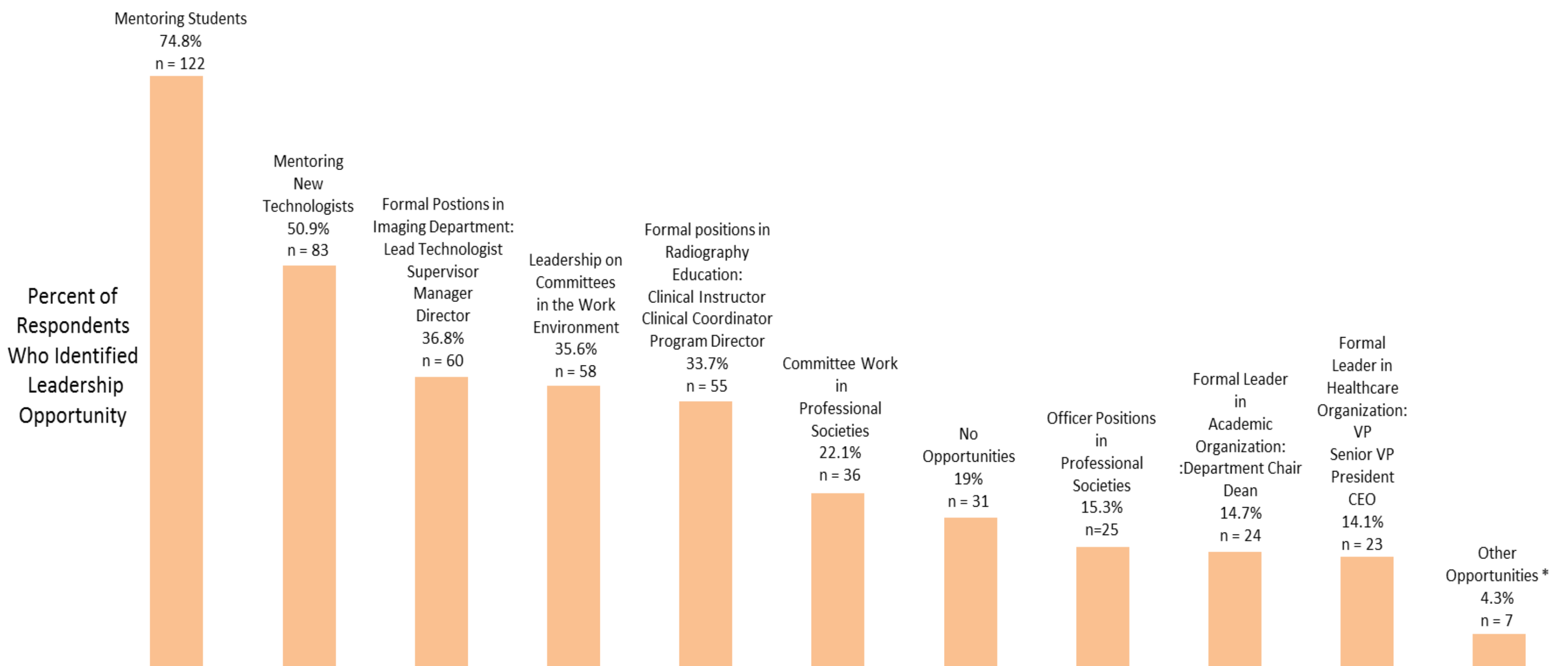

Figure 3. *Perceptions of Leadership Opportunities that Exist for Radiologic Technologists Upon Graduation or in the Future*

Based on my perception that the list of leadership opportunities in the field that students identified in the survey for this study is progressive in nature in terms of a potential career trajectory for radiographers, I categorized the 11 leadership opportunities into four new variables: 1) no opportunities, 2) narrow range of opportunities, 3) wider range of opportunities, and 4) widest range of opportunities. Figure 4 shows the percentages for leadership opportunities identified by students that I categorized into four variables. Of the students who indicated that leadership opportunities exist for radiographers, most perceived that only opportunities exist in the narrow range of opportunities. The least number of students who indicated that leadership opportunities exist for radiographers identified opportunities in the widest range of opportunities.

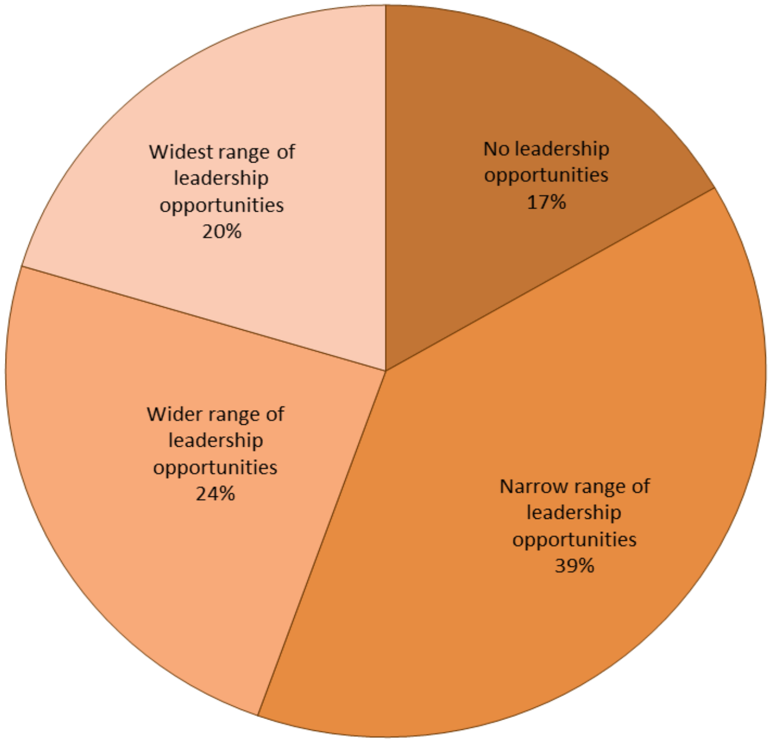

Figure 4. Students' Perceptions of Leadership Opportunities for Radiographers. Narrow range leadership opportunities entail committees in the work environment and in professional societies, student mentoring, mentoring technologists, and "other opportunities." Wider range opportunities include all opportunities that are in the narrow range plus formal positions in the imaging department (supervisor, manager, or director), formal positions in radiography education (clinical coordinator, clinical instructor, program director) and leaders of professional societies. Widest range opportunities include all opportunities that are in the narrow and wider ranges plus leadership opportunities in academic organizations (dean, department chair) and leaders in health care organizations (vice president, senior vice president, or chief executive officer).

Perceptions that radiography students have of their own self-efficacy with regard to transformational leadership. To assess students' self-efficacy with regard to transformational leadership, respondents completed a modified, non-permissioned version of the Student Leadership Practices Inventory (Student-LPI) (Arendt & Gregoire, 2005; Endress, 2000; Kouzes & Posner, 1998) using an 11-point Likert-like scale. A composite student self-efficacy for leadership score was then computed for each respondent. For the sake of comparison with composite role model leadership scores, student self-efficacy for leadership scores were adjusted to a scale of 1 to 5 with 1 equaling "cannot do" and 5 equaling "can do." Table 4, displayed earlier, shows measures of central tendency and spread for composite student self-efficacy for leadership score.

Results of Bivariate and Multivariate Statistical Analyses by Research Question

This section presents results of bivariate and multivariate statistical analyses by research question.

Research Question One (RQ1)

The primary intent of Research Question 1 was to understand the perceptions that radiography students had of the transformational leadership behaviors demonstrated by their radiography role models. Since composite role model leadership score was treated as continuous variable, I used two-group differences of means tests (independent samples t-tests) and one-way ANOVAs with Scheffe post hoc tests for bivariate analyses based on attributes of the variables including levels of measurement and the number of categories. I used ordinary least squares for multiple regression analyses.

RQ1.A. How do radiography students rate the transformational leadership of their radiography role models? I conducted descriptive statistics to calculate measures of central tendency and spread for the composite role model leadership scores. Students rated program directors highest in transformational leadership followed next by clinical coordinators, clinical instructors, department directors, and radiologic technologists. Mean composite leadership scores for the five radiography role models are discussed earlier in this chapter and are displayed earlier in Table 4.

RQ1.A.i. Do radiography students rate the transformational leadership of their role models differently relative to the position of the role model (program director, clinical

coordinator, clinical instructor, radiologic technologist, or department director)? I conducted one-way ANOVAs with Scheffe post hoc tests to evaluate if students rated transformational leadership of radiography role models differently according to the position held by the radiography role models. Statistically significant differences surfaced in the comparisons of some role models' leadership scores. Statistically significant differences in the mean composite leadership scores for the five radiography role models are discussed earlier in this chapter and are displayed earlier in Table 5.

RQ1.B. Do radiography students rate the transformational leadership of their role models differently relative to other variables? I conducted bivariate statistical analyses to determine if characteristics of students, radiography role models, or radiography programs influenced how students perceived the transformational leadership of their radiography role models. I used independent sample t-tests to evaluate potential relationships between composite role model leadership scores and gender of role models, radiography program type, terminal degree awarded, student gender, student race/ethnicity, and student annual household income at the time of graduation. I used one-way analysis of variance tests to evaluate potential differences in the means of composite role model leadership scores by age of student. Additionally, I conducted statistical analyses of the variable, *are radiographers, in general, leaders?* for comparison to other variables. Results of statistical analyses for composite leadership scores of radiography role models against control variables and *are radiographers, in general, leaders?* follow.

RQ1.B. i. Do radiography students rate the transformational leadership of their role models differently relative to the gender of the radiography role models? I conducted independent-samples t-tests to evaluate relationships between composite leadership scores of radiography role models for all five groups (program directors, clinical coordinators, clinical instructors, and department directors) and the gender of the radiography role model with whom students worked. Gender of radiography role models was categorized as *all or majority women* and *all or majority men*. The composite leadership scores of role models with whom students worked who were predominantly women was compared to the scores of role models in the same category with whom student worked who were predominantly men. In analyses not shown, at the .05 level of significance, independent-samples t-test showed no statistically significant differences in the composite role model leadership scores of any role model type whether students worked with predominantly women or predominantly men in that category of role model.

RQ1.B. ii. Do radiography students rate the transformational leadership of their role models differently based on the type of radiography program the student attended? I conducted independent-samples t-tests to assess relationships between mean composite role model leadership scores and types of radiography programs that students attended. Program type was categorized into 1) hospital-based, technical, and military programs, and 2) college/university programs. Results of the independent-samples t-test showed at the .01 level of significance statistically significant differences in the mean composite role model leadership scores for program directors as a function of program type, $t(155) = -2.82$, $p = .005$, $\alpha = .005$. The mean composite role model leadership scores of program directors were higher when rated by students who attended a college/university program ($M = 4.02$, $SD = .70$, $n = 98$) than by students who attended a hospital, technical, or military program ($M = 4.02$, $SD = .90$, $n = 59$). The independent-samples t-test failed to show significant differences in mean composite role model leadership scores of the four other radiography role models as a function of program type.

Results of the bivariate statistical analyses that revealed statistically significant differences of means between composite leadership scores of radiography role models and other control variables are presented in Table 6.

Table 6

Bivariate Analysis of Role Model Leadership Scores and Student Age, Student Income, Program Type, and Award Received

	Program Director			Clinical Coordinator			Clinical Instructor			Radiologic Technologists			Department Director		
	n	Mean or %	SD	n	Mean or %	SD	n	Mean or %	SD	n	Mean or %	SD	n	Mean or %	SD
Control Variables															
Age of students by category															
24 years of age and under	32	4.4	0.59	31	4.32	0.63	33	4.29	0.65	33	3.97**[a]	0.71	27	4.05	0.87
25 - 35 years of age	70	4.25	0.8	67	4.22	0.83	71	4.07	0.76	72	3.68	0.77	62	3.78	0.96
Over 35 years	51	4.18	0.87	53	4.01	0.97	53	3.88	1.02	158	3.63	0.87	39	3.71	1.17
Annual household income of students while in radiography program															
Under $50,000 per year	105	4.30	.78	104	4.20	.85	108	4.12	.79	108	3.73	.83	90	.3.81	.08
$50,000 and over per year	43	4.05	.85	42	3.96	.86	44	3.78*	.91	45	3.36*	.90	32	3.73	.13
Program type															
Hospital, technical, or military	59	4.02**	.90	56	4.04	.93	58	3.93	.82	60	3.50	.83	46	3.72	.94
College/university	98	4.38	.69	99	4.21	.81	103	4.10	.86	102	3.69	.91	84	3.87	1.05
Terminal award received															
Certificate or Diploma	21	3.91*	1.04	21	3.91	.99	22	4.06	.74	23	3.5	.80	14	3.76	1.07
Associate or Bachelor's Degree	136	4.30	.74	134	4.19	.83	139	4.03	.87	139	3.64	.89	11	3.82	1.00

[a] Age 24 and younger compared to over age 35.

p* < .05, ***p* < .01,* *p* < .001.

RQ1.B. iii Do radiography students rate the transformational leadership of their role models differently based on the terminal award the student received? I conducted independent-samples t-tests to evaluate relationships between mean composite role model leadership scores and types of terminal awards received by students. Terminal award received was categorized as 1) certificate or diploma and 2) associate and bachelor's degree. Results of the t-test at the .05 level of significance showed a significant difference in mean composite role model leadership scores for program directors as a function of terminal award received, $t(155) = -2.14$, $p = .034$, $\alpha = .05$. Transformational leadership behaviors of program directors were rated higher by students who received an associate or bachelor's degree ($M = 4.3$, $SD = .74$, $n = 136$) than by students who received a certificate or diploma ($M = 3.91$, $SD = 1.04$, $n = 21$). The independent-samples t-tests did not show significant differences in the means of composite role model leadership scores of the four other radiography role models and terminal award received.

RQ1.B. iv. Do radiography students rate the transformational leadership of their role models differently based on the students' gender? I conducted independent-samples t-tests to evaluate relationships between mean composite role model leadership scores and students' gender. Students' gender was categorized as 1) woman and 2) man. Results of the independent-samples t-tests at the .05 level of significance failed to show significant differences between mean composite role model leadership scores in any of the five leader categories as a function of students' gender in any role model category.

RQ1.B. v. Do radiography students rate the transformational leadership of their role models differently based on the students' age? I conducted one-way analysis of variance tests to evaluate the relationship between composite role model leadership scores and students' age. Students' age was comprised of three categories that included 24 years and younger, 25 to 35 years, and over 35 years. Results of the ANOVA at the .01 level of significance showed statistically significant difference between mean composite role model leadership scores for radiologic technologists as a function of students' age ($F[2, 155] = 5.386$, $p = .005$, $\alpha = .05$). The test showed that the mean composite role model leadership score for radiologic technologists was statistically significantly higher in the 24 years and younger category ($M = 3.97$, $SD = .71$, $n = 33$) compared to the over 35 years category ($M = 3.36$, $SD = 1.02$. $n = 53$). There were no statistically significant differences in mean composite role model leadership scores for radiologic technologists between the 24 years and younger category or the over 35 years category when compared to the 25 to 35 years category ($M = 3.37$, $SD = .77$, $n = 72$). Additionally, there were no other statistically significant differences in mean composite role model leadership scores of the four other role model positions (program director, clinical coordinator, clinical instructor, and department director) as a function of students' age. Table 6 demonstrates the breakdown of mean leadership scores of radiography role models for students' age in groups from IBM SPSS output data for the one-way ANOVA that was used to compare the means of these two variables as well as other statistically significant differences of means that emerged in the bivariate analyses of composite leadership scores of radiography role.

RQ1.B. vi. Do radiography students rate the transformational leadership of their role models differently based on the student's race/ethnicity? To evaluate relationships between mean composite role model leadership scores and students' ethnicity/race, I conducted independent-samples t-tests. Race/ethnicity was categorized as 1) White, and 2), non-White. Test results indicated at the .05 level of significance that there were no significant differences between mean composite role model leadership scores in any category of role model and students' ethnicity/race.

RQ1.B. vii. Do radiography students rate the transformational leadership of their role models differently based on the student's annual household income per year? I conducted an independent-samples t-test to assess the relationship between mean composite role model leadership scores of radiography role models and student's annual household income per year at the time of graduation from their radiography program. Student's annual household income per year was categorized as 1) under $50,000 per year, and 2) $50,000 per year and over. The results of the t-tests showed, at the .05 level of significance, statistically significant differences in mean composite role model leadership scores for both clinical instructors, $t(150) = 2.28$, $p = .02$, $\alpha = .05$, and radiologic technologists, $t(151) = 2.44$, $p = .02$, $\alpha = .05$ by students' level of annual household income per year at the time of graduation. Mean composite role model leadership scores of clinical instructors were statistically significantly higher as rated by students whose household income was under $50,000 per year at time of graduating from their radiography program ($M = 4.12$, $SD = .79$, $n = 108$) than by students whose household income was $50,000 and over per year at time of graduating from their radiography program ($M = 3.78$, $SD = .91$, $n = 44$). Likewise, mean composite role model leadership scores of radiologic technologists were statistically significantly higher as rated by students whose household income was under $50,000 per year at time of graduating from their radiography program ($M = 3.73$, $SD = .83$, $n = 108$) than by students whose household income was $50,000 and over per year at time of graduating from their radiography program ($M = 3.36$, $SD = .90$, $n = 32$). Based on independent samples t-tests, at the .05 level of significance, there were no statistically significant differences in composite role model leadership scores for program directors, clinical coordinators, and department directions between students with annual household incomes below $50,000 per years and those with incomes $50,000 per year and over. Results are displayed in Table 6.

RQ1.B.viii. Do radiography students rate their role models differently relative to students' perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders? I conducted independent-samples t-tests to assess the relationship between mean composite role model leadership scores of radiography role models by students' perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders. Students' perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders were categorized as 1) yes and 2) no or not sure. The t-tests showed, at the .05 level of significance, statistically significant differences in mean composite role model leadership scores for all role models relative to perceptions students have of the profession of radiologic technology and its members, as a whole, are leaders. Students who indicated that they thought the profession of radiologic technology and its members, as a whole, are leaders rated the transformational leadership behaviors of all radiography role models statistically significantly higher than students who indicated that they did not think or were not sure if the profession of radiologic technology and its members, as a whole, are leaders. Results are displayed in Table 7.

Table 7

Bivariate Analysis of Radiographers as Leaders, Role Model Leadership Score, and Composite Student Self-Efficacy Scores

	In general, are radiographers leaders?						Differences in means of "yes" and "no or not sure" groups
	Yes		No or Not Sure				
Variable	***n***	***M(SD)***	***n***	***M(SD)***	***t(DF)***	**α**	
Composite Leadership Score of Role Model							
Program Director[a]	129	4.35 (.68)	28	3.77 (1.08)	2.72** (31.85)	.01	.58
Clinical Coordinator[b]	126	4.26 (.74)	29	3.69 (1.15)	2.53* (33.44)	.02	.57
Clinical Instructor[c]	131	4.15 (72)	30	3.54 (1.17)	2.72** (34.13)	.01	.61
Radiologic Technologist	131	3.85 (73)	31	2.64 (.80)	8.21*** (160)	<.01	1.21
Department Director	110	3.92 (.94)	20	3.26 (1.19)	2.77** (128)	.01	.66
Composite Self-Efficacy Score							
Student[d]	130	4.82 (.26)	27	4.68 (.31)	2.11* (34.12)	0.04	2.71

[a]Levene's Test for Equality of Variances for composite role model leadership score for program directors as a function of are radiographers leaders? was significant (*p* = .001, *α* = .05,) so the assumption of homogeneity of variance was violated for this analysis. Therefore, data for "equal variances not assumed" was used to account for the different sample sizes.

[b]Levene's Test for Equality of Variances for composite role model leadership score for clinical coordinators as a function of are radiographers leaders? was significant (*p* = .003, *α* = .05,) so the assumption of homogeneity of variance was violated for this analysis. Therefore, data for "equal variances not assumed" was used to account for the different sample sizes.

[c]Levene's Test for Equality of Variances for composite role model leadership score for clinical instructors as a function of are radiographers leaders? was significant (*p* = < .001, *α* = .05,) so the assumption of homogeneity of variance was violated for this analysis. Therefore, data for "equal variances not assumed" was used to account for the different sample sizes.

[d]Levene's Test for Equality of Variances for composite role model leadership score for students as a function of are radiographers leaders? was significant (*p* = < .035, *α* = .05,) so the assumption of homogeneity of variance was violated for this analysis. Therefore, data for "equal variances not assumed" was used to account for the different sample sizes.

p* < .05, ***p* < .01,* *p* < .001.

Multiple Regression Analyses of RQ1. Student Perceptions of Radiography Role Models' Leadership

Using IBM SPSS, I ran several series of multiple regression analyses to examine relationships between students' sociodemographic characteristics and program characteristics and students' perceptions of the transformational leadership behavior of their radiography role models. I regressed role model Student-LPI scores on control variables: student characteristics (age, gender, race/ethnicity, and annual household income at time of graduation from the radiography program), program characteristics (program type and terminal award received), and gender of radiography role models.

Having conducted exploratory data analyses at the univariate level, I took corrective action by dropping six outlying cases to reduce skewness and kurtosis of student self-efficacy for leadership which normalized the distributional shape of the variable. For each OLS regression model, I also analyzed regression diagnostic tests that included variance inflation factors (VIF) and found no evidence of multicolinearity in any of the analyses. Additionally, for each OLS regression model, I reviewed residuals versus fitted values plots (RVF plots) and found no problems with heteroskedasticity.

The multiple regression analyses that I ran on data related to Research Question One did not yield compelling factors that predict how students perceive leadership behaviors in their radiography role models. Of the numerous analyses that I ran on all five role models in which I regressed role model's leadership scores on student characteristics, program characteristics, and then the predominant gender of each type of radiography role model the students encountered, few statistically significant predictive findings surfaced.

Regression analyses for Research Question One. How do radiography students rate the transformational leadership of their radiography role models? The series of multiple regression analyses that I conducted on composite role model leadership scores for program directors, clinical instructors, and radiologic technologists yielded some statistically significant results. There were no statistically significant results of the regression analyses that I conducted for clinical coordinators and department directors, and therefore, for parsimony, those analyses are not shown.

Regression models for transformational leadership of program directors. For Model 1 of this series, I regressed the composite role model leadership score of program directors on student characteristics (age, gender, race/ethnicity, and annual household income at time of graduation from the radiography program). At the .05 alpha level of significance, Model 1 was not significant and no individual predictor variable was statistically significant. In Model 2 of this series, I added program characteristics (program type and terminal award received) as predictor variables. At the .05 level of significance, Model 2 was statistically significant, ($F[7] = 2.19$, $p = .04$), but no individual predictor variable was statistically significant. In Model 3 of this series, I added program director gender as a predictor variable. At the .05 alpha level of significance, the overall model was not statistically significant and no individual predictor variables were statistically significant. In this series of analyses, Model 2 was the best model for predicting composite role model leadership score of program directors. No individual key predictor emerged in the model, but sociodemographic characteristics and program characteristics covaried and accounted for 11% of program directors' composite role model leadership scores

$R^2 = .11$.

These results suggest that the type of program that students attend and the type of terminal award that they earn co-vary with students' sociodemographic factors to predict how students perceive the transformational leadership behaviors in program directors. Regardless, all three models for program director, including the second model that was statistically significant, had relatively low R^2 values. This suggests that the transformational leadership scores of program directors cannot be explained well by the model and it cannot be determined with certainty, based on the findings of this study, which factors will predict how radiography students perceive the leadership behaviors of program directors. Table 8 displays the results of the series of multiple regression analyses that I conducted on composite role model leadership scores for program directors.

Table 8

Summary of OLS Regression of Program Director Role Model Leadership Score

	Model 1			Model 2			Model 3		
Variable	*b*	SE b	β	*b*	SE b	β	*b*	SE b	β
Control Variables									
Student Characteristics									
Gender (men)	.16	.14	.10	.18	.14	.11	.23	.17	.14
Age 24 and under[a]	.21	.19	.11	.28	.19	.14	.12	.22	.06
Age 25 – 35[a]	.07	.16	.04	.12	.15	.08	- .05	.19	- .03
Race/ethnicity (non-White)	.15	.17	.08	.14	.16	.07	.23	.22	.14
Annual household income (over $50k)	- .24	.16	- .13	- .16	.16	- .09	- .15	.19	- .08
Program Characteristics									
Program type (college)				.30	.16	.18	.22	.19	.14
Terminal award received (academic)				.28	.22	.12	.59	.30	.24
Gender of Program Director (predominantly men)							.07	.18	.04
Intercept (Constant)	4.14***				3.65***			3.66***	
R2		.04			.11			.11	
F		1.17			2.19*			1.91	
Model Comparison									
R^2 change				.06			.00		
F change					$F_{2, 127}$ = 4.58**			$F_{1, 126}$ = .89	

Note: Based on the principle of parsimony, Model 2 displayed in this table is the best predictive model for Program Director Composite Role Model Leadership Score.

OLS = ordinary least squares.

[a]over 35 years of age is the omitted reference category.

p* < .05, ***p* < .01,* *p* < .001.

Regression models for transformational leadership of clinical coordinators. At the .05 level of significance, regression analyses for composite role model leadership score of clinical coordinators did not result in a statistically significant predictive model and no statistically significant variables.

Regression models for transformational leadership of clinical instructors. At the .05 alpha level of significance, Model 1 was statistically significant, $F(5) = 2.87$, $p = .02$. Students age 24 and under was significant ($t = -2.31$, $p = .02$) and students' annual household income was significant ($t = 2.31$, $p = .02$). In Model 2, I added program characteristics (program type and terminal award received) as predictor variables. At the .05 level of significance, Model 2 was also statistically significant $F(7) = 2.25$, $p = .04$. Students age 24 and under was significant ($t = -2.40$, $p = .02$) and students' annual household income was significant ($t = -2.12$, $p = .04$). In Model 3, I added gender of clinical instructor as a predictor variable. At the .05 alpha level of significance, the overall model was not statistically significant. Students age 24 and under was significant ($t = 2.40$, $p = .08$) and student's annual household income was also significant ($t = -2.05$, $p = .04$). In this series of analyses, Model 2 was the best model for predicting composite role model leadership score of clinical instructors. Students' age 24 and under and students' annual household income emerged as the key predictors for composite role model leadership score of clinical instructors. In covariation with other sociodemographic characteristics and program characteristics, the model accounted for 12% of clinical instructors' composite role model leadership scores $R^2 = .12$.

These findings suggest that the age of students and their annual household income co-vary with student gender and race/ethnicity to predict how students perceive the transformational leadership behaviors in clinical instructors. However, the predictive value of these models is not strong based on relatively low R^2 values. This suggests that student age and annual household income do not account well for predicting how students rate the transformational leadership of their clinical instructors. Table 9 displays the results of the series of multiple regression analyses that I conducted on composite role model leadership scores for clinical instructors.

Table 9

OLS Regression Analyses of Clinical Instructor Leadership Score

	Model 1			Model 2			Model 3		
Variable	*b*	SE b	β	*b*	SE b	β	*b*	SE b	β
Control Variables									
Student Characteristics									
Gender (men)	.25	.15	.14	.28	.15	.16	.27	.15	.16
Age 24 and under[a]	.46*	.20	.22	.48*	.20	.24	.48*	.20	.24
Age 25 - 35[a]	.27	.17	.15	.27	.17	.15	.27	.17	.15
Race/ethnicity (non-white)	.16	.18	.08	.18	.18	.09	.19	.18	.09
Annual household income (over $50k)	-.38*	.16	-.20	-.35*	.17	-.18	-.34*	.17	-.18
Program Characteristics									
Program type (college)				.20	.17	.11	.21	.17	.12
Terminal award received (academic)				-.10	.25	-.04	-.10	.25	-.04
Gender of Clinical Coordinator (predominantly men)							-.06	.20	-.02
Intercept (Constant)		3.78***			3.72***			3.72***	
R2		.10			.11			.12	
F		2.87*			2.25*			1.96	
Model Comparison									
R^2 change					.01			.001	
F change					$F_{2, 122}$ = .72			$F_{2, 122}$ = .08	

[a]Over 35 years of age is the omitted reference category.

OLS = ordinary least squares.

*p < .05; **p < .01; ***p < .001.

Regression models for transformational leadership of radiologic technologists. At the .05 alpha level of significance, Model 1 was significant (F[5] = 2.73, p = .04) and students age 24 and under was significant at the .01 alpha level (t = 2.84, p = .01). In Model 2 of this series, I added program characteristics (program type and terminal award received) as predictor variables. At the .05 alpha level of significance, Model 2 was significant (F[7] = 2.52, p = .02) and students age 24 and under was significant at the .01 alpha level ($t =$ 3.09, $p = .002$). In Model 3 of this series, I added radiologic technologist gender as a predictor variable. At the .05 alpha level of significance, Model 3 was significant ($F[8] = 2.19$, $p = .04$) and students age 24 and under was significant at the .01 alpha level ($t =$ 3.07, $p = .003$).

In this series of analyses, Model 3 was the best model for predicting composite role model leadership score of radiologic technologists. Students' age 24 and under emerged as the key predictors for composite role model leadership score of radiologic technologists. In covariation with other sociodemographic characteristics and program characteristics, and gender of radiologic technologists, the model accounted for 13% of radiologic technologists' composite role model leadership scores $R^2 = .13$. The composite role model leadership score for radiologic technologists increased by .61 points when rated by students who were 24 years of age or younger.

These findings suggest that the age of students and their annual household income co-vary with student gender and race/ethnicity to predict how students perceive the transformational leadership behaviors in radiologic technologists. However, the predictive value of any of these models is not strong based on relatively low R^2 values. This suggests the transformational leadership radiologic technologists cannot be predicted by the age of the student.

Table 10 reports the results of the series of multiple regression analyses that I conducted on composite role model leadership scores for radiologic technologists.

Table 10

OLS Regression Analyses of Radiologic Technologist Leadership Score

	Model 1			Model 2			Model 3		
Variable	***b***	**SE b**	**β**	***b***	**SE b**	**β**	***b***	**SE b**	**β**
Control Variables									
Student Characteristics									
Gender (men)	.11	.15	.07	.12	.15	.07	.12	.15	.07
Age 24 and under[a]	.56**	.20	.28	.61**	.20	.30	.61**	.20	.30
Age 25 - 35[a]	.27	.16	.16	.31	.16	.19	.31	.17	.19
Race/ethnicity (non-white)	.24	.18	.11	.25	.18	.12	.24	.20	.12
Annual household income (over $50k)	-.30	.16	-.16	-.24	.16	-.13	-.24	.17	-.13
Program Characteristics									
Program type (college)				.20	.16	.12	.20	.16	.12
Terminal award received (academic)				.22	.24	.09	.22	.24	.09
Gender of Radiologic Technologist (predominantly men)							.05	.24	.02
Intercept (Constant)		3.40***			3.03***			3.03***	
R2		.10			.13			.13	
F		2.73*			2.52*			2.19*	
Model Comparison									
R^2 change					.05			.02	
F change					$F_{2, 121} = 1.91$			$F_{5,120} = .04$	

Note: OLS = ordinary least squares.
**p* = .05, ***p = .01,* ****p* = .001..

Regression models for transformational leadership of department directors. At the .05 level of significance, regression analyses for composite role model leadership score of department directors did not result in a statistically significant predictive model and no statistically significant variables.

Research Question Two (RQ2)

The primary intent of Research Question 2 was to understand the perceptions that radiography students had of leadership opportunities in the field of radiography. Four variables were used to analyze leadership opportunities in the field: (1) no leadership opportunities, (2) narrow range of opportunities for leadership such as committee work and mentoring students or other radiographers, (3) wider range of opportunities for leadership such as leadership opportunity at a mid-level or department level including supervision, management, educational program officials, and (4) widest range of opportunities for leadership such leadership opportunities at a higher level or organizational level including senior level administration in hospitals and academic institutions. Each of the four opportunity for leadership variables were dichotomous in that students either selected opportunities that were categorized into the variable or did not select opportunities that were categorized into the variable. At the bivariate level, I used independent samples t-tests to test differences of means between the dependent variable and composite role model leadership scores for the five radiography role models (a continuous variable). Since all other variables in Research Question 2 were categorical in nature, I used cross tabulations with chi-square tests for all other bivariate analyses. At the multivariate level, I used logistics regression analyses.

RQ2.A. What leadership opportunities in the field do radiography students identify? I conducted descriptive statistics to assess the perceptions that students have of leadership opportunities in the field. I analyzed the frequency of leadership opportunities that respondents indicated they thought existed upon graduation from their radiography program. I also analyzed how students perceived leadership opportunities by grouping the opportunities into four categories that suggest progression in the nature of the leadership opportunity (no opportunities, narrow range of leadership opportunities, wider range of leadership opportunities, and widest range of leadership opportunities). Leadership opportunities in the field of radiography that students identified in order of most frequent to least frequent are discussed earlier in this chapter and are displayed in Figure 3. Leadership opportunities in the field of radiography by category were also discussed earlier this chapter and are displayed in Figure 4.

RQ2.B. Do radiography students perceive leadership opportunities in the field differently relative to the leadership ratings of their role models (program director, clinical coordinator, clinical instructor, radiologic technologist, or department director)? I conducted independent samples t-tests to assess the relationship between students' perceptions of leadership opportunities in the field of radiography (based on four categories of opportunities) and their perceptions of the transformational leadership behaviors demonstrated by their radiography role models. Statistically significantly lower mean composite leadership scores for clinical instructors and radiologic technologists were reported by students who perceived there were no opportunities for leadership in the profession compared with students who perceived there were opportunities. No statistically significant differences emerged in composite role model leadership scores for program directors, clinical coordinators, or department directors based on whether students did or did not perceive leadership opportunities. Table 11 displays results of the statistically significant t-tests of this relationship.

At the .05 level of significance, independent samples t-tests did not show statistically significant relationships between students' perceptions of leadership opportunities in the other categories of opportunities (narrow range, wider range, and widest range) and the ratings of the transformational leadership of any of the five types of role models.

Table 11

Bivariate Analysis of Leadership Opportunities in the Field and Role Model Leadership Scores

Response to "There are No Leadership Opportunities"	**Program Directors Leadership Score**			
	n	*M(SD)*	*t(DF)*	*p*
Did not select	126	4.3 (.73)	-1.9 (29.81)	.07
Selected	25	3.92 (.96)		
	Clinical Coordinators Leadership Score			
	n	*M(SD)*	*t(DF)*	*p*
Did not select	126	4.17 (.81)	-1.31 (148)	.19
Selected	24	3.92 (1.06)		
	Clinical Instructors Leadership Score			
	n	*M(SD)*	*t(DF)*	*p*
Did not select	131	4.1 (.8)	2.38 (153)	.02*
Selected	24	3.66 (.96)		
	Radiologic Technologists Leadership Score			
	n	*M(SD)*	*t(DF)*	*p*
Did not select	130	3.72 (.82)	3.28 (154)	.001***
Selected	26	3.11 (.96)		
	Department Directors Leadership Score			
	n	*M(SD)*	*t(DF)*	*p*
Did not select	16	3.48(1.04)	-1.47 (124)	.14
Selected	110	3.72 (.82)		

Note: Role Model Leadership Scores are the Composite Role Model Leadership Scores.
[d]Levene's Test for Equality of Variances for there are no leadership opportunities as a function of program director composite role model was significant ($p = < .034$, $\alpha = .05$,) so the assumption of homogeneity of variance was violated for this analysis. Therefore, data for "equal variances not assumed" was used to account for the different sample sizes.

$*p < .05$, $**p < .01$*,*** $p < .001$.

RQ2.C. Do radiography students perceive opportunities for leadership in the field of radiography differently depending on other factors? I analyzed relationships between perceived leadership opportunities in the field and control variables by conducting independent samples t-tests and one-way ANOVAs, where appropriate. Additionally, I conducted statistical analyses of the item, "*Are radiographers, in general, leader?*" for comparison with other variables. Results of statistical analyses follow.

RQ2.C. i. Do radiography students perceive leadership opportunities differently relative to the predominant gender of the role models in each category? I conducted two-way contingency table analyses (cross tabulations with chi-square tests) to evaluate relationships between perceived leadership opportunities in the field and predominant gender represented in each type of radiography role model. Students' perceptions of leadership opportunities in the field related only to gender of clinical coordinators and radiologic technologists. At the .05 level of significance, cross tabulation with chi-square results indicated a statistically significant relationship between gender of clinical coordinators and the "no opportunities" for leadership variable, Pearson χ^2 (1, n = 148) = 5.28, p = .02, Cramer's V = .19. In sum, a larger proportion (31%, n = 10) of students who worked with clinical coordinators who were men (or the majority of whom were men) (n = 32) perceived that there are no opportunities for leadership in the field of radiography compared to 14% (n = 16) of students who worked with women (or the majority of whom were women) (n = 116) clinical coordinators and who perceived that there are no opportunities for leadership in the field of radiography. Additionally, at the .05 level of significance, test results showed a statistically significant relationship between gender of clinical coordinators and the "widest range" of leadership opportunities variable, Pearson χ^2 (1, 148) = 4.97, p = .03, Cramer's V = .18. Six percent (n = 2) of students who worked with clinical coordinators who were men (or the majority of whom were men) selected "widest range" of leadership opportunities compared to 24% (n = 28) of students who worked with clinical coordinators who were women (or the majority of whom were women) (n = 116) and who selected “widest range” of opportunities for leadership. So, students who worked with clinical coordinators who were men (or majority of whom were men) were less likely to perceive that leadership opportunities in the widest range category existed compared to students who worked with clinical coordinators who were women (or majority of whom were women).

Lastly, the gender of radiologic technologists was statistically related to perceptions that students had of opportunities in the “narrow range” category. Test results of students who perceived opportunities for leadership as it related to gender of radiologic technologists were χ^2 (1, 141) = 4.38, *p* = .04, Cramer’s *V* = .04. A smaller proportion (13%, *n* = 2) of students who worked with radiologic technologists who were men (or the majority of whom were men) perceived that opportunities for leadership that exist in the field of radiography are narrow in range compared to 39% (*n* = 49) of students who worked with radiologic technologists who were women (or the majority of whom were women) and who perceived that opportunities for leadership that exist in the field of radiography are narrow in range. At the .05 level of significance, two-way contingency table analyses (cross tabulations with Chi-square) did not show statistically significant relationships between any other category of opportunities for leadership and radiography role models in any of the five role model positions. Results for no opportunities for leadership regressed on gender of role model are displayed in Table 12.

Table 12

Bivariate Analysis of *No Leadership Opportunities and Gender of Role Models*

Response to "There are No Leadership Opportunities"	**Program Directors**			
	All or Majority Women	All or Majority Men	X^2	*p*
Selected	14	9	.11	.74
Did not select	80	44		
	Clinical Coordinator			
	All or Majority Women	All or Majority Men	X^2	*p*
Selected	16	10	5.278	.02*
Did not select	100	22		
	Clinical Instructors			
	All or Majority Women	All or Majority Men	X^2	*p*
Selected	21	3	0.77[a]	0.38
Did not select	3	24		
	Radiologic Technologists			
	All or Majority Women	All or Majority Men	X^2	*p*
Selected	23	1	1.48[b]	0.22
Did not select	102	15		
	Department Directors			
	All or Majority Women	All or Majority Men	X^2	*p*
Selected	8	7	0.31	0.57
Did not select	64	41		

[a]The chi-square test for clinical instructors had one cell (25%) with an expected count less than 5. The minimum expected count was 4.53.
[b]The chi-square test for radiologic technologists had one cell (25%) with an expected count less than 5. The minimum expected count was 2.72.
$*p < .05$, $**p < .01*$, $***p < .001$.

RQ2.C. ii. Do radiography students perceive leadership opportunities differently relative to the type of radiography program the student attended? I conducted two-way contingency table analyses (cross tabulations with chi-square) to evaluate relationships between leadership opportunities in the field and the type of radiography program the student attended.

Program type was categorized as 1) hospital-based, technical, or military, and 2) college or university. At the .001 level of significance, cross tabulations with chi-square results indicated statistically significant relationships between the “no opportunities” for leadership category as a function of program type. Twenty-nine percent (*n* = 17) of students who attended a hospital-based, technical, or military radiography program (*n* = 58) indicated that there are “no opportunities” for leadership compared to 9% (*n* = 9) of students who attended a radiography program housed in a college or university (*n* = 99). Seventy-one percent (*n* = 41) of students who attended a hospital-based, technical, or military radiography program did not select there are “no opportunities” for leadership compared to 91% (*n* = 90) of students who attended a radiography program housed in a college or university (*n* = 99). A statistically significantly larger proportion of students who attended a radiography program housed in a college or university perceived that opportunities for leadership in the field of radiography exist compared to students who attended a hospital, technical, or military radiography program. Table 13 displays results.

Table 13

Bivariate Analysis of No Leadership Opportunities and Program Type

Response to "There are No Leadership Opportunities"	**Type of Program Attended**			
	Hospital, Technical or Military	**College or University**	X^2	***p***
Selected	17	9	10.82	.001***
Did not select	41	90		

p* < .05, ***p* < .01*,* *p* < .001.

RQ2.C. iii. Do radiography students perceive leadership opportunities differently relative to the type of terminal award? I conducted two-way contingency table analyses (cross tabulations with chi-square, not shown) to evaluate relationships between leadership opportunities in the field and the type of terminal award students received. Terminal award received was categorized as 1) diploma or certificate, and 2) associate degree or bachelor's degree. There were no significant differences by type of award received, at the .05 level of significance, in any category of opportunities for leadership.

RQ2.C. iv. Do radiography students perceive leadership opportunities differently by gender? I conducted a two-way contingency table analyses (cross tabulations with chi-square, not shown) to evaluate the relationship between students' perceptions of leadership opportunities in the field and students' gender. There were no statistically significant differences at the .05 level of significance in any category of opportunities for leadership as a function of students' gender.

RQ2.C. v. Do radiography students perceive leadership opportunities differently relative to the students' age? I conducted a two-way contingency table analyses (cross tabulations with chi-square, not shown) to evaluate the relationship between students' perceptions of leadership opportunities in the field and students' age. Students' age had three categories (24 years and younger, 25 to 35 years, and over 35 years). There were no statistically significant differences at the .05 level of significance in any category of opportunities for leadership as a function of students' age.

RQ2.C. vi. Do radiography students perceive leadership opportunities differently relative to the student's ethnicity/race? I conducted a two-way contingency table analyses (cross tabulations with chi-square, not shown) to evaluate the relationship between students' perceptions of leadership opportunities in the field and students' ethnicity/race. Students' ethnicity/race had two categories (White and non-White). There were no statistically significant differences at the .05 level of significance in any category of opportunities for leadership as a function of students' ethnicity/race.

RQ2.C. vii. Do radiography students rate their role models differently relative to the student's annual household income? I conducted a two-way contingency table analyses (cross tabulations with chi-square, not shown) to evaluate the relationship between students' perceptions of leadership opportunities in the field and students' level of annual household income at the time of graduation from their radiography program. Students' annual household income had two categories (under $50,000 per year and $50,000 per year and over). There were no statistically significant differences at the .05 level of significance in any category of opportunities for leadership as a function of students' annual household income.

RQ2.C.viii. Do radiography students perceive leadership opportunities differently relative to students' perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders? I conducted two-way contingency table analyses (cross tabulations with chi-square) to evaluate the relationship between students' perceptions of leadership opportunities in the field and their perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders. Students' perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders had response categories of 1) yes, and 2) no or not sure. At the .01 level of significance, a statistically significant relationship was revealed between the "no opportunity" for leadership category and students' perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders, χ^2 (1, N = 157) = 9.05, p = .003, Cramer's V = .25. Only 12% (n = 16) of students who perceived that radiographers *are* leaders selected the "no opportunities" for leadership category compared with 88% (n = 113) of students who said radiographers are leaders and who perceived that there are leadership opportunities at some level (narrow, wider, widest). Thirty-six percent (*n* = 10*)* of students who thought that radiographers are *not* leaders or who were not sure also perceived that "no opportunities" for leadership exist, compared to 64% (*n* = 18*)* who perceived that opportunities exist at some level. In sum, a statistically significantly larger proportion of students who indicated that radiographers, in general, are leaders also perceived that opportunities for leadership in the field exist to some degree. The two-way contingency analyses failed to show statistically significant relationships between students' perceptions of leadership opportunities in the narrow range, wider range, or widest range categories as a function of students' perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders. Results are shown in Table 14.

Table 14

Bivariate Analysis of No Leadership Opportunities and Radiographers as Leaders

Response to "There are No Leadership Opportunities"	**Are Radiologic Technologists, in General, Leaders?**			
	Yes	**No or Not Sure**	X^2	***p***
Selected	16	10	9.05	.003**
Did not select	113	18		

Note: The chi-square test had one cell (25%) with an expected count less than 5. The minimum expected count was 4.53.

p* < .05, ***p* < .01*,* *p* < .001.

RQ2.C.ix. Do radiography students perceive leadership opportunities differently based on how they rate their own self-efficacy with regard to transformational leadership? I conducted independent samples t-tests to evaluate relationships between students' perceptions of leadership opportunities in the field of radiography and student's perceptions of their own self-efficacy for transformational leadership. At the .05 level of significance, statistically significant relationships resulted between the "narrow range" and "wider range" categories of leadership opportunities and composite student self-efficacy for leadership score. The mean self-efficacy for leadership score of students who indicated that there are opportunities in the narrow range category of leadership (*M* = 4.72, *n* = 59) had statistically significantly (*p* =.05) lower self-efficacy scores than those who did not indicate that there are opportunities in the narrow range category of leadership (*M* = 4.82, *n* = 93). The mean self-efficacy score of students who indicated that there are opportunities in the wider range category of leadership (*M* = 4.88, *n* = 37) had statistically significantly (*p* =.002) higher self-efficacy scores than those who did not indicate that there are opportunities in the wider range category of leadership (*M* = 4.72, *n* = 59). Independent samples t-tests did not show statistically significant relationships between students' perceptions of leadership opportunities in the "no opportunities" and "widest range" of leadership categories as a function of student's perceptions of their own self-efficacy for transformational leadership. Results of independent t-test analyses are displayed in Table 15.

Table 15

Bivariate Analysis of Students' Perceptions of Leadership Opportunities and Student Self-Efficacy for Leadership

	Leadership Self-Efficacy			
No Opportunities	*n*	*M(SD)*	*t(DF)*	*p*
Selected	24	4.78 (.26)	-1.07 (150)	.92
Did not select	128	4.78 (.28)		
Narrow Range Opportunities				
Selected*	59	4.72 (.31)	-2.03 (98.95)	.05*
Did not select	93	4.82 (.24)		
Wider Range Opportunities				
Selected**	37	4.88 (.18)	3.114 (101.29)	.002**
Did not select	115	4.75(.829)		
Widest Range Opportunities				
Selected	32	4.79 (.27)	.115(150)	.91
Did not select	120	4.78 (.27)		

*Levene's Test for Equality of Variances for narrow range opportunity as a function of composite student self-efficacy for leadership was significant (p = .008, α = 0.05,) so the assumption of homogeneity of variance was violated for this analysis. Therefore, data for "equal variances not assumed" was used to account for the different sample sizes.
*p < .05, ***p < .01, ****p < .001.

Regression analyses for Research Question Two. What do radiography students perceive about leadership opportunities in the field of radiography?

Using IBM SPSS, I ran logistic regression analyses to analyze if variables included in my study predicted how students perceived leadership opportunities in the field of radiography. For each of the four variables of leadership opportunities ("no opportunities," "narrow range" of opportunities, "wider range" of opportunities, and "widest range" of opportunities), I used a step-wide regression approach and systematically entered groups of predictor variables into one successive model specific to each of the five radiography role models. I tested the same model individually for each of the four categories of leadership opportunities because I expected unique predictors in each model. The first group of predictor variables entered into each model was student characteristics (age, gender, race/ethnicity, and annual household income at time of graduation from the radiography program). This was Model 1 in the series. In Model 2, I added program characteristics (program type and terminal award received). I then added the gender and composite role model leadership score for the specific role model under analysis. This was Model 3 in the series. Next, I added composite student self-efficacy for leadership score (Model 4). I followed this process for each of the five role models for each of the four leadership opportunity variables. I then included all predictor variables that were statistically significant $\leq$ .05 level of significance in the initial models of each of the four leadership opportunity variables in a final regression model. This systematic process entailed use of an "intelligent mix of reason and statistical exploration" (Hamilton, 1992, p. 84) that supports the theoretical and statistical soundness of my methods.

Overall, I ran more than 80 logistic regression analyses for Research Question Two. To simplify understanding of these numerous analyses, results for the series of models that I ran are displayed in one comprehensive table for each of the four (dichotomously coded) levels of perceived leadership opportunity (none, narrow, wider, widest). For parsimony, only models that were statistically significant or had variables that were statistically significant are included in the tables unless the analyses was otherwise compelling and warranted inclusion. Results of logistic regression analyses for leadership opportunities that yielded statistically significant models follow.

Regression models for "no opportunity" for leadership variable. I systematically regressed the "no opportunity" for leadership variable on each of the five role models as described previously. The series of analyses resulted in only one statistically significant model which included program directors. Results for logistic regression for no opportunity for leadership are included in Table 16.

Table 16

Logistic Regression Analyses of Predictors of No Opportunities by Role Model

Program Director

	Model 1			Model 2			Model 3			Model 4		
Predictor	*B*	*SE B*	*OR*	*B*	*SE B*	e^B	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*
Control Variables												
Student Characteristics												
Gender (man)	-.03	.53	.97	-.24	.57	.78	-.22	.59	.81	-.21	.59	.82
Age 24 and under[a]	.61	.58	1.85	.57	.62	1.77	.59	.63	1.80	.59	.63	1.81
Age 25 - 35[a]	.14	.58	1.15	-.28	.63	.75	-.29	.63	.75	-.27	.63	.76
Race/ethnicity (non-White)	.08	.72	1.08	-.19	.76	.83	-.14	.78	.87	-.15	.79	.86
Annual household income[b] ($50K & over)	-.15	.59	.86	-.13	.65	.88	-.06	.66	.94	-.08	.67	.92
Program Characteristics				.								
Program type (college)				-2.24***	.65	.11	-2.17**	.66	.11	-2.17**	.66	.12
Terminal award received (academic)				.76	.77	2.13	.95	.81	2.59	1.01	.81	2.74
Gender of Role Model (predominantly men)							-.19	.62	.83	-.21	.62	.81
Role Model Leadership Score							-.30	.37	.74	-.41	.39	.67
Student Self-Efficacy Score										.92	1.21	2.51
Constant	-1.94			-1.33			-.26			-4.29		
χ^2		1.15			15.22*			15.94			15.56	
df		5.00			7.00			9.00			10.00	
Nagelkerke R2		.02			.20			.21			.22	

Clinical Coordinator

	Model 1[e]			Model 2[f]			Model 3[g]			Model 4[h]		
Predictor	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*
Control Variables												
Student Characteristics												
Gender (man)	.24	.52	1.27	.05	.55	1.05	.02	.57	1.02	.02	.57	1.02
Age 24 and under[a]	.27	.61	1.31	.06	.64	1.06	-.25	.67	.78	-.27	.68	.77
Age 25 - 35[a]	.03	.57	1.03	-.15	.61	.87	-.12	.64	.89	-.09	.64	.92
Race/ethnicity (non-White)	-.32	.76	.73	-.59	.80	.55	-.60	.82	.55	-.60	.83	.55
Annual household **income[b]** ($50K & over)	-.09	.57	.91	-.06	.60	.94	-.15	.63	.86	-.18	.64	.84
Program Characteristics												
Program type (college)				-1.77***	.59	.17	-1.78**	.60	.17	-1.77**	.60	.17
Terminal award received (academic)				1.06	.87	2.90	1.14	.93	3.13	1.24	.95	3.46

Predictor	B	SE B	OR	B	SE B	OR	B	SE B	OR	B	SE B	OR
Gender of Role Model (predominantly men)							1.36*	.60	3.89	1.37*	1.37*	.61
Role Model Leadership Score							.07	.36	1.07	-.06	.41	.94
Student Self-Efficacy Score										.80	1.29	2.23
Constant	-1.86			-1.67			-2.30			-5.68		
χ^2		.77			10.38			15.42			.40	
df		5.00			7.00			9.00			15.83	
Nagelkerke R2		.01			.14			.20			.21	

Radiologic Technologist

	Model 1[e]			**Model 2[f]**			**Model 3[g]**			**Model 4[h]**		
Predictor	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*
Control Variables												
Student Characteristics												
Gender (man)	.12	.53	1.13	-.12	.59	.89	-.17	.60	.84	-.15	.61	.86
Age 24 and under[a]	.61	.61	1.83	.39	.65	1.48	.54	.68	1.72	.56	.68	1.75
Age 25 - 35[a]	.14	.58	1.14	-.33	.64	.72	-.44	.67	.64	-.43	.68	.65
Race/ethnicity (non-White)	.47	.70	1.60	.27	.75	1.31	.70	.83	2.02	.70	.83	2.02
Annual household income[b] ($50K & over)	.11	.62	1.11	.18	.68	1.20	.39	.74	1.47	.35	.75	1.42
Program Characteristics												
Program type (college)				-2.15***	.66	.12	-2.07**	.67	.13	-2.05**	.68	.13
Terminal award received (academic)				.51	.79	1.66	.62	.82	1.86	.63	.83	1.88
Gender of Role Model (predominantly men)							-1.04	1.16	.35	-1.07	1.16	.34
Role Model Leadership Score							-.71	.40	.49	-.80	.43	.45
Student Self-Efficacy Sco										.71	1.12	2.04
Constant	-2.12			-1.32			.95			-2.16		
χ^2		1.30			14.41*			18.58*			19.00*	
df		5.00			7.00			9.00			10.00	
Nagelkerke R2		.02			.20			.25			.26	

No Opportunity Final Model

	Final Model		
	B	*SE B*	e^B
Program type	-1.445**	.47	.24
Gender of clinical ;coordinator	1.07*	.49	2.92
Constant	-1.09		
χ^2		14.98***	
df		2.00	

Nagelkerke R2	.16

Note: I conducted a series of logistic regression analyses for no opportunities (not shown) for clinical instructor and department director similar to the analyses represented in this table. No model in either of these series of regression analyses was significant and the only variable that was significant in any of the models in both series was program type. To simplify the presentation of results, analyses displayed in this table include only series that had at least one statistically significant model. These series include program director, clinical coordinator, and radiologic technologist.

[a]Over 35 years of age is the omitted reference category.

[b]Annual household income at time of graduation from radiography program.

[c]This final model consists of predictor variables that were significant at .05 alpha level in any series of regressions conducted for no opportunities for leadership.

*$p < .05$; **$p < .01$; *** $p < .001$.

Program Directors. I conducted a series of four successive analyses in which no opportunity for leadership was regressed on predictor variables including program director gender and composite student self-efficacy for leadership score. Model 2 that included both student characteristics (age, gender, race/ethnicity, and annual household income) and program characteristics (program type and terminal award received) was statistically significant (χ^2 = 15.22[7], p = .03) at .the 05 level of significance. The predictive value of the model was not strong based on relatively low *Nagelkerke* R^2 value of .16. No other model was statistically significant. At the .05 level of significance, program type was statistically significant in Model 2 (Wald's χ^2 = 11.77[1], p = .001), in Model 3 (Wald's χ^2 = 10.81[1], p = .001), and in Model 4 (Wald's χ^2 = 10.72[1], p = .001). No other predictor variable was statistically significant in any model.

Clinical Coordinator. I conducted four successive analyses in which no opportunity was regressed on predictor variables including clinical coordinator gender and composite role model leadership score. At the .05 level of significance, no model in this series of analyses was statistically significant. Program type was statistically significant at .01 alpha level in Model 2 (Wald's χ^2 = 9.1[1], p = .003), in Model 3 (Wald's χ^2 = 8.69[1,, p = .003), and Model 4 (Wald's χ^2 = 11.77[1], p = .003). Gender of clinical coordinator was statistically significant at the .01 alpha level in Model 3 (Wald's χ^2 = 5.10[1,, p = .02) and in Model 4 (Wald's χ^2 = 8.58[1], p = .002). No other predictor variable was statistically significant in any model.

Clinical Instructors. I conducted four successive analyses in which no opportunity was regressed on predictor variables including clinical instructor gender and composite role model leadership score. At .05 level of significance, no model in this series of analyses was statistically significant. Program type was statistically significant at .01 level of significance in Model 2 (Wald's χ^2 = 8.26[1], p = .004), Model 3 (Wald's χ^2 = 7.72[1], p = .007), and Model 4 (Wald's χ^2 = 6.88[1], p = .009). No other predictor variable was statistically significant in any model.

Radiologic Technologists. I conducted four successive analyses in which no opportunity was regressed on predictor variables including radiologic technologist gender and composite role model leadership score. At the .05 level of significance, Model 2 was significant (χ^2 = 14.41[7], p = .04), Model 3 was significant (χ^2 = 18.58[9], p = .03), and Model 4 was significant at .01 alpha level (χ^2 = 19[10], p = .001). Program type was statistically significant at .001 alpha level in Model 2 (Wald's χ^2 = 10.77[1], p = .009), at .01 alpha level in Models 3 (Wald's χ^2 = 9.45[1], p = .002) and Model 4 (Wald's χ^2 = 9.1[1], p = .002). No other predictor variable was statistically significant in any model.

Department Directors. I conducted four successive analyses in which no opportunity was regressed on predictor variables including department director gender and composite role model leadership score. At the .05 level of significance, no model in this series of analyses was statistically significant. Program type was statistically significant at .05 alpha level in Model 2 (Wald's χ^2 = 4.75[1], p = .03), Model 3 (Wald's χ^2 = 4.25[1], p = .04) and at .01 alpha level in Model 4 (Wald's χ^2 = 4.17[1], p = .004). No other predictor variable was statistically significant in any model.

Final Predictive Logistic Regression Model for "no opportunity" for leadership variable. The final predictive model for the no opportunity for leadership variable consisted of program type and gender of clinical coordinator. The model was statistically significant at .001 alpha level (χ^2 = 14.98[2], p = .001). At .01 alpha level, program type was statistically significant (Wald's χ^2 = 9.62[1], p = .002) and at .05 alpha level, gender of clinical coordinator was significant (Wald's χ^2 = 4.74[1], p = .03). Students who completed a hospital, technical, or military program were .24 as likely to select the "no opportunities" for leadership response as they were to not select this response. All else being equal, when asked to identify leadership opportunities in the field of radiography, students who worked predominantly with men as clinical coordinators were 2.92 times as likely to select the "no opportunities" for leadership response as they were to not select this response. Results for regression analyses for no opportunity are displayed in Table 16.

Regression models for "narrow range opportunity" for leadership variable. I regressed the narrow range leadership opportunity variable on each of the five role models as described previously. Results for significant models are displayed in Table 17 that follows this section.

Program Directors. I conducted four successive analyses in which narrow range leadership opportunity was regressed on predictor variables that included program director variables. At the .05 level of significance, no model was statistically significant. Program type was statistically significant at the .05 level of significance in Model 3 (Wald's χ^2 = 3.8[1], p = .05) and Model 4 (Wald's χ^2 = 3.91[1], p = .05). Composite student self-efficacy for leadership score was significant at the .05 level of significance in Model 4 (Wald's χ^2 = 1.19[1], p = .02). No other predictor variable was statistically significant.

Clinical Coordinators. I conducted four successive analyses in which narrow range leadership opportunity was regressed on predictor variables that included clinical coordinator variables. At the .05 level of significance, no model in this series of analyses was statistically significant. Composite student self-efficacy for leadership score was significant at the .01 alpha level in Model 4 (Wald's $\chi^2 =$ 6.98[1], p = .01). No other predictor variable was statistically significant.

Clinical Instructors. I conducted four successive analyses in which narrow range leadership opportunity was regressed on predictor variables that included clinical instructor variables. At the .05 level of significance, no model in this series of analyses was statistically significant. Composite student self-efficacy for leadership score was significant at the .01 alpha level in Model 4 (Wald's $\chi^2 =$ 6.8[1], p = .01). No other predictor variable was statistically significant.

Radiologic Technologists. I conducted four successive analyses in which narrow range leadership opportunity was regressed on predictor variables that included radiologic technologist variables. At the .05 alpha level, no model in this series of analyses was statistically significant. Program type was significant at the .05 level of significance in Model 3 (Wald's $\chi^2 =$ 4.5[1], p = .04) and Model 4 (Wald's $\chi^2 =$ 4.35[1], p = .04). No other predictor variable was statistically significant.

Department Directors. I conducted four successive analyses in which narrow range leadership opportunity was regressed on predictor variables that included department director variables. At the .05 alpha level, no model in this series of analyses was statistically significant. Composite student self-efficacy for leadership score was significant the .05 level of significance in Model 4 (Wald's $\chi^2 = 5.76[1]$, $p = .02$). No other predictor variable was statistically significant.

Final Predictive Logistic Regression Model for "narrow range" of opportunities for leadership variable. The final predictive model for the narrow range of opportunities for leadership variable consisted of program type and composite student self-efficacy for leadership score. At the .05 level of significance, the model was statistically significant ($\chi^2 = 6.37[2]$, $p = .04$). At the .05 level of significance, student self-efficacy for leaderships score was statistically significant (Wald's $\chi^2 = 4.2[1]$, $p = .04$) but program type was not. The predictive value of the model was weak based on a *Nagelkerke* R^2 value of .06. All else being equal, for every one unit increase in the composite student self-efficacy for leadership score, students, when asked to identify leadership opportunities in the field of radiography, were .28 as likely to select leadership opportunities in the narrow range of opportunities for leadership compared to students who did not select opportunities in this category.

Table 17 displays results for the statistically significant models of logistic regression analyses conducted for narrow range of opportunities for leadership. With the goal of simplifying presentation of the numerous logistic regression analyses that I conducted, I did not display all results for models for the narrow range of opportunities for leadership. The table includes results of the program director model because it was the only model for narrow range of opportunities for leadership that had two statistically significant variables (although the overall model was not statistically significant). Table 17 also includes results from the radiologic technologist model because patterns consistently emerged at various points in my data suggesting that interesting relationships exist between students and radiologic technologists relative to leadership development. Results from my analyses of clinical coordinator, clinical instructor, and department director models are not displayed in Table 17 because the only variable that was statistically significant in any of these models was composite student self-efficacy for leadership score which was included in the final model. Displaying the regression results of clinical coordinator, clinical instructor, and department director models in Table 17 was not warranted as results were not significant.

Table 17

Logistic Regression Analyses of Predictors of Narrow Range Opportunities by Role Model

Program Director

	Model 1			Model 2			Model 3			Model 4		
Predictor	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*
Control Variables												
Student Characteristics												
Gender (man)	.19	.39	1.21	.31	.40	1.37	.28	.04	1.32	.29	.41	1.34
Age 24 and under[a]	.11	.52	1.12	.20	.54	1.22	.23	.54	1.26	.33	.56	1.40
Age 25 - 35[a]	.40	.44	1.50	.40	.44	1.49	.40	.45	1.50	.60	.47	1.81
Race/ethnicity (non-White)	-.26	.45	.77	-.23	.46	.79	-.20	.46	.82	-.19	.47	.83
Annual household income[b] ($50K and over)	-.58	.44	.56	-.44	.45	.64	-.40	.46	.67	-.39	.47	.68
Program Characteristics												
Program type (college)				.89	.46	2.42	.92*	.47	2.52	.98*	.50	2.66
Terminal award received (academic)				-.68	.63	.51	-.69	.65	.50	-.95	.67	.39
Gender of Role Model (predominantly men)							-.54	.41	.59	-.50	.42	.61
Role Model Leadership Score							.05	.27	1.05	.33	.30	1.39
Student Self-Efficacy Score										-2.12	.88	.12*
Constant	-.50			-.57			-.63			8.40		
χ^2		2.96			6.88			8.64			14.91	
df		5			7			9			10	
Nagelkerke R2		.03			.07			.47			.15	

Radiologic Technologist

	Model 1[e]			Model 2[f]			Model 3[g]			Model 4[h]		
Predictor	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*
Control Variables												
Student Characteristics												
Gender (man)	.16	.40	1.18	.29	.42	1.34	.28	.43	1.32	.25	.43	1.29

Age 24 and under[a]	-.24	.52	.79	-.15	.54	.86	.09	.58	1.10	-.01	.60	1.00
Age 25 - 35[a]	.05	.44	1.05	.05	.45	1.05	.09	.48	1.09	.14	.49	1.15
Race/ethnicity (non- White)	-.58	.51	.56	-.49	.52	.62	-.28	.54	.76	-.31	.54	.73
Annual household income[b] ($50K & over)	-.27	.44	.77	-.11	.46	.90	.00	.47	1.00	-.03	.48	.97
Program Characteristics												
Program type (college)				-.88	.47	2.41	1.02*	.48	2.78	1.03*	.49	2.79
Terminal award received (academic)				-0.48	0.69	-.48	.69	.62	-.48	.71	.62	-.60
Gender of Role Model (predominantly men)							-1.38	.83	.25	-1.34	.84	.26
Role Model Leadership Score							-.29	.27	.75	-.06	.30	.94
Student Self-Efficacy Score[b]										-1.47	.86	.23
Constant	-.33			-.58			.38			6.69		
χ^2		1.96			5.71			10.07			13.09	
df		5			7			9			1	
Nagelkerke R2		.02			.06			.11			.14	

Narrow Range Final Model

	Final Model		
	B	*SE B*	e^B
Program type	.48	3.57	1.62
Student Self-Efficacy Score[b]	-1.28*	.62	.28
Constant	5.33		
χ^2		6.37*	
df		2.00	
Nagelkerke R2		.06	

Note: I conducted a series of logistic regression analyses for narrow range of leadership opportunity (not shown) for clinical coordinator, clinical instructor, and department director similar to the ones represented in this table. No model in any of the f regression analyses conducted on clinical coordinator, clinical instructor, or department director was significant. The only variables that were statistically significant in any of the models were program type student self-efficacy for leadership score. Note: The final model consists of predictor variables that were significant at .05 alpha level in any series of regressions conducted for narrow range of for leadership.

[a]Over 35 years of age is the omitted reference category.

[b]Annual household income at time of graduation from radiography program.

*p < .05; **p < .01; ***p < .001.

Regression models for "wider range opportunity" for leadership variable. I regressed the wider range leadership opportunity variable on each of the five role models as described previously.

Program Directors. I conducted four successive analyses in which wider range leadership opportunity was regressed on predictor variables that included program director variables. At .05 alpha level, no model in this series of analyses was statistically significant. Students age 25 – 35 was significant at .05 alpha level (Wald's χ^2 = .53[1], p = .02) and composite student self-efficacy for leadership score (Wald's χ^2 = 6.54[1], p = .01) was significant at .01 alpha level in Model 4. No other predictor variable was statistically significant.

Clinical Coordinators. I conducted four successive analyses in which wider range leadership opportunity was regressed on predictor variables that included clinical coordinator variables. At the .05 level of significance, no model in this series of analyses was statistically significant. Students age 25 – 35 (Wald's χ^2 = 4.17[1], p = .04) and composite student self-efficacy for leadership score (Wald's χ^2 = 5.58[1], p = .02) score were statistically significant at the .05 alpha level in Model 4. No other predictor variable was statistically significant.

Clinical Instructors. I conducted four successive analyses in which wider range leadership opportunity was regressed on predictor variables that included clinical instructor variables. At the .05 level of significance, no model in this series of analyses was statistically significant. Composite student self-efficacy for leadership score (Wald's χ^2 = 6.18[1], p = .01) was statistically significant at. 01 alpha level in Model 4. No other predictor variable was statistically significant.

Radiologic Technologists. I conducted four successive analyses in which wider range leadership opportunity was regressed on predictor variables that included radiologic technologist variables. At the .05 level of significance, no model in this series of analyses was statistically significant. Students age 24 years and under (Wald's χ^2 = 3.77[1], p = .05) and composite role model leadership (Wald's χ^2 = 4.22[1], p = .04) for radiologic technologists were both statistically significant at the .05 alpha level in Model 3 but neither variable was statistically significant in Model 4. No other predictor variable was statistically significant.

Department Directors. I conducted four successive analyses in which wider range leadership opportunity was regressed on predictor variables that included department director variables. At the .05 level of significance, no model in this series of analyses was statistically significant. Students age 24 years and under was statistically significant at the .05 alpha level in Model 1 (Wald's χ^2 = 4.06[1], p = .04), Model 3 (Wald's χ^2 = 3.81[1], p = .05), and Model 4 (Wald's χ^2 = .77[1], p = .05). No other predictor variable was statistically significant.

Final Predictive Logistic Regression Model for "wider range opportunity" for leadership variable. The final predictive model for the wider range leadership opportunity variable consisted of students age 24 years and under, students age 25 – 35, composite role model leadership score for radiologic technologists, and student self-efficacy for leadership score. The model was statistically significant at the .05 alpha level, (χ^2 = 6.37[2], p = .04). The predictive value of the model was weak based on a *Nagelkerke* R^2 value of .12. Student self-efficacy for leadership score (Wald's χ^2 = 4.2[1], p = .04) was statistically significant at the .05 alpha level. No other variable was statistically significant. All else being equal, for every one unit increase in the composite student self-efficacy for leadership score, students, when asked to identify leadership opportunities in the field of radiography, were 21.51 as likely to select leadership opportunities in the wider range of leadership opportunities compared to students who did not select opportunities in this category.

Table 18 displays results for the statistically significant models and the final predictive model for the series of regression analyses conducted for wider range of leadership opportunities. All models are displayed in the table except for predictor variables in the clinical instructor series of regression analyses. The clinical instructor series had only one statistically significant variable (composite student self-efficacy for leadership score) that was already included in the final model. Results from the clinical instructor model were not compelling and were therefore omitted from Table 18 in the effort to simplify results.

Table 18

Logistic Regression Analyses of Predictors of Wider Range Opportunities by Role Model

Program Director												
	Model 1			**Model 2**			**Model 3**			**Model 4**		
Predictor	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*
Control Variables												
Student Characteristics												
Gender (man)	-.20	.45	.82	-.07	.46	.93	-.08	.47	.92	-.08	.48	.92
Age 24 and under[a]	-1.02	.61	.36	-1.02	.63	.36	-1.02	.63	.36	-1.21	.66	.30
Age 25 - 35[a]	-.85	.48	.43	-.93	.49	.40	-.93	.49	.39	-1.22*	.53	.30
Race/ethnicity (non-White)	-.35	.53	.71	-.30	.54	.74	-.30	.54	.74	-.36	.56	.70
Annual household income[b] ($50K and over)	-.27	.50	.77	-.21	.52	.81	-.20	.52	.82	-.32	.56	.72
Program Characteristics												
Program type (college)				.88	.57	2.42	.87	.58	2.39	1.10	.61	3.01
Terminal award received (academic)				-1.11	-1.11	.74	.33	-1.13	.74	.32	-1.11	.76
Gender of Role Model (predominantly men)							-.08	.46	.92	-.18	.48	.83
Role Model Leadership Score							.04	.30	1.04	-.38	.33	.69
Student Self-Efficacy Score										3.46**	1.35	31.78
Constant	-.37			-.03			-.16			-15.02		
χ^2		4.79			8.12			8.175			16.79	
df		5			7			9			10	
Nagelkerke R2		.44			.09			.09			.19	
										-	-	
Clinical Coordinator												
	Model 1[e]			**Model 2[f]**			**Model 3[g]**			**Model 4[h]**		
Predictor	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*
Control Variables												
Student Characteristics												
Gender (man)	-.31	.45	.73	-.21	.46	.81	-.24	.46	.79	-.29	.47	.75
Age 24 and under[a]	-.97	.61	.38	-.97	.62	.38	-1.01	.63	.37	-1.05	.66	.35
Age 25 – 35[a]	-.76	.47	.47	-.82	.48	.44	-.86	.49	.42	-1.04*	.51	.36
Race/ethnicity	-.32	.54	.73	-.26	.55	.77	-.36	.58	.70	-.41	.60	.67

Predictor	B	SE B	OR	B	SE B	OR	B	SE B	OR	B	SE B	OR
(non- White)												
Annual household income[b] ($50K and over)	-.36	.50	.70	-.35	.51	.70	-.32	.51	.72	-.42	.54	.66
Program Characteristics												
Program type (college)				.78	.53	2.17	.79	.56	2.21	.90	.58	2.47
Terminal award received (academic)				-1.12	0.74	-1.12	.74	.33	-1.18	.75	.31	-1.02
Gender of Role Model (predominantly men)							.27	.55	1.32	.38	.57	1.46
Role Model Leadership Score							.13	.27	1.14	-.31	.31	.74
Student Self-Efficacy Score										2.96**	1.25	19.25
Constant	-.34			.08			-.42			-12.96		
χ^2		4.57			7.5			7.943			14.81	
df		5			7			9			10	
Nagelkerke R2		.05			.09			.09			.17	
										-	-	

Radiologic Technologist	**Model 1[e]**			**Model 2[f]**			**Model 3[g]**			**Model 4[h]**		
Predictor	B	SE B	OR	B	SE B	OR	B	SE B	OR	B	SE B	OR
Control Variables												
Student Characteristics												
Gender (man)	-.43	.48	.65	-.29	.49	.75	-.37	.51	.69	-.35	.52	.71
Age 24 and under[a]	-.86	.62	.42	-.88	.63	.42	-1.31*	.68	.27	-1.24	.69	.29
Age 25 - 35[a]	-.61	.50	.54	-.68	.51	.51	-.86	.54	.43	-.91	.55	.40
Race/ethnicity (non-White)	-.31	.58	.73	-.22	.59	.81	-.53	.65	.59	-.48	.66	.62
Annual household income[b] ($50K and over)	-.73	.56	.48	-.66	.58	.52	-.70	.60	.50	-.75	.62	.47
Program Characteristics				.78	.57	2.18	.64	.59	1.90	.72	.60	2.05
Program type (college)				-.98	.79	.38	-1.09	.82	.34	-1.10	.83	.33
Terminal award received (academic)												
Gender of Role Model (predominantly men)							.61	.76	1.83	.60	.76	1.81
Role Model Leadership Score							.64*	.31	1.89	.32	.35	1.37
Student Self-Efficacy Score										2.35	1.34	10.52

Constant	-.36			-.07			-2.08			-12.29		
χ^2		4.66			7.11			12.218			15.79	
df		5			7			9			10	
Nagelkerke R2		.06			.09			.15			.11	
										-	-	

Department Director

	Model 1[e]			Model 2[f]			Model 3[g]			Model 4[h]		
Predictor	*B*	*SE B*	e^B	*B*	*SE B*	e^B	*B*	*SE B*	e^B	*B*	*SE B*	e^B
Control Variables												
Student Characteristics												
Gender (man)	-.20	.52	.82	-.17	.52	.84	-.28	.54	.75	-.16	.55	.85
Age 24 and under[a]	-1.48*	.74	.23	-1.40	.75	.25	-1.49*	.76	.23	-1.53*	.77	.22
Age 25 – 35[a]	-.67	.54	.51	-.65	.56	.52	-.66	.57	.52	-.70	.58	.50
Race/ethnicity (non-White)	-.49	.64	.62	-.46	.65	.63	-.48	.66	.62	.68	.68	.51
Annual household income[b] ($50K and over)	-.76	.63	.47	-.66	.65	.52	-.77	.66	.46	-.92	.70	.40
Program Characteristics												
Program type (college)				.50	.59	1.65	.38	.60	1.46	.49	.63	1.64
Terminal award received (academic)				.22	1.23	1.25	.09	1.25	1.10	.20	1.30	1.22
Gender of Role Model (predominantly men)							-.20	.52	.82	-.50	.55	.61
Role Model Leadership Score							.39	.26	1.48	.14	.28	1.15
Student Self-Efficacy Score										2.39	1.43	10.86
Constant	-.25			-.85			-.20			-12.60		
χ^2		6.2			7.26			9.07			12.82	
df		5			7			9			10	
Nagelkerke R2		.09			.10			.13			.18	
										-	-	

Wider Range Final Model

	Final Model		
	B	*SE B*	*OR*
Age 24 and under[a]	-.70	*.59*	.50
Age 25 – 35[a]	-.55	.46	.58

Radiologic Technologist Role Model Leadership Score)	-.09	.27	.91
Student Self-Efficacy Score	3.07*	1.20	21.51
Constant	-15.26		
χ^2		11.68*	
df		4	
Nagelkerke R2		.12	

Note: I conducted a series of logistic regression analyses for wider range opportunities (not shown) for clinical instructor similar to the ones represented in this table . The clinical instructor series of regression analyses was not significant and the only variable that was significant in the models was student self-efficacy for leadership score. To simplify the presentation of results, results for predictor variables in the clinical instructor series are not presented.

Note: The final model consists of predictor variables that were significant at .05 alpha level in any series of regressions conducted for no opportunities for leadership.

[a]Over 35 years of age is the omitted reference category.

[b]Annual household income at time of graduation from radiography program .

**p* < .05; ***p* < .01; ****p* < .001

Regression models for "widest range opportunity" for leadership variable. I regressed the widest range leadership opportunity variable on each of the five radiography role models as described previously.

Program Director. I conducted four successive analyses in which widest range leadership opportunity was regressed on predictor variables that included program director variables. At the .05 level of significance, no model in this series of analyses was statistically significant and no predictor variables were statistically significant. I followed these same procedures for the four other radiography role models. At the .05 level of significance no models or variables within models for clinical instructor, radiologic technologist, or program director were statistically significant. The model for clinical coordinator also was not statistically significant but gender of clinical coordinators was statistically significant at the .05 level of significance in Models 3 (Wald's χ^2 = 4.24[1], p = .04) and Model 4 (Wald's χ^2 = 4.2[1], p = .04). No other predictor variable in the clinical coordinator model was statistically significant.

Since there was only one statistically significant variable in the series of regression analyses that I ran for widest range leadership opportunity, I did not run a final regression analyses of this variable. Based on variables in this study, the factors that predict the likeliness of students selecting leadership opportunities that fall into the widest range of opportunities are unknown. Table 19 shows results for the statistically significant models of logistic regression analyses conducted for widest range leadership opportunity. The results displayed in Table 19 are from only the clinical coordinator model since this was the sole model that yielded a variable that was statistically significant.

Table 19

Logistic Regression Analyses of Predictors of Widest Range Opportunities by Role Model

Clinical Coordinator												
	Model 1			**Model 2**			**Model 3**			**Model 4**		
Predictor	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*	*B*	*SE B*	*OR*
Control Variables												
Student Characteristics												
Gender (man)	-.05	.47	.95	-.11	.47	.89	-.10	.50	.90	-.09	.50	.92
Age 24 and under[a]	1.19	.64	3.27	1.14	.64	3.12	1.12	.66	3.06	1.12	.67	3.06
Age 25 - 35[a]	.62	.55	1.86	.65	.56	1.92	.66	.58	1.93	.66	.58	1.94
Race/ethnicity (non-White)	.47	.56	1.07	.39	.57	1.48	.79	.61	2.19	.77	.61	2.16
Annual household income[b] ($50K and over)	.68	.48	1.96	.66	.48	1.93	.76	.51	2.15	.77	.51	2.17
Program Characteristics												
Program type (college)				-0.34	0.5	0.72	-0.37	0.52	0.69	**-0.36**	0.52	0.7
Terminal award received (academic)				0.93	0.87	2.53	0.78	0.88	2.19	0.88	0.9	2.4
Gender of Role Model (predominantly men)							-1.68*	.82	.19	-1.68*	.82	.19
Role Model Leadership Score							.31	.32	1.36	.15	.37	1.16
Student Self-Efficacy Score										.53	.99	1.70
Constant	-2.17			-2.75			-3.79			-5.736		
χ^2		5.58			6.92			14.31 3			13.69	
df		5			7			9			10	
Nagelkerke R2		.07			.08			.16			.16	

Note: I conducted a series of logistic regression analyses for widest range of leadership opportunity (not shown) for program director, clinical instructor, radiologic technologist, and department director similar to the one represented in this table. No model for clinical coordinator was the only model that had a statically significant variable. Consequently, no other model is displayed in this table and a final predictive model did not emerge for analyses.

[a]Over 35 years of age is the omitted reference category.

[b]Annual household income at time of graduation from radiography program.

*p < .05; **p < .01; ***p < .001.

Research Question Three (RQ3)

The primary intent of Research Question 3 was to understand the perceptions that radiography students have of their own self-efficacy with regard to transformational leadership.

Composite student self-efficacy for leadership was treated as a continuous variable, so I used two-group differences of means tests (independent samples t-tests), one-way ANOVAs, and Pearson product-moment correlations for bivariate analyses based on attributes of the variables including levels of measurement and the number of categories. I used ordinary least squares for multiple regression analyses.

RQ3.A. How do radiography students rate their own self-efficacy with regard to transformational leadership? I conducted descriptive statistics to calculate measures of central tendency and spread for composite student self-efficacy for leadership score. On a scale of 1 to 5, the mean composite student self-efficacy for leadership score was (M = 4.79, SD = .27, n = 157). Mean composite student self-efficacy for leadership score is discussed in detail earlier in this chapter and results are displayed in Table 3.

RQ3.B. Do students' perceptions of their self-efficacy with regard to transformational leadership relate to their perceptions of the transformational leadership behaviors of their radiography role models? I computed Pearson product-moment correlations to evaluate relationships between composite student self-efficacy for leadership score and composite role model leadership scores for the five role model categories (program directors, clinical coordinators, clinical instructors, radiologic technologists, and department directors). All relationships were statistically significantly correlated at the .001 alpha level of significance. Composite student self-efficacy for leadership score correlated positively and moderately with the composite role model leadership scores of program directors, r = .33, n = 153 , p = <.001 and department directors , r = .38, n = 125, p = <.001. There was a strong, positive correlation between composite student self-efficacy for leadership score and the composite role model leadership scores of clinical coordinators, r = .48, n = 151, p = <.001;

clinical instructors, r = .44, n = 145, p = <.001; and radiologic technologists, r = .43, n = 156, p = <.001. Overall, the perceptions that students had of their own self-efficacy for leadership correlated statistically with the perceptions they had of the transformational leadership demonstrated by their radiography role models. The strongest correlation of these relationships occurred between the composite student self-efficacy for leadership score and the composite role model leadership score for clinical coordinators while the weakest correlation occurred between student self-efficacy scores and the leadership scores of program directors. Table 20 displays correlations of composite students' composite self –efficacy for leadership and composite role model leadership scores.

Table 20

Correlation of Student Self-Efficacy Scores and Role Model Leadership Scores

	Composite Student Self-Efficacy for Leadership Score		
Composite Role Model Leadership Scores	*n*	*r*	*p*
Program Directors	153	.33**	< .001
Clinical Coordinators	151	.48**	< .001
Clinical Instructors	145	.44**	< .001
Radiologic Technologists	156	.43**	< .001
Department Directors	125	.38**	< .001

*p = .05, **p = .01, ***p = .001.

RQ3.C. Do radiography students' perceptions of their self-efficacy for transformational leadership scores relate to other variables (gender of role models, program type, terminal award received, gender of students, age, ethnicity/race, household income?) I analyzed relationships between composite student self-efficacy for leadership score and control variables by conducting independent samples t-tests and one-way ANOVAs. Results follow.

RQ3.C.i. Do radiography students rate their efficacy for transformational leadership differently in relation to the gender of radiography role models with whom they worked? I conducted an independent-samples t-test to evaluate the relationship between composite student self-efficacy for leadership score as a function of gender of radiography role models with whom students worked. Gender of radiography role models was categorized to show the predominant gender of the role models with whom students worked and consisted of two groups: all or majority women and all or majority men. At the .05 level of significance, the independent-samples t-test showed no statistically significant relationships between composite student self-efficacy for leadership score and gender of radiography role models, and therefore the results of these analyses are not shown. The perceptions that radiography students had about their own self efficacy with regard to transformational leadership were not statistically significantly different based on whether the radiography role models with whom students worked were predominantly women or predominantly men.

RQ3.C. ii. Do radiography students rate their self-efficacy for transformational leadership differently based on the type of radiography program the student attended? I conducted an independent-samples t-test to assess the relationship between student self-efficacy for leadership score and the types of radiography programs that students attended. Program type was categorized into 1) hospital-based, technical, and military programs, and 2) college/university programs. At the .05 level of significance, results of the t-test showed no statistically significant relationships between composite student self-efficacy for leadership score and program type, and therefore they are not shown. The perceptions that radiography students had about their own self efficacy with regard to transformational leadership were not statistically significantly different based on whether students attended a hospital-based, technical, or military program compared to a college or university program.

RQ3.C. iii. Do radiography students rate their self-efficacy for transformational leadership differently based on the type of terminal award received? I conducted an independent-samples t-test to assess the relationship between the composite student self-efficacy for leadership score and the types of terminal awards that students received. Terminal award received was categorized as 1) certificate or diploma and 2) associate and bachelor's degree. At the .05 level of significance, results of the t-test showed no statistically significant relationships between composite student self-efficacy for leadership score and type of terminal award received, and therefore these results are not shown. The perceptions that radiography students had about their own self efficacy with regard to transformational leadership were not statistically significantly different based on whether the terminal award received was a certificate or diploma compared to associate or bachelor's degree.

RQ3.C. iv. Do radiography students rate their self-efficacy for transformational leadership differently based on their gender? I conducted an independent-samples t-test to evaluate if there was a relationship between composite student self-efficacy for leadership score and student gender. Student gender was categorized as 1) woman, and 2) man. At the .05 level of significance, results of the t-test showed no statistically significant relationships between composite student self-efficacy for leadership score and students' gender, and therefore the results are not shown. The perceptions that radiography students had about their own self efficacy with regard to transformational leadership were not statistically significantly different based on whether the student was a woman or man.

RQ3.C. v. Do radiography students rate their self-efficacy for transformational leadership differently based on their age? I conducted a one-way analysis of variance to assess the relationship between composite student self-efficacy for leadership score and student age. Student age, consisted of three categories including 24 years and younger, 25 to 35 years, and over 35 years. At the .05 level of significance, results of the ANOVA showed no statistically significant relationships between students' self-efficacy for leadership and any category of students' age, therefore results are not shown. The perceptions that radiography students had about their own self efficacy with regard to transformational leadership were not statistically significantly different if the student was 24 years of age and under, 25 to 35 years of age, or over 35 years.

RQ3.C. vi. Do radiography students rate their self-efficacy for transformational leadership differently based on their ethnicity/race? I conducted an independent-samples t-test to evaluate the relationship between composite student self-efficacy for leadership score and student's ethnicity/race. Student's ethnicity/race was categorized as 1) White, and 2) non-White. At the .05 level of significance, results of the t-test showed no statistically significant relationships between composite student self-efficacy for leadership score and student race/ethnicity. The perceptions that radiography students had about their own self efficacy with regard to transformational leadership were not statistically significantly if the student was Caucasian (White) or another race/ethnicity (non-White).

RQ3.C. vii. Do radiography students rate their self-efficacy for transformational leadership differently based on their annual household income at the time of graduation? I conducted an independent-samples t-test to evaluate the relationship between composite student self-efficacy for leadership score and student annual household income at the time of graduation from their radiography program. Student annual household income was categorized as 1) under $50,000 per year, and 2) $50,000 per year and over. At the .05 level of significance, the t-test showed no statistically significant relationships between composite student self-efficacy for leadership score and student annual household income. The perceptions that radiography students had about their own self efficacy with regard to transformational leadership were not statistically significantly different if the student had an annual household income at the time of graduation of under $50,000 per year or $50,000 per year and over.

RQ3.C.viii. Do radiography students rate their own self-efficacy with regard to transformational leadership relative to their perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders? I conducted an independent-samples t-test to assess the relationship between student's perceptions of their own self-efficacy for transformational leadership and their perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders. Students' perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders has response categories of 1) yes, and 2) no or not sure. At the .05 level of significance, results of the test showed a statistically significant relationship in mean composite self-efficacy for transformational leadership scores and students' perceptions of whether the profession of radiologic technology and its members, as a whole, are leaders. The mean composite self-efficacy for transformational leadership score as rated by students who think the profession of radiography and its members, as a whole, are leaders (M = 4.79, SD = .29, n = 132) was statistically significantly higher than students who indicated "no or not sure" (M = 4.49, SD = .58, n = 31), $t(33.51) = 2.80$ p = .01. The perceptions that radiography students had about their own self efficacy with regard to transformational leadership were statistically significantly higher if they perceived that the profession of radiologic technology and its members, as a whole, are leaders.

Multiple Regression Analyses of RQ3. What do radiography students perceive of their own self-efficacy with regard to transformational leadership? Based on exploratory data analyses at the univariate level, I dropped six outlying cases to reduce skewness and kurtosis of student self-efficacy for leadership score which normalized the distributional shape of the variable. For each OLS regression model, I also analyzed regression diagnostic tests that included variance inflation factors (VIF) and found no evidence of multicolinearity in any of the analyses. I also reviewed residuals versus fitted values plots (RVF plots) and found no problems with heteroskedasticity.

Similar to Research Question One, I conducted a series of OLS regression analyses for Research Question Three. In Model 1 of the series, I regressed composite student self-efficacy for leadership score on student characteristics (age, gender, race/ethnicity, and annual household income at time of graduation from the radiography program). In Model 2, I added program characteristics (program type and terminal award received) as predictor variables. In Model 3, I added gender of role model, and in Model 4, I added composite role model leadership score. No model except Model 4 was statistically significant (F=2.41[17], p = .01. The only individual predictor variable that emerged as being statistically significant was composite role model leadership score for radiologic technologists in Model 4. Consequently, composite role model leadership score for radiologic technologists was the key predictor for composite student self-efficacy for leadership score in covariation with all other variables in the model. This model accounted for 37% of students perceptions of their own self-efficacy for leadership. All else being equal, for every one unit increase in the composite role model leadership score for radiologic technologists, student self-efficacy for leadership score increased .13 units. Results of OLS regression analyses for student self-efficacy for leadership score is demonstrated in Table 21.

Table 21

OLS Regression Analyses for Students' Self-Efficacy Scores

	Model 1			Model 2			Model 3			Model 4		
Variable	b	SE b	β	b	SE b	β	b	SE b	β	b	SE b	β
Control Variables												
Student Characteristics												
Gender	-.01	.05	-.01	-.01	.05	.00	-.01	.06	-.02	-.07	.05	.15
Age 24 and under[a]	.08	.07	.14	.09	.07	.16	.08*	.07	.13	-.01	.07	-.02
Age 25 - 35[a]	.04	.06	.08	.04	.06	.09	.04	.06	.09	.02	.06	.03
Race/ethnicity	.12	.07	.19	.13	.07	.21	.13	.08	.21	.05	.07	.08
Annual household income[b]	.07	.06	.13	.08	.06	.14	.07	.07	.13	.03	.06	.05
Program Characteristics												
Program type				.06	.06	.13	.03	.06	.05	-.01	.06	-.03
Terminal award received				-0.01	-.01	.10	-.01	.01	.11	.01	-.03	.10
Program Director Gender							.04	.06	.08	.03	.05	.06
Clinical Coordinator Gender							-.09	.08	-.15	-.05	.07	-.08
Clinical Instructor Gender							-.06	.09	-.09	-.10	.08	-.10
Radiologic Technologist Gender							0.05	.05	.10	.07	.07	.09
Department Director Gender										.10	.06	.21
Program Director Leadership Score										.05	.06	.17
Clinical Coordinator Leadership Score										.03	.07	.09
Clinical Instructor Leadership Score										-.02	.07	-.06
Radiologic Technologist Leadership Score										.13*	.13*	.05
Department Director										.01	.03	.02
Intercept (Constant)		4.75***			4.72***			4.69***			4.05***	
R2		.06			.07			.12			.37	
F		1			.85			.87			2.41**	
Model Comparison												
R^2 change					.01			.05			.25	
F change					$F_{2, 80}$ = ..49			$F_{5,75}$ = .90			**$F_{5,70}$ =** 5.49*	

Note: Leadership Scores of role models refers to the composite role model leadership score.

Note: Model 4 was the best predictive model for Radiologic Technologist Composite Role Model Leadership Score.

[a]Over 35 years of age is the omitted reference category.

[b]Annual household income at time of graduation from radiography program.

*p < .05; **p < .01; ***p < .001.

Conclusion

Chapter 4 provided results of statistical analyses that I conducted on my data at the univariate, bivariate, and multivariate level in relationship to the research questions of my study. In Chapter 5, I discuss implications of these findings, draw conclusions, and make suggestions about leadership development in radiography students.

CHAPTER 5

DISCUSSION

The purpose of this study was to better understand leadership awareness among radiography students with the intent of informing leadership development and succession in the field of radiography. First, this study sought to describe perceptions that radiography students, as reported by graduates of radiography educational programs, had of leadership in the field based on their evaluation of the transformational leadership behaviors demonstrated by radiography role models during the radiography educational process. Second, this study sought to describe relationships that existed between radiography students' perceptions of the transformational leadership behaviors demonstrated by radiography role models and the perceptions that radiography students had of (a) leadership opportunities in the field of radiography, and (b) students' own sense of efficacy with regard to transformational leadership. In this chapter, I explain findings of my research questions, identify limitations of the study, suggest opportunities for future research, and identify implications that findings from this study have for policy and practice related to the educational process of radiography students and the field of radiography in general.

Findings of the Study

There were three primary research questions for this study: 1) What do radiography students perceive about the transformational leadership demonstrated by radiography role models during the radiography educational process? 2) What do radiography students perceive about leadership opportunities in the field of radiography? 3) What do radiography students perceive about their self-efficacy with regard to transformational leadership? The remainder of this section addresses key findings of this study or other compelling findings according demographical data followed by findings that address the three primary research questions.

Research Question One. What do radiography students perceive about the transformational leadership demonstrated by radiography role models during the radiography educational process?

The radiography students in this study indicated that they observed transformational leadership behaviors in their radiography role models. The lowest leadership rating given by students in this study was assigned to radiologic technologists and was 3.62 (n = 162). This suggests that, overall, students observed above-average transformational leadership in their radiography role models.

Transformational leadership of radiography program directors. Students rated the transformational leadership of radiography program directors higher than that of any of the other four role models. Program directors' transformational leadership was rated statistically significantly higher than that of radiologic technologists and department directors, but not statistically significantly higher than that of clinical coordinators or clinical instructors. These findings align with findings reported by Aaron (2006) and Shaver (2003) that indicated that radiography program directors tend to employ transformational leadership behavior in their roles. In Aaron's study, program directors reported being satisfied with their transformational leadership skills relative to their responsibilities as program directors. In Shaver's study, transformational leadership contributed the most to the satisfaction that that faculty had with the program director's leadership and to faculty members' perceptions of the program director as a leader.

Program directors play a critical role in merging post-secondary education and healthcare. Within the context of the educational program, program directors hold a high-level position of authority. In radiography educational programs that are accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT), the program director is charged with administrative oversight of the program and must hold a minimum of a master's degree (JRCERT, 2014). The program director must effectively administer the program both within and external to the organization. The duties they perform are both task-oriented and relational (Tolley Gurley & Calloway, 2011; Turley, 2004). Program directors typically are considered as the "face" of the radiography educational program and must effectively meet the needs of a diverse group of constituents. It could be argued that transformational leadership is a requisite to being an effective program director. Radiography students are typically in close proximity to the program director throughout the duration of the educational program and are likely to see the program director carrying out functions that other radiography role models may not be tasked with, except for the department director. These dynamics therefore are likely to provide opportunities for radiography students to observe diverse and frequent transformational leadership behaviors in the program director.

Shertzer and Schuh (2004) suggested that college students understand leadership based on how they define leadership. A key way that college students define leadership is by legitimized positions of authority (Shertzer & Schuh, 2004). Program directors are in a leadership position that has legitimized authority. Further, in comparison with other radiography role models, the program director may hold the highest academic degree. She is likely to be the only role model who is mandated by a regulatory body to hold such a degree – even more so than department directors. By virtue of their position and academic preparation, alone, program directors may be perceived by students to be leaders. On the other hand, students may be observing program directors practicing transformational leadership in a greater capacity than other radiography role models. The physical location of program directors, if on a college campus, may significantly promote development and foster a mindset of transformational leadership in program directors. This is in contrast to the other role models who, according to their positions, typically spend more time in the clinical environment and less time in the college environment. Astin and Astin (2000) suggest that collegiate environments have organizational cultures that practice and promote tenets of transformational leadership. Additionally, the academic preparation of program directors may foster transformational leadership practices by promoting collegiate principles of “intellectual honesty, responsibility for society’s moral health and social justice, active participation as a citizen of a diverse democracy, discernment of the ethical consequences of decisions and actions, and deep understanding of one’s self and respect for complex identities of others, their histories, and their cultures” (Association of American Colleges and Universities, 2002, p. xii).

Transformational leadership of clinical instructors and clinical coordinators. Similar to the leadership ratings of program directors, students in this study rated the transformational leadership of clinical coordinators statistically significantly higher than that of radiologic technologists and department directors but not than that of clinical instructors. Clinical instructors, on the other hand, had leadership ratings that were statistically significantly higher than radiologic technologists, but not not higher than department directors. Many of the same factors that might cause students to perceive leadership in program directors also applies to clinical coordinators. Clinical coordinators hold a high level leadership position in radiography educational programs and are required by the JRCERT to hold a minimum of a bachelor’s degree. Clinical coordinators typically have more of a presence in the clinical environment than program directors. Although the amount of actual time that clinical coordinators spend in the clinical environment performing hands-on patient care with students varies from program to program, clinical coordinators, along with clinical instructors and radiologic technologists are the individuals who are likely to work most closely with students in the clinical environment. It is well-documented in the literature of diverse health care disciplines that the clinical learning environment has propensity to result in profound learning opportunities for students that are stressful and emotionally-charged (Fortsch, Henning & Nielsen, 2009) and that must be mediated by students' clinical preceptors (Curtis, Helion & Domsohn, 1998; Fortsch, Henning & Nielsen, 2009; Giordano, 2008; Livsey, 2009; Steves, 2005). Winn and Grantham suggest that clinical instructors must be able to recognize differences in the personality traits of students with whom they work and provide instruction and oversight that aligns with their individual traits. Rudolph, Simon, Raemer, and Eppich (2008) suggest that medical students who experience complex or confusing clinical scenarios should be debriefed. Rudoph et al. define debriefing as a process in which "individually tailored doses of feedback" are given to students about their performance in clinical scenarios with the intention of improving student performance. All of these practices that serve to help students in the clinical environment process difficult experiences are grounded in a transformational leadership perspective. A transformational leadership approach, when applied to a radiography clinical learning environment, suggests that constructs of transformational leadership that include "idealized influence (charisma), individualized consideration, intellectual stimulation, and inspirational motivation" (Antonakis, Cianciolo & Sternberg, 2004, p. 175) will support and enhance radiography students' success in achieving clinical learning objectives. Empirical research in various health care disciplines supports that a transformational leadership approach is effective with health care students and in health care educational environments (Curtis, Helion & Domsohn, 1998; Fortsch, Henning & Nielsen, 2009; Heller, Drenkard, Esposito-Herr, Romano, Tom & Valentine, 2004; Vahey, Aiken, Sloan, Clark & Vargas, 2004; Westrope, Vaughn, Bott & Taunton, 1995).

Findings of this study suggest that clinical coordinators and clinical instructors tend to employ a transformational leadership approach with students. In this study, the leadership of clinical coordinators and clinical instructors was rated statistically significantly higher than radiologic technologists, likely for two reasons: First, clinical coordinators and clinical instructors hold formalized positions within educational programs and are assigned formal titles that are recognized by students and others in the medical imaging department. Like clinical coordinators and clinical instructors, radiologic technologists also provide clinical supervision to students in the clinical environment. But the role of the radiologic technologist, while vital to the success of the radiography educational program, might be considered as being tangential to the program. Unlike clinical instructors and clinical coordinators, radiologic technologists typically do not hold a formal title relative to the radiography educational program. This may cause radiography students to perceive radiologic technologists as leaders to a lesser degree compared to clinical instructors and clinical coordinators. In radiography programs that are accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT), radiologic technologists who are associated with a radiography educational program are considered to be "clinical staff" (JRCERT, 2014a, p. 44). The JRCERT mandates that radiologic technologists associated with an educational program be acclimated to the radiography educational program. They must "understand the clinical competency system, understand the requirements for student supervision, support the educational process, and maintain current knowledge of program policies procedures, and student progress" (JRCERT, 2014a, p. 44). The requirements set forth by the JRCERT for the clinical staff (radiologic technologists) establish a level of responsibility for the education of radiography students and yet radiologic technologists may not have a clear understanding of their responsibilities to students with regard to leadership modeling. Fortsch (2009) stated that the role of radiologic technologists heavily influences students' clinical experiences, yet radiologic technologists may not realize the significance of the role that they have in the education of radiography students or feel valued in that role in terms of leadership. Role theory posits that leaders may experience confusion and conflict in their role when leader behavior that is expected by others does not align with expectations of oneself (Tsui, 1984). Leaders who are unable to resolve such conflict may demonstrate negative behaviors that undermine leadership effectiveness (Hughes, Ginnett & Curphy, 2006). Radiologic technologists, as individuals who are in the position to model leadership to radiography students but who may not hold formal titles beyond that of staff technologist, may experience confusion and conflict in their roles and relationship to students and to the radiography educational program. Moreover, the theory of identity verification posits that individuals desire for others to validate their role identity (Turner, 2003). The degree to which radiologic technologists have clarity about their positions as leaders in the educational process of radiography students and the degree to which those positions of authority are validated by others in the imaging department may increase the transformational leadership behaviors that radiologic technologists demonstrate. In turn, students' perceptions of radiologic technologists as transformational leaders may be positively impacted.

A second possible reason that the leadership behaviors of clinical coordinators and clinical instructors were rated statistically significantly higher than radiologic technologists by students in this study is because clinical coordinators and clinical instructors are likely to have a higher degree of knowledge and skill in the instruction of students. The body of research in radiologic technology and athletic training suggests that clinical instructors, themselves, would benefit from more formal training in the clinical education of students (Giordano, Weidner and Henning, 2004; Giordano, 2008). Radiologic technologists typically do not have the same status as clinical instructors in the educational process and will therefore have even less formal training and guidance relative to working with and instructing students. The lack of preparation to work with students in the clinical environment may be exacerbated by the *Standards for an Accredited Educational Program in Radiography ("Standards")* (JRCERT, 2014a). In the *Standards*, the JRCERT mandates that accredited radiography educational programs have sufficient resources to provide "faculty with opportunities for continued professional development" (JRCERT, 2014a, p. 23), but the JRCERT differentiates between faculty and clinical staff in the *Standards*. The JRCERT's mandate for the provision of professional development opportunities does not extend clinical to staff.

Transformational leadership of radiologic technologists. Students in this study rated the transformational leadership of radiologic technologists lowest, on average. However, students also related with radiologic technologists more than any other role model. Students 24 years of age and younger rated the transformational leadership of radiologic technologists statistically significantly higher than students over 35 years of age, and students whose annual household income was under $50,000 at the time of graduation rated radiologic technologists statistically significantly higher in transformational leadership than students whose annual household income was $50,000 or higher. Additionally, the transformational leadership score of radiologic technologists was also statistically related to whether students thought leadership opportunities of various types existed in the field. Further, the transformational leadership score of radiologic technologists emerged as the key predictor of radiography students' perceptions of their self-efficacy with regard to leadership.

Students in this study over the age of 35 may have been a factor in the lower transformational leadership scores of radiologic technologists. There were more students in this age category than in the 24 years and younger category, and students over 35 years of age rated the transformational leadership of radiologic technologists statistically significantly lower than students 24 years of age and younger. However, the largest number of students in this study was in the 25 to 35 years of age category and there were no statistically significant differences in how they rated the transformational leadership of radiologic technologists compared to students who were in younger or older categories.

Another possible explanation for the discrepancy between the relatively low ratings of transformational leadership of radiologic technologists and the relatively high influence that radiologic technologists had on radiography students may be the leadership approaches employed by radiologic technologists. Radiologic technologists may have demonstrated a transactional approach to leadership that emphasized task orientation or a situational leadership approach. Situational leadership theory suggests that leaders employ both task orientation and relationship orientation depending on the situation (Hughes, Ginnett & Curphy, 2006). Task orientation in radiographers is not uncommon (Forbes & Prime, 2000; K. Powers [personal communication, February 15, 2011]; Tolley Gurley & Calloway, 2011). The historical technical roots and task-orientation of the profession of radiography typically produces radiographers who are task efficient and focused (Forbes & Prime, 2000; K. Powers [personal communication, February 15, 2011]; Tolley Gurley & Calloway, 2011). Students who observe a high degree of task oriented behaviors in radiologic technologists may logically rate them as low in transformational leadership.

Further, the discrepancy between the leadership ratings that students in this study assigned to radiologic technologists and the high degree of influence that radiologic technologists had on students may stem from power undercurrents that may exist in the student/technologist relationship. The dynamics of leadership are informed by consideration of the construct of power (Hughes, Ginnett, & Curphy, 2006). Radiologic technologists hold various degrees of legitimate power over students in the clinical environment (Tolley Gurley & Calloway, 2006). However, even in the absence of legitimate power, radiologic technologists may gain a significant degree of power over students through the process of legitimization. Social theorist, Max Weber, theorized that power, even if oppressive, must be legitimized by individuals over whom the power is exerted (Weber, 1968). Weber maintained that for legitimization of power to occur, it must be considered valid and acceptable (Weber, 1968).

French's and Raven's (1959) empirical research on power suggests that the interaction that occurs between radiography students and radiologic technologists and the dependency that students have on radiologic technologists in the clinical environment is likely to result in a dyadic relationship grounded in various types of power. In their Taxonomy of Social Power, French and Raven (1959) identified five sources of power that include expert power, referent power, legitimate power, reward power, and coercive power. Expert power is power that comes through knowledge (Hughes, Ginnett & Curphy, 2006). In the clinical environment, radiologic technologists have critical knowledge to which radiography students need access to be successful in their clinical education. Referent power stems from influence that one individual has over another as a result of a "strong, interpersonal relationship" (Hughes et al, 2006, p. 114). Referent power results when one individual defers to another out of admiration (Hughes et al., 2006). Radiologic technologists who have referent power over students are considered by students as role models. The student will therefore be responsive to the technologist. Findings of this study that suggest that radiography students identify closely with radiologic technologists support that referent power is likely to exist in the student/technologist relationship. Reward and coercive power is established when a leader is in the position to influence others through allocations of resources, (Hughes et al, 2006). There is potential for both reward and coercive power to exist in the student/technologist relationship because radiologic technologists assist students in achieving clinical educational outcomes which may entail evaluating students' clinical performance. Further, radiologic technologists may also be significantly influential in including or excluding students from the social network of the imaging department that can provide students with "friendship, a sense of belonging, and a sense of competency and self-worth" (Kowtko, 2010, p. 217).

All five types of power identified by French and Raven may be influential factors in how radiography students relate to radiologic technologists. Students in radiography clinical environments have reported perceptions that technologists have "unchecked power" (Fortsch, Henning & Nielsen, 2009, p. 118). Relative to this study, the potential for the construct of power to both positively and negatively influence the student/technologist relationship, and in turn influence how students rate radiologic technologists as leaders, may be explained in part by the anecdotal responses that students in this study provided when asked if they perceived that radiologic technologists, in general, are leaders. An example of an anecdotal response that supports the potential for power to exist between the student and radiologic technologist in a negative form is as follows: "*I feel like it was a very dog eat dog world. Everything was* *(competitive), people were competitive and mostly concerned about their own welfare unless they had developed a friendship with someone."* Conversely, an example of an anecdotal response that supports the potential for power to exist between the student and radiologic technologist in a positive form is as follows: *"I have had an opportunity to work with several people that are passionate about their chosen career, enthusiastic about new ideas . . ."*

Transformational leadership of department directors. A compelling non-significant finding in this study that warrants discussion is that students did not rate the transformational leadership of department directors statistically significantly differently than that of radiologic technologists. In this study, the transformational leadership of directors of imaging departments was rated statistically significantly lower than that of program directors and clinical coordinators and was not rated statistically significantly differently than that of clinical instructors. Department directors' transformational leadership was rated just slightly higher than radiologic technologists (although the difference was not statistically significant). These non-significant findings have substantive implications. An effective director of a medical imaging department, as a health care leader, will possess sophisticated administrative competencies that ensure their department functions effectively in an increasingly complex health care arena (Stefl, 2008). The department director must be proficient in "1) communication in that they can relate to others and clearly and concisely present information, 2) professionalism in that they can achieve and preserve professional standards, 3) leadership in that they can advance the organization's strategic direction, 4) organizational and analytical skills in that they are effective problem solvers, and 5) technical/professional knowledge and skills specific to their position" (American College of Medical Practice Executives, 2003, p. 6). The department director plays a key role in the governance of imaging departments and in setting policies and procedures that impact patients, imaging personnel and students, other hospital departments, and even medical staff. In addition to holding legitimized positons of authority, effective department directors are likely to have several other requisites for leadership that are typically identified by college students such as intelligence, motivation, extroversion, empathy, charisma, influence, ethics, networking ability, and desire for control and power (Shertzer & Schuh, 2004). The ratings that students in this study gave to the transformational leadership of department directors suggest that radiography students either observed leadership in department directors that was relatively low in transformational characteristics or that student were not sufficiently exposed to department directors' roles so as to observe, understand, and assess the transformational leadership of individuals in that position.

Student perceptions of role model leadership and program type. Students in this study who attended radiography educational programs sponsored by colleges and universities rated the transformational leadership of radiography program directors statistically significantly higher than students who attended programs sponsored by hospitals, technical schools, and the military. However, no other statistically significant differences resulted relative to the type of program students attended and the other four radiography role models. The majority of students in this study (63%, n = 103) attended radiography educational programs housed in colleges and universities. This suggests that the majority of program directors in this study were employed by a college or university. The nature of the typical job-related duties of a radiography program director is to provide administrative oversight for the educational program and didactic instruction of students. The program director is likely to be physically located on the college campus more so than other radiography role models who are likely to be in the clinical environment more frequently (as with clinical coordinators and clinical instructors) or continuously (as with radiologic technologists and department directors). College campuses are increasingly emphasizing a culture of leadership development in students through an array of classroom and co-curricular experiences (Astin & Astin, 2000; Cress, Astin, Zimmerman-Oster, & Burkhardt, 2001). Leadership is modeled both intentionally and unintentionally on college campuses not only by faculty and staff such as student affairs personnel, but also by college presidents and other senior-level administrators (Astin & Astin, 2000; Shehane, Sturevant, Moore & Dooley, 2012). The predominant leadership model on the college campus is transformational leadership (Astin & Astin, 2000). Radiography program directors who spend the majority of their time on the college campus are likely to adhere to tenets and practices of transformational leadership as a result of being immersed in campus culture. Students who attend college or university radiography programs may therefore observe transformational leadership behaviors in program directors to a greater extent than in other radiography role models. Students who attend college or university radiography programs may also be more attuned to recognizing transformational leadership behaviors compared to students who attend hospital, technical, or military programs.

Student perceptions of role model leadership and terminal award received. Students in this study who earned an academic degree as the terminal award for the radiography educational program rated the transformational leadership behaviors demonstrated by program directors statistically significantly higher than students who earned a diploma or certificate. No other statistically significant differences resulted relative to the type of terminal degree students earned and the other four radiography role models. A logical assumption holds that students in this study who earned an academic degree also attended a radiography program housed in a college or university. However, this is not always the case. In this study, although 63% (*n* =

103) of respondents attended a college radiography program, 86% (n = 120) earned an academic degree. This discrepancy may be explained, in part, by some respondents in this study who attended a hospital, technical, or military program and who earned an academic degree such as an applied sciences degree. Further, there are a number of unique configurations that are used for radiography programs that result in atypical educational models. Nevertheless, an academic degree often suggests that the student completed liberal education course work. To facilitate comparisons it was assumed that, on average, students in this study who earned BS degrees completed more liberal education than students who completed AS degrees who, in turn, completed more liberal education than students who did not earn an academic degree. Liberal education may help to explain why students who earned academic degrees rated the transformational leadership behaviors exhibited by program directors higher than students who did not earn academic degrees. Seifert, Goodman, Lindsay, Jorgensen, Wolniak, Pascarella and Blaich (2008) reported empirical evidence of the value of liberal arts education and suggested that liberal education contributes to positive leadership outcomes in students. Radiography students in this study who are assumed to have had more liberal arts education, as demonstrated by being conferred an academic degree as the terminal award, might have been more sensitive to and recognized transformational leadership more readily when displayed by program directors. Further, nearly all program directors in this study would hold a master's degree, as evidenced by the overwhelming majority of respondents (95%, n = 163) who indicated that they graduated from a program accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT). JRCERT-accredited radiography programs must appoint masters-prepared program directors. Currently, no other role models in this study are mandated by governing or regulatory bodies to hold graduate level degrees. Masters-prepared program

directors, who are likely to have had more liberal education than other role models, may demonstrate to a higher degree positive outcomes purported by the Association of American Colleges and Universities (AACU) (2002) as a result of liberal education. These outcomes reflect what leadership scholars tout as fundamental tenets of transformational leadership (Antonakis, Cianciolo & Sternberg, 2004; Northouse, 2007) and include "intellectual honesty, responsibility for society's moral health and social justice, active participation as a citizen of a diverse democracy, discernment of the ethical consequences of decisions and actions, and deep understanding of one's self and respect for complex identities of others, their histories, and their cultures" (AACU, 2002, p. xii).

Student perceptions of role model leadership and student age. Students in all three age categories (24 years and under, 25 – 35, and over 35 years) perceived that all radiography role models demonstrated transformational leadership. The lowest leadership rating of role models by any age group was the score of 3.36 given to radiologic technologists by students over 35 years old. Ratings of the leadership of radiologic technologists by students in the oldest age group were statistically significantly lower than ratings by students in the youngest age group. No statistically significant differences in ratings of the leadership of radiologic technologists occurred between students in the 25 to 35 age group and students in either the younger or older age groups. And, no other statistically significant differences in the leadership ratings of role models surfaced among age groups of students. To better understand these findings, data that compared leadership ratings of role models to student age was compared to data collected from the item in the survey that asked the following: "Upon graduation from your radiography educational program, when you thought about the profession of radiologic technology as a whole, did you perceive its members (radiologic technologists), in general, to be leaders?" This item was intended to encompass the entire profession of radiologic technology, in aggregate, including all role models in this study. However, wording on this item in the questionnaire was obscure and may have resulted in a variety of interpretations by respondents thereby rendering it as an unreliable measure. Nevertheless, while it cannot be determined with certainty if students responded to this question based on all radiologic technologists in aggregate, anecdotal responses appear to be based solely upon radiologic technologists as staff technologists who work with students. Common themes among anecdotal responses to this question were mostly that students perceived that radiologic technologists are apathetic toward their jobs and toward working with students. Respondents indicated that radiologic technologists considered their roles to be "just a job," and that technologists worked with students out of obligation. One respondent wrote, "*(Radiologic technologists') social status was based on certifications held and speed in performing exams, not a formal leadership role."* Other responses were, "*Most are just doing their job,"* and, *"Some techs were willing to be in this role and some considered it to be an obligation."*

Another common theme that emerged in anecdotal information provided by respondents was that not all individuals can be leaders. For example, one respondent wrote, "*I know from experience that not everyone is a leader, especially a good leader."* For the most part, these responses did not appear to insinuate that this phenomenon was specific only to the profession of radiologic technology but instead to all individuals in all walks of life. These findings suggest that radiography students, even older students who have more life experience, hold basic ideas about who can and cannot be leaders or what a leader is or is not, and students are either unaware of or do not subscribe to the transformational leadership premise that leadership can be learned. Like college students in Shertzer and Schuh's (2004) study who primarily understood leadership from a trait theory perspective, students in this study who indicated that some radiologic technologists simply do not have what it takes to be a leader also demonstrated evidence of a trait theory perspective of leadership. Trait theory posits that individuals must have special qualities such as "sociability, self-confidence, insight, and influence" (Northouse, 2007, p. 18) to be effective leaders. Shertzer and Schuh suggest that the way that college students define leadership is likely to impact whether they pursue leadership roles. Radiography students in this study who indicated that not all individuals can be leaders may limit their own leadership development potential if they do not think that they, themselves, have the requisite traits for leadership. A transformational leadership theory lens suggests, however, that all individuals can learn transformational leadership (Bass & Avolio, 1990).

Differences in the transformational leadership demonstrated by radiologic technologists as rated by the youngest group of students compared to the oldest group of students in this study underscores unique factors and perspectives that returning adult students bring with them to the learning environment compared to traditional students. The returning adult radiography students in this study who rated the leadership of radiologic technologists more critically than younger students likely had different learning styles and life experiences that Kenner and Weinerman (2011) argue may either help or hinder their ability to achieve their academic goals. The established sense of self that adult learners have and their inclination to "protect this self from perceived threats that might arise in the learning environment" adds to the dynamics of the adult learner in the clinical environment. Brown, Collins, and Duguid (1989) suggest that adult learners must feel safe in the learning environment and yet the clinical learning environment is a minefield of complex social, emotional, and humanistic dynamics that can have a "profound impact on souls" (Fortsch, Henning & Nielsen, 2009, p. 113). And it is the radiologic technologist who is most likely to be alongside and in the moment of such intense experiences with the adult learner radiography student. The radiologic technologist who works with radiography students assumes total responsibility for all aspects of clinical practice when supervising students. In this sense, the role of the radiologic technologist may conflict with an adult learner's need to know that they hold the status of a responsible, independent learner who can be afforded autonomy in their learning endeavors McClusky (1970). Adult learners who do not perceive that they hold this status may not readily participate in learning opportunities (Macherarcher, 2007). This suggests that the degree of autonomy afforded to adult learners in clinical learning environments is dependent upon the supervising radiologic technologist.

A supervising radiologic technologist who deems, out of safety concerns for the patient or the student, that an adult learner should not perform a radiographic procedure independently, or who does not understand the unique needs of returning adult students, threatens the adult learner's status as a responsible, independent learner and also threatens their established sense of self (Macheracher, 2007; McClusky, 2007). Linares (1999) provided further insight that helps to understand the unique needs of radiography students who are adult learners. Linares posited that although adult learners are self-directed in their personal lives, they may experience "confusion and bewilderment when demands are placed on them in the educational environment" (Linares, 1999, p. 407). Supervising radiologic technologists who are not knowledgeable of the unique needs of adult learners and adult learning theory may alienate older radiography students and cause them to form negative perceptions about radiologic technologists as transformational leaders. This suggests that returning adult radiography students will benefit if radiography role models are knowledge of adult learning theory and skillful in applying adult learning strategies while working with returning adult radiography students. Giordano (2008) purported that clinical instructors are expected to be outstanding communicators, good teachers, and good clinicians, but that they often receive no formal training in their role as an instructor and may therefore mimic the instructional styles of individuals who taught them. Strohschein, Hagler, and May (2002) opined that while there are numerous outstanding physical therapy clinical instructors and positive clinical experiences for students, these things may be occurring "due more to clinicians' intuition and natural abilities as educators than to their effective, consistent approach to the clinical education process" (Strohschein, Hagler & May, 2002, p. 171). Several health care disciplines including radiologic technology, nursing, physical therapy, and athletic training are assessing the quality of the clinical learning experience of their students and are acknowledging the need for formal training of individuals who work with students in the clinical environment (Giordano, 2008; Fortsch, Henning & Neilsen, 2009; Strohschein, Hagler & May, 2002; Zilembo & Monterosso, 2008). These dynamics shed light on tension that can exist between radiography students who are returning adults and supervising radiologic technologists and support the established need for formal training of individuals who work with radiography students in the clinical environment – particularly from the perspective of adult learning theory and instructional methodology.

Student perceptions of role model leadership and student income. Students in this study whose annual income at the time of graduation was under $50,000 per year rated the transformational leadership of radiologic technologists and clinical instructors higher than students whose annual household income was $50,000 or more. No other statistically significant differences surfaced in how radiography students rated program directors, clinical coordinators, or department directors based on students' annual household income. This may suggest that students with lower incomes identify more closely with the role models with whom they are most similar in terms of sociodemographic status. Of the five role models in this study, radiologic technologists and clinical instructors are likely to be those whose incomes are closest to the annual household income of students in the under $50,000 per year category. Charles Cooley's (1909) and George Herbert Mead's (1934) theories on the development of self and role development suggest that the development of an individual's sense of self has social origins and is influenced by those with whom she has contact (Allen, 2005; Powers, 2004). Cooley differentiated between primary and secondary interaction social groups and proffered that the greater frequency and higher degree of intimacy of interactions that an individual has with a group renders the group as a primary social group. Primary social groups will have a greater influence mediating the individual's social interactions and their sense of self (Allen, 2005; Cooley, 1909). Radiography students whose income is lower than $50,000 per year are likely to have had been integrated with social groups that consisted of individuals more similar to radiologic technologists and clinical instructors in terms of sociodemographic factors than to other radiography role models. Radiography students may therefore first relate to and readily identify their own sense of self with radiologic technologists and clinical instructors. Next, radiography students may relate the leadership behaviors they observe in radiologic technologists and clinical instructors to the leadership behaviors that students have observed in their primary social groups.

Student perceptions of role model leadership and perceptions of radiologic technologists, in aggregate, as leaders. Students in this study who perceived that radiologic technologists are, in aggregate, leaders observed statistically significantly more leadership behaviors in all five radiography role models than students who answered "no or not sure" when asked if radiologic technologists, in aggregate, are leaders. This item was included in this study with the intent of asking a broad question that would provide data on the overall perspective that radiography students have of leadership in the field. Data from this question provided limited information and was analyzed with caution because of the ambiguous nature of the item on the questionnaire.

Predictive Modeling for Leadership Ratings of Radiography Role Models

In regression analyses that I ran that controlled for students' sociodemographic factors, program characteristics, and the predominant gender of each role model type with whom students worked, student age and income emerged as statistically significant predictors of the transformational leadership ratings of clinical instructors and only student age emerged as a statistically significant predictor of the transformational leadership ratings of radiological technologists. No other statistically significant factors for predicting the transformational leadership ratings of radiography role models surfaced.

Research Question Two. What do Radiography Students Perceive about Leadership Opportunities in the Field of Radiography?

Radiography students in this study indicated that they perceived the most opportunities for leadership in the field of radiography to be mentoring students (74.8%, n = 122) followed by mentoring new technologists (50.9%, n = 83). These two categories of leadership opportunities were identified by over 50% of respondents. Leadership opportunities that result from being assigned to formal positions in the imaging department and in radiography education, along with opportunities to provide leadership on work committees were identified by 25 to 50% of respondents. Individuals who mentor students and new technologists as well as those who are in formal positions in the imaging department and in radiography education are typically significantly visible to and interactive with radiography students during the educational process.

The close proximity that radiography students typically have with individuals in these roles may explain, in part, why the majority of respondents identified these kinds of leadership opportunities. All other categories of leadership opportunities were identified by fewer than 25% of respondents. These categories included committee work for professional societies; officer positions in professional societies; formal leadership positions in health care organizations such as vice-president, senior vice-president, president, or chief executive officer; and formal leadership positions in academic organizations such as dean or department chair. Individuals who fulfill these types of leadership roles are typically not significantly visible to or interactive with radiography students during the educational process which may explain, in part, why fewer respondents identified these kinds of leadership opportunities.

Students' perceptions of "no leadership opportunities" in the field. Students in this study who perceived that there are no leadership opportunities in the field of radiography rated the transformational leadership behaviors of clinical instructors and radiologic technologists statically significantly lower than students who did not select the "there are no leadership opportunities" response. No other statistically significant relationships resulted between the no leadership opportunities response and any other radiography role model (program director, clinical coordinator, or department director). These findings support other findings in this study that indicate that radiologic technologists and clinical instructors, as key individuals who work closely with students in the clinical environment, are prominent influential role models to radiography students. The relationship between the no opportunities for leadership variable and the transformational leadership scores of radiologic technologists and clinical instructors implies that if students do not see leadership being demonstrated by these two role models, or if students do not identify activities of radiologic technologists and clinical instructors as leadership activities, students will not recognize that these two role models carry out leadership tasks and may therefore conclude that there are no opportunities for leadership for radiographers. Charles Cooley's and George Herbert Mead's theories on the development of self and role development (Allen, 2005; Cooley, 1909; Mead, 1934; Powers, 2004) suggest that radiography role models have a significant influence on how students perceive themselves as radiographers and students who know that their radiography role models recognize, seek, and engage in leadership opportunities in the field will, themselves, recognize, seek, and engage in leadership opportunities. Further, if radiologic technologists and clinical instructors, themselves, do not perceive that their roles entail leadership or if they perceive that their roles as leaders are not validated by others in the organization, they will struggle to identify as a leader (Turner, 2003) and will not convey to students that they are leaders and that their activities are leadership activities. Radiography students in Schmidt's (2006) study who perceived that radiologic technologists were not esteemed as leaders by others in the health care environment referred to themselves as "just techs" (Schmidt, 2006, p. 204) and "grunts" (Schmidt, 2006, p. 328) because they perceived that they were considered as having lower status than other healthcare professionals in the organization.

Additionally, a statistically significantly larger proportion of students in this study who worked with clinical coordinators who were predominantly men selected the "no leadership opportunities" category compared to the proportion of students who worked with clinical coordinators who were predominantly women and who chose "no opportunities." This a compelling finding given the numerous gender dynamics that are in place in radiography programs, as discussed in Chapter 2. The profession of radiography is a female dominated profession (Reid, 2010) that functions in gendered organizations (Acker, 1999). The majority of respondents (62%, n = 99) in this study were women. One possible explanation for this finding stems from role theory and suggests that the larger number of female students in this study could not identify with male clinical instructors and therefore did not recognize leadership opportunities in the field. However, this logic would also apply to the relationships between students' perceptions of opportunities and the gender of other role models. Since this was not the case, this finding cannot be explained.

Further, a statistically significantly larger proportion of students who attended hospital, technical, or military radiography programs selected the "no leadership opportunities" category than the proportion of students who attended college or university programs and who selected this category. Individuals who choose vocational or technical education typically have a pragmatic perspective that emphasizes the most efficient use of resources in return for maximized outcomes (Lehmann, 2009). Socioeconomic status may factor into a student's decision of the type of radiography program to attend (Lehmann). Students in this study who attended a hospital, technical, or military program may have had preconceived pragmatic ideas about the field of radiologic technology as being largely technical and void of professional career advancement opportunities including leadership opportunities.

A statistically significantly smaller proportion of students in this study who answered "yes" when asked if radiologic technologists, in general, are leaders, indicated that they saw "no leadership opportunities for radiologic technologists" compared to the proportion of students who did not perceive that radiologic technologists, in general, are leaders. To understand this finding, it is helpful to note that a statistically significant relationship existed in this study between the variable, "are radiologic technologists, in general, leaders?" and the leadership scores of all five radiography role models. Students who answered "yes" to this question rated the transformational leadership of their radiography role models statistically significantly higher than students who answered, “no” and therefore may have seen greater leadership in their role models that, from their perspective, translated into leadership opportunities. Charles Cooley’s and George Herbert Mead’s theories on the development of self and role development (Allen, Cooley, 1909; Mead, 1934; 2005; Powers, 2004) suggest that radiography students will identify with influential individuals who they consider to be leaders and will use this information to inform their own identity as leaders. Female students in Schmidt’s (2006) study reported that they lacked female leader role models in the profession and therefore questioned if leadership opportunities would exist for them in their future careers. But students’ perceptions of radiography role models as leaders may not, alone, explain why students do or do not perceive leadership opportunities in the field. While a definitive explanation cannot be provided, application of the construct of optimism may offer insight into why radiography students do or do not perceive leadership opportunities in the field. Optimism is “the generalized expectation that good things will happen” (Eichner, Kwon, and Marcus, 2014, p. 1056). Individuals who are optimistic have a generalized confidence pertaining to all situations rather than to just one (Scheier and Carver, 1992). Radiography students who perceive that radiographers, in general, are leaders; that there are leadership opportunities in the field; and that their role models exhibit positive transformational leadership behaviors may have a higher degree of optimism than students who have different perceptions. Predicting which radiography students will have higher levels of optimism is difficult since optimism is likely to stem from numerous factors that are specific to each individual (Eichner, Kwon, and Marcus).

Students’ perceptions of narrow range and wider range leadership opportunities. Gender of the radiologic technologist role model and students’ self-efficacy with regard to leadership related to students' perceptions of leadership opportunities. Compared to the proportion of students who worked with radiologic technologists who were predominantly men, a statistically significantly larger proportion of students who worked with predominantly women radiologic technologists indicated that they perceived that leadership opportunities exist for radiographers in the narrow range. The narrow range category of opportunities entailed mentoring students and new technologists and committee membership at work and in professional societies. Given the predominance of women in the field of radiography (Reid, 2010), respondents in this study may have seen more women radiologic technologists serving in roles included in the narrow range of leadership opportunities category. This finding may be also be considered through application of a feminist perspective that suggests that women who work in gendered organizations are required to do overwhelming amounts of committee work (APA Task Force on Women, 2000). Additionally, mentoring has elements of nurturing, caring, and provision of emotional support (Dorsey and Baker, 2004; Wroten and Waite, 2009) that, because of established social norms, may be construed as roles that are more suited for women.

Lastly, a stronger sense of leadership efficacy among students in this study was related to perceptions of opportunities for leadership in the field of radiography. Statistically significantly more students who rated themselves higher in self-efficacy for leadership indicated that there are opportunities for leadership in the narrow range category compared to students who rated themselves lower in self-efficacy for leadership. This same statistically significant relationship emerged between self-efficacy for leadership and the wider range of leadership opportunities variable. Wider range opportunities for leadership included officer positions in professional societies, formal leadership positions in a medical imaging department (lead technologists, supervisor, manager, or director), and formal positions in radiography education (clinical coordinator, clinical instructor, program director). The nature of this study does not facilitate cause and effect, so it is not possible to determine if students' perceptions of opportunities in the field resulted because they rated their self-efficacy for leadership higher or if they rated their self-efficacy for leadership higher because they perceived that there are leadership opportunities in the field. But when Bandura's (2000) perspective on the construct of self-efficacy is applied to these findings, radiography students who observe role models who are similar to themselves persevering and succeeding in leadership opportunities will have increased self-efficacy and will believe that they have the ability to be successful in similar situations or tasks (Bandura, 2000).

Students' perceptions of widest range of leadership opportunities. Of students in this study who perceived that the range of leadership opportunities that exist for radiographers was widest, a statistically significantly larger proportion worked with clinical coordinators who were predominantly women compared to the proportion who worked with clinical coordinators who were predominantly men and who perceived that leadership opportunities exist in the widest range. As with findings of no opportunities for leadership, it is unknown why this finding was limited only to clinical coordinators and not to all radiography role models. However, one plausible explanation takes into account the predominance of women in the field of radiography, the larger percentage of female radiography students in this study, and the status of the clinical coordinator in the hierarchy of the radiography program. Charles Cooley's and George Herbert Mead's theories on the development of self and role development (Allen, 2005; Cooley, 1909; Mead, 1934; Powers, 2004) suggest that female radiography students will identify most with role models who are female and with whom they have other similarities. Earlier findings of this study demonstrated that radiography students who had lower incomes identified more closely with radiologic technologists and clinical coordinators with whom they are likely to be most similar in terms of sociodemographic status. But when students contemplate whether they can achieve very high leadership positions such as those included in the widest range of leadership opportunities category, they may base their perceptions on other radiography role models. In the hierarchy of role models in radiography programs, the clinical coordinator typically holds a higher professional status than radiologic technologists and clinical instructors, but not as high of a status as the program director and department director. Radiography students may not be able to identify with program directors and department directors but are instead able to identify more closely with the clinical coordinator. Students may therefore base their perceptions of higher level leadership opportunities on the individual in the clinical coordinator role. And, in this study there was a larger percentage of female students (62%, $n = 99$) who worked with predominantly female clinical coordinators (73%, $n = 119$). Female students in this study were therefore more likely to form opinions about high level leadership opportunities based on their ability to identify with clinical coordinators – the majority of whom were women.

Predictive Modeling for Perceptions of Leadership Opportunities

Predictor factors for no leadership opportunities. Program type consistently emerged as a statistically significant predictor in all regression analyses related to "no opportunities" for leadership. And, gender of clinical coordinator was statistically significant in the series of regression analyses that I ran that involved clinical coordinators. In the final analysis that I ran for "no leadership opportunities," program type and gender of clinical coordinators emerged as the key predictors of whether students in this study selected "there are no leadership opportunities" in the field of radiologic technology or did not select this option. Students who worked with clinical coordinators who were predominantly men and students who attended hospital, technical, or military radiography programs were more apt to indicate that no opportunities for leadership exist in the field of radiography. All else being equal, when asked about leadership opportunities in the field of radiography, students who worked predominantly with male clinical coordinators were 2.92 times as likely to select the “no opportunities” for leadership response as students who worked predominantly with female clinical coordinators. All else being equal, students who completed a hospital, technical, or military program were .24 as likely to select the “no opportunities” for leadership response as students who completed a college or university program.

Data collected in this study do not adequately explain why a larger proportion of students who worked predominantly with male clinical coordinators perceived that there were no opportunities in the field compared to students who worked predominantly with female clinical coordinators. A search of the body of literature in medical imaging sciences and other health-related fields also do not offer answers. However, application of role theory and identity verification (Turner, 2003) may provide insight. Certain structures and dynamics in the radiography educational program may influence the attitudes of male clinical coordinators relative to leadership opportunities that, in turn, influence the perceptions of students with whom they work. In radiography educational programs that are accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT), the clinical coordinator is tasked with “correlating students’ clinical education with didactic education” (JRCERT, 2014a, p. 43). The JRCERT further mandates that the clinical coordinator “participates in clinical and/or didactic education of students, supports the program director to help ensure effective program operation, and cooperates with the program director in periodic review and revision of clinical course materials ” (JRCERT, 2014a, p. 43). In this sense, the clinical coordinator may be functioning in a similar role as that of middle manager. Mintzberg (1989) describes the role of the middle manager as “a hierarchy of authority between the operating core and the apex’ (Mintzberg, 1989, p. 98). Clinical coordinators may not find adequate career satisfaction in this “middle ground.”

Additionally, clinical coordinators are required by the JRCERT to hold, at minimum, a bachelor’s degree (JRCERT, 2014a). A 2013 survey by the American Society of Radiologic Technologists (ASRT) of over 10,000 radiologic technologists registered with the American Registry of Radiologic Technologists revealed that 33% of respondents held an academic degree at the baccalaureate level or higher (ASRT, 2013). This indicates that clinical coordinators have higher academic degrees than 67% of other radiologic technologists, and yet, the clinical coordinator is not the primary administrator of the radiography educational program. When considered through application of Turner’s (2003) theory of identity verification, the clinical coordinator may perceive that the level of recognition and esteem that he receives from others in the organization is not high enough compared to the status that he should hold as a result of his relatively high level of education. Additionally, the clinical coordinator may think that attainment of the next higher position in the radiography educational program, that of program director, is not feasible or desirable because of the requirement of a master’s degree. Lastly, grounded in identity theory, the male clinical coordinator may not identify with the role of program director given that the profession of radiography is predominantly female and the majority of program directors are women (ASRT, 2011).

The finding in this study that indicated that program type was a predictor of students perceiving that there are no opportunities in the field also cannot be explained with certainty because of limited data. However, consideration of why students choose to attend technical and vocational radiography programs may be useful in understanding why students in this study who completed a hospital, technical, or military radiography program were more likely to select the "no opportunities" for leadership response compared to students who completed a college or university program. Although empirical evidence could not be found that fully explains why some students choose to attend educational programs that are housed in vocational institutions, pragmatism, in terms of using resources most efficiently in return for maximized outcomes, is a factor (Lehmann, 2009). And while the choice to earn a diploma or certificate (as opposed to an academic degree) may have initially been considered by some students in this study as the most pragmatic option for achieving career goals (Lehmann, 2009), once the student was exposed to other radiography role models who had academic degrees and saw them in advanced positions, the student may have then considered their own future opportunities for leadership to be limited or non-existent.

Predictor factors for leadership opportunities in the narrow range, wider range, and widest range. As with the narrow range category for leadership, student self-efficacy for leadership was also the key predictor for students' perceptions of leadership opportunities in the wider range category. The opportunities that were included in the narrow range and wider-range categories of leadership are roles in which radiography students are likely to most frequently observe their role models. Radiography students who observe role models who are similar to themselves persevering and succeeding in leadership opportunities will have increased self-efficacy and will believe that they have the ability to be successful in similar situations or tasks (Bandura, 2000). None of the factors in this study were statistically significant predictors of students' perceptions of leadership opportunities in the widest range of leadership. I was therefore unable to identify factors that predicted the likeliness of students selecting leadership opportunities that fall into the widest range of opportunities.

Research Question Three. What do Radiography Students Perceive about their Self-Efficacy with Regard to Transformational Leadership?

Self-efficacy is an individual's belief in her effectiveness in situations or ability to attain desired outcomes (Bandura, 2000); the ability to succeed in a situation. For the purposes of this study, self-efficacy as a leader pertains to belief that oneself can be effective in engaging in transformational leadership behaviors. The high ratings of self-efficacy for leadership of students in this study are similar to dietetic students in Arendt and Gregoire's (2005) study who also rated themselves highly as leaders in a variety of contexts including at home, at work and in school. Students' in Endress (2000) study of self-efficacy for relational leadership rated themselves moderately high with mean scores between seven and eight on a scale of one to ten. High ratings of self-efficacy for leadership of students in this current study and of leadership in students in Arendt and Gregoire's study may be explained, in part, by the phenomenon of social desirability. Schriesheim (1979) posited that favorable bias will occur in responses when individuals self-report and may therefore distort self-report measures.

Students' self-efficacy for leadership and leadership scores of radiography role models. The high scores for leadership self-efficacy that students in this study gave themselves may be explained, in part, by the high levels of transformational leadership they observed in their radiography role models. A transformational leadership approach will inspire and motivate followers to higher levels of personal development (Antonakis, Cianciolo & Sternberg, 2004). Further, transformational leadership is proffered to facilitate self-efficacy in followers (Schyns, 2001; Kark & Van Dijk, 2007). But the ranking patterns of role models scores for transformational leadership behavior did not align with rankings of the strength of correlation that role models' leadership had with students' perceptions of their own self-efficacy for transformational leadership. This suggests that, in this study, higher ratings of transformational leadership in role models were not predictably related to students' self-efficacy for transformational leadership. Students in this study rated radiologic technologists lowest in transformational leadership and yet students' self-efficacy for leadership scores correlated most strongly with the leadership score of radiologic technologists. Likewise, students rated program directors highest in transformational leadership but the correlational strength between students' self-efficacy for leadership and program director's transformational leadership scores was the weakest. The convoluted nature of these correlations in comparison to the rankings of the transformational leadership of role models may be explained by considering that the role models' leadership scores reflect students' perceptions of a leadership hierarchy and students, instead of ranking leadership, were instead ranking leadership positions. A logical assumption therefore holds that the correlational strength of role models' leadership scores with students' self-efficacy for leadership, and not the ranking of role models leadership scores, might best indicate the particular role model whose leadership is related most to students' self-perceptions of leadership.

Students' self-efficacy for leadership and other variables. Endress (2000) reported that women in her study of college students' self-efficacy for relational leadership had statistically significantly higher pre-test scores than men in three of the five dimensions of the Student Leadership Practices Inventory (Kouzes & Posner, 1998). Endress found no other statistically significant differences in the self-efficacy for relational leadership scores for students in her study according to age, race, or socioeconomic status. Sociodemographic factors of radiography students in the current study were not related to students' perceptions of their self-efficacy with regard to transformational leadership. No other factors in this study were statistically significantly related to students' self-efficacy for leadership except for the variable, "Are radiologic technologists, in general, leaders?" The perceptions that radiography students had about their own self efficacy with regard to transformational leadership were statistically significantly higher if they perceived that the profession of radiologic technology and its members, in general, are leaders. This may be explained by understanding the relationship that surfaced in this study between students' ratings of the transformational leadership scores of role models and students' responses to the question, "Are radiologic technologists, in general, leaders?" Students who rated leaders highly in transformational leadership behaviors were more apt to answer "yes" when asked if radiologic technologists, in general, are leaders. And, since transformational leadership is suggested to facilitate self-efficacy in followers (Schyns, 2001, Kark & Van Dijk, 2007), students in this study who indicated that radiographers, in general, are leaders and who also observed transformational leadership in their radiography role models likely had higher self-efficacy with regard to leadership. Another explanation that might account for why students in this study who had higher levels of self-efficacy were also more likely to indicate that radiologic technologists, in general, are leaders is the construct of optimism. In their study of academic self-efficacy in college students, Chemers, Hu, and Garcia (2001) reported that students who had high levels of optimism also had higher levels of academic self-efficacy.

Predictive Modeling for Students' Self-Efficacy for Leadership

The transformational leadership score of radiologic technologists emerged as the key predictor of students' perceptions of their own self-efficacy for leadership. Bandura (1995) suggested that self-efficacy increases when individuals observe models who are similar to themselves persevering and succeeding in experiences. The relationship that radiography students have with radiologic technologists satisfies Bandura's criteria for increasing self-efficacy perhaps more so than any other dyadic relationship that exists between radiography students and radiography role models. Radiography students regularly observe clinical coordinators, clinical instructors, and radiologic technologists persevering and succeeding in the often challenging clinical environment not only with patients, physicians, and coworkers, but also in the oversight and instruction of students. And, findings reported earlier revealed that radiography students in this study who were in the lower income bracket related more to the leadership of radiologic technologists and clinical instructors than other role models. Radiography students are likely to have formed their sense of self in social groups in their personal lives that consisted of individuals with characteristics similar to radiologic technologists and will therefore identify more readily with radiologic technologists (Allen, 2005; Cooley, 1909; Mead, 1934; Powers, 2004). And, students will increasingly identify with radiologic technologists throughout the educational process because of the long, frequent, and close interactions they have with radiologic technologists in the clinical environment that is oftentimes emotionally-charged (Fortsch, Henning & Nielsen, 2009). The close nature of the relationship will result in radiologic technologists having a substantial influence on radiography students and will also render radiologic technologists as the allegorical primary caregivers of students (Allen, 2005; Mead, 1934; Powers, 2004). Whereas the program director was likely to be the primary caregiver of radiography students early in the educational process, this role is apt to shift based on the undercurrents of the dyadic relationship that develops between students and radiologic technologists as a result of dynamics in the clinical environment. Radiography students will likely form and solidify their professional identities based on an identity defined by radiologic technologists.

Radiography students' beliefs about their self-efficacy will drive their thoughts, feelings, self-motivation, and actions (Bandura, 1995). Students who have higher self-efficacy for leadership will be more likely to demonstrate leadership behaviors (Bardou, Byrne, Pasternak, Perez & Rainey, 2003). And, the leadership behaviors that radiography students are likely to demonstrate will be based on the leadership behaviors that they observed in their primary caregivers – radiologic technologists. In this sense, the relationship that radiography students have with radiologic technologists may be the most critical of all role models in terms of students' leadership development. Further, the relationship that radiography students have with radiologic technologists has significant implications for the profession of radiography at large because it suggests perpetuity of the dyadic student/technologist relationship. The initial clinical experiences and relationships that radiography students have with radiologic technologists will shape perceptions that students have of their future profession (Lockwood-Rayermann, 2003; Lofmark & Wikblad, 2001; Myrick & Yonge, 2002). Like program directors in Turley's (2004) study, radiologic technologists, by "shaping the knowledge, skills, and attitudes" of students will be "shaping the profession as a whole" (Turley, 2004, p. 15).

The degree of influence that radiologic technologists are likely to have on radiography students' leadership efficacy and the resulting potential for far-reaching effects on the entire field with regard to leadership development suggests that radiologic technologists must take considerable care in working with students. Radiography students rely heavily on the guidance of clinical personnel, including radiologic technologists, with regard to learning and emotional support (Curtis, Helion & Domsohn, 1998; Fortsch, Henning & Nielsen, 2009; Giordano, 2008; Livsey, 2009). The degree of dependency that students have on radiologic technologists, the emotionally-charged nature of the clinical learning environment (Fortsch, Henning & Nielsen, 2009), and radiologic technologists' potential role as primary caregivers to radiography students may result in technologists having a significant amount of power over students. In some radiography educational clinical environments, technologists are thought to "set the direction and tone of the clinical experience" (Fortsch, Henning & Nielsen, 2009, p. 118). Radiologic technologists can facilitate student learning and self-confidence in the clinical environment by being supportive, nurturing, and patient (Fortsch et al., 2009). Conversely, however, technologists can impede student learning by not providing suggestions for improvement of clinical performance, by showing favoritism, and by being disrespectful to students (Fortsch, Henning & Nielsen, 2009, p. 118). Some radiography students in this study may have formed negative perceptions about the transformational leadership behaviors of radiologic technologists as reflected in the lower scores for transformational leadership that students, particularly older students, assigned to radiologic technologists. Returning adult students who were over age 35 rated the transformational leadership of radiologic technologists statistically significantly lower than students age 24 years and younger. And, statistically significantly more students in the older age category indicted that radiologic technologists, in general, are not leaders or were not sure if radiologic technologists are leaders.

The findings of this study suggest that a paradox exists within the radiography educational model – particularly the clinical educational model. The role model who, in this study, although was rated lowest on average in leadership, emerged as the most influential to radiography students (i.e., radiologic technologist) in shaping students' perceptions of themselves as leaders, opportunities in the field, and of themselves as future leaders are the lowest in the hierarchy of individuals who are formally prepared and purposefully equipped to work with radiography students. This incongruity of radiologic technologists' roles and of the expectations placed on them relative to the education of radiography students may stem from longstanding norms of the radiography educational model that largely assume that radiologic technologists, having once been students themselves, will automatically know how to work with radiography students. This mindset may be reinforced by the primary accrediting body of radiography educational programs – the Joint Review Committee on Education in Radiologic Technology (JRCERT). The JRCERT has a highly prominent and powerful voice in the radiography educational process and "promotes excellence in education" (www.JRCERT.org, retrieved July 2014). But, there may be a discrepancy in the JRCERT's *Standards for an Accredited Educational Program in Radiography ("Standards")* (JRCERT, 2014a) regarding the role that radiologic technologists have in the radiography educational process. Unlike clinical coordinators and clinical instructors, the JRCERT does not afford radiologic technologists a formal title relative to the education of radiography students but instead refers to them as "clinical staff" (JRCERT, 2014a, p. 23). More importantly, the JRCERT requires that radiologic technologists who work with students "understand the clinical competency system, understand the requirements for student supervision, support the educational process, and maintain current knowledge of program policies procedures, and student progress" (JRCERT, 2014a, p. 44), but, the JRCERT does not mandate that radiologic technologists, unlike other faculty in the radiography educational program, be afforded opportunities for "continued professional development" (JRCERT, 2014a, p. 23). Radiologic technologists are informal mentors to radiography students and should be trained accordingly and valued for this role.

Fortsch, Henning & Nielsen (2009) asserted that radiologic technologists and radiography students would benefit from professional development opportunities made available to radiologic technologists who provide clinical instruction to students. The field of radiologic technology is not alone in its need to facilitate professional development of clinical preceptors. Several other health care disciplines including nursing, physical therapy, and athletic training are assessing the quality of the clinical learning experience of their students and are recognizing the need for formal training for individuals who work with students in the clinical environment including instructional methodology specific to adult learners (Fortsch, Henning & Nielsen, 2009; Giordano, 2008; Strohschein, Hagler & May, 2002; Zilembo & Monterosso, 2008).

Radiography Education within the Context of Gendered Environments

It should be noted that the focus of this study did not center on gender issues in radiography education and therefore discussion in this section about findings related to gender are made with care so as not to minimize potential gender issues that may exist.

Radiography educational programs, typically housed either in health care organizations or post-secondary academic institutions, function in historically male-dominated environments (Harris, 1995; Madden, 2005; P. McCullough, personal communication, December 16, 2013; Patterson-Lorenzetti, 2002) that fit Acker's (1990) theory of gendered organizations. Few findings in this study were statistically related to gender of students or gender of role models. With the exception of how students in this study perceived leadership opportunities, gender was otherwise not a predictor of the perceptions that students had of their radiography role models. In certain circumstances, students who worked with female role models recognized certain types of leadership opportunities more than students who worked with male role models. A larger percentage of students who worked with radiologic technologists who were women were more likely to recognize that entry-level leadership opportunities existed, but this may be because these types of opportunities (committee work and mentoring) may be construed as being more feminine in nature (APA Task Force on Women, 2000; Dorsey & Baker, 2004; Wroten & Waite, 2009). In contrast, a larger percentage of students who worked with clinical coordinators who were women were more likely to identify that, in general, leadership opportunities exist and that they exist at very high levels. In this sense, female radiography students in this study may have had an adequate amount of positive role modeling from women who contributed to students' positive perceptions of opportunities for women in the field of radiography. This is in contrast to female radiography students in Schmidt's (2006) study who reported a noticeable lack of female leader role models in the profession that was related to students questioning whether leadership opportunities would exist in their future careers. A compelling finding of the current study suggests that gender bias might be a factor for radiography students. A larger percentage of students (88.4%) reported working with predominantly women radiologic technologists compared to 60.5% of students who reported working with predominantly women department directors. This suggests that there may be disparity in the proportion of women in lower level positions in the medical imaging department compared to the proportion of women in higher level positions. This is particularly poignant given that, overall, there are a greater number of women radiologic technologists than men (Patterson-Lorenzetti , 2002) In 2009, 72% of registered radiographers were female (Reid, 2010). These phenomena may be explained by Acker's contention that even in organizations that are conceptualized as being gender-neutral, a pervasive masculinized epistemology, although usually obscure, shapes the structure and function of organizations.

Limitations of the Study

Sample

Participants in this study were obtained from a convenience sample from a small, self-selecting group of examination candidates who, as part of the primary radiography certification examination application process with the American Registry of Radiologic Technologists (ARRT), agreed to receive correspondence about research. Individuals who did not pass the ARRT certification examination in radiography were not included in this study because correspondence with study participants and data collection had to be accomplished through email due to financial limitations of the researcher. The ARRT does not add an individual's email address to its records until the individual becomes a registered technologist (J. Reid, personal communication, March 28, 2013). Inclusion in this study of individuals who did not pass the ARRT's primary radiography certification examination would have resulted in a more holistic understanding of students' perceptions of leadership in the field of radiography.

There was a low final response rate (9%, n = 163) for this study. The small sample size was considered carefully during interpretation of data. Bivariate and multivariate statistical analyses yielded results that were statistically and theoretically sound for the nature of this descriptive, exploratory study. The small sample size may have resulted in predictive models that were not ideal, but the intent of this study was not to try to attain exactness in coefficients for prediction as much as to describe the significant relationships and their relative strength of association. The small sample size may, in part, be due to the length of the questionnaire. The questionnaire used for this study asked respondents to answer 17 items. However, two scales in the instrument used to measure students' perceptions of leadership of their radiography role models and their own self-efficacy with regard to leadership were comprised of 30 items each. Respondents were asked to answer all 30 items for six different role models and then 30 items about themselves. The design of the instrument was therefore lengthy and broad in scope and may have been a disincentive to respondents to participate and to fully complete the questionnaire.

The results of this descriptive study should be generalized to to the larger population of radiography students with caution. Still, findings of this study contribute to the body of information that exists about the radiography educational experience and how it may shape students' perceptions of leaders in the field, their perceptions of leadership opportunities, and beliefs about their own leadership. And, although I used a convenience sample, characteristics of the respondents in this study reflect the broader population of radiography students. Additionally, although the sample was self-selecting, it is unlikely that respondents self-selected on the basis of their identification with certain role models or perceptions of leadership.

Adaptation of the Student-Leadership Practices Inventory (Kouzes & Posner, 1998)

The adapted, non-permissioned version of the Student-LPI (Kouzes and Posner, 1998) used in this study reflects additional changes to previously adapted (permissioned) versions of the Student-LPI used by Endress (2000) and Arendt and Gregoire (2005). While the purpose of using and transforming Endress' and Arendt's and Gregoire's adapted version of the Student-LPI (Kouzes and Posner, 1998) was specific to the purpose of the research questions, context, and sample in this study, the publisher of the Student-LPI (Jossey-Bass) stressed that Kouzes and Posner "did not design the Student-LPI to evaluate self-efficacy or capacity, but rather the frequency of actual behavior which is the foundation upon which The Five Practices rest" (E. Null, personal communications, January 22, 2014).

Response Scales in Leadership Measures

Similar to Endress (2000), an 11-point Likert- type scale was used in this study to assess students' self-efficacy with regard to transformational leadership with response categories ranging from "cannot do" to "can do." Bandura (1997) contended that scales with a "greater number of steps allow for greater sensitivity in assessing and differentiating information"

(Bandura, 1997, p. 44). This 11 point scale was later mathematically converted to a 5-point scale for the purpose of comparing students' self-efficacy assessment with their assessment of radiography role models' transformational leadership scores that were measured with a 5-point scale with response categories ranging from "never" to "always." The differences in the original response categories used in the two scales may have impacted validity of comparisons of role model leadership scores with students' self-efficacy for leadership scores.

Directions for Future Research

Radiography Students' Understanding and Definition of Leadership

This study offered insight to the perceptions that radiography students have about the leadership of their radiography role models, but it was not intended to describe factors that inform their perceptions. Shertzer and Schuh (2004) purported that college students define leadership according to personal characteristics, legitimized positions of authority, and internal motivating factors. Requisites of a leader were defined by students in Shertzer's and Schuh's study as intelligence, motivation, extroversion, empathy, charisma, influence, ethics, networking ability, and desire for control and power (Shertzer & Schuh, 2004). Additional research, including qualitative research, is warranted that assesses radiography students' beliefs, understanding, and definition of leadership and how these dynamics influence development as leaders and professionals.

Students' Self-Efficacy for Leadership

Like the dietetic students in Arendt and Gregoire's (2005) study who rated themselves highly as leaders, radiography students demonstrated a high degree of confidence in their leadership ability. Students in this study rated their own self-efficacy for leadership (M = 4.79, *n* = 157) higher than they rated the transformational leadership behaviors of any of their radiography role models. And while the phenomenon of social desirability (Schriesheim, 1979) may have contributed to the high ratings of students' self-efficacy for transformational leadership, future research might explore factors that contribute to radiography students' leadership self-efficacy. Additionally, a longitudinal study of self-efficacy for leadership in radiologic technologists will allow us to assess if levels of self-efficacy for leadership change over time. Analysis of self-efficacy five and ten years post graduation will provide insight into whether the self-efficacy and enthusiasm for leadership that graduates have as new practitioners diminishes over time as they progress in their careers, or if they continue to see new opportunities for leadership and still feel efficacious in their leadership abilities.

Relationship of Student's Self-Efficacy for Leadership and Identifying with Role Models

Findings of this study suggest that students' perceptions about their own self-efficacy for leadership are likely to be influenced the most by the role model with whom they identified the most. Future research might include a study of factors that influence radiography students' identification as as radiography students, as current and future leaders, and as future practitioners with the degree of influence of role models as a control variable.

Effective Leadership Styles in the Radiography Clinical Environment

Future research might assess effective leadership approaches that optimize student learning in the clinical environment. The body of literature from multiple health care disciplines informs us that transformational leadership is an effective leadership approach for teaching college students and in health care educational environments (Curtis, Helion & Domsohn, 1998; Fortsch, Henning & Nielsen, 2009; Heller, Drenkard, Esposito-Herr, Romano, Tom & Valentine, 2004; Shertzer & Schuh, 2004), but situations arise in the clinical environment in which radiography students would benefit from teaching and leading that is more task-oriented. Study of the effectiveness of various leadership approaches in the radiography clinical learning environment is therefore warranted.

Implications for Policy and Practice

The initial purpose of this study was to understand leadership development of professionals in the field of radiography by understanding the perceptions that student radiographers, upon graduating from radiography educational programs, have of the transformational leadership demonstrated by their radiography role models, their perceptions of leadership opportunities in the field of radiography, and perceptions of their own self-efficacy with regard to transformational leadership. Findings of this study were intended to inform a model of leadership succession for the field of radiography. A model of leadership succession will ensure continued supply of effective leaders in the field of radiography who can effectively represent and give voice to its members in organizational decision making that impacts the profession as a whole as well as its constituents, namely, our patients.

Incorporation of Leadership Theory into the Entry-Level Radiography Curriculum

Radiography students, like college students in Shertzer and Schuh's (2004) study are likely to define leadership according to personal characteristics, legitimized positions of authority, formal titles, and internal motivating factors and traits that they perceive leaders should have, such as intelligence, motivation, extroversion, empathy, charisma, influence, ethics, networking ability, and desire for control and power. Students who perceive that they do not have these attributes will not think they have potential for leadership (Shertzer & Schuh, 2004). Students in this study were influenced by their radiography role models, particularly role models who work with them in the clinical environment. From the perspective of theories of development of self and role formation (Allen, 2005; Cooley, 1909; Mead, 1934; Powers, 2004), radiography students formulate meanings about how to behave and take on roles as radiologic technologists and as leaders in the profession based on what they actively and passively learn during the radiography educational process. These phenomena suggest that perceptions that students form about themselves as radiologic technologists and as leaders is occurring, largely, through happenstance which will not serve the field well. Students, as future technologists, will likely perpetuate these notions and perceptions – whether positive or negative – in the next generation of radiography students.

Formal instruction of leadership will help radiography students more fully understand leadership from a theory-based perspective and may dispel preconceived and constraining beliefs that they, as with other college-aged students, typically have about leadership (Shertzer & Schuh, 2004). Currently, the curriculum used for nearly all JRCERT-accredited entry-level radiography educational programs in the United States is published by the American Society of Radiologic Technologists (ASRT, 2012) and does not emphasize leadership. In the 2012 *ASRT Radiography Curriculum,* the only reference made to leadership development is identified as a global content objective that is listed under the social and behavioral sciences (ASRT, 2012). The structure of general education requirements in the 2012 *ASRT Radiography Curriculum* is such that leadership development is a markedly minimal and optional content objective (ASRT, 2012).

Adding leadership content to the *ASRT Radiography Curriculum* presents challenges because the curriculum is already overburdened with content (Bower, 2010). Nevertheless, Frank, Aroian, and Tashea (2003) argued that insufficient attention to leadership development at the entry level (associate degree) in nursing programs requires enhanced leadership preparation at upper level programs in nursing. Nurses who are enrolled in baccalaureate and master's level programs have already held managerial positions and would have benefitted from leadership instruction at the associate degree level (Frank et al, 2003). The resources and time necessary to make these changes to the entry-level radiography curriculum may be justified by the benefit to the profession at large when considered through Well's (2002) introspection about the field of pharmacy. Based on Well's perspective, if the field of radiography does not expend the necessary resources to develop adequate leadership, we are "stealing from our future" (Wells, 2002, p. 437). By incorporating leadership theory and leadership practice opportunities into the entry-level radiography curriculum, the profession of radiography, like the professions of nursing and pharmacy, will be taking measures to grow our own leaders (Sherman, 2005; Zimmerman-Oster & Burkhardt, 1999).

Incorporation of Leadership Practice into the Entry-Level Radiography Curriculum

Shertzer and Schuh (2004) argued that the way that a student defines leadership is likely to impact whether they pursue leadership roles. Findings from Shertzer's and Schuh's 2004 study suggest that leadership perceptions and involvement in leadership were mediated in college students primarily by two factors: 1) students' understanding of the definition of leadership, and 2) factors that either empowered or constrained students' beliefs about themselves as leaders. These factors included opportunities to practice leadership and receiving support and encouragement to participate in leadership opportunities (Shertzer and Schuh, 2004). Bandura (1995) purported that self-efficacy is increased through persuasion from others of one's capability to succeed, encouragement to try, and provision of opportunities that will likely result in success.

Findings from this study indicate that radiography students feel efficacious as leaders. Reinforcing and developing this belief in students' ability to lead should occur in the radiography educational process by providing students opportunities to lead and by encouraging students to participate in leadership opportunities. Radiography students who are encouraged by their radiography role models, advisors, and faculty members to participate in leadership opportunities will have increased confidence for leadership (Shertzer & Schuh, 2004; Endress, 2000). Students who have opportunities to get involved in leadership and follow through with that opportunity develop empowering leadership beliefs about themselves as leaders (Shertzer & Schuh, 2004). Students in Shertzer and Schuh's study reported that having just one leadership opportunity was often all that was needed to open the door to their participation in several more (Shertzer & Schuh, 2004).

Student Participation in Professional Societies

The vast majority of radiography students in this study were not familiar with leaders of professional societies. This may indicate that students are not being encouraged to join professional societies or to participate in professional society events. The level of participation that radiography students have in professional societies is likely to be influenced by their radiography role models. Radiography role models are well positioned to teach radiography students about the function and role of professional societies, the benefit of membership, and the importance of supporting one's profession through membership. Further, program directors and department directors typically have the authority and access to resources that support and encourage student participation in professional society events by facilitating time off and transportation.

Students have much to gain through professional association membership in terms of solidifying their identity as radiologic technologists. The benefits include observing prominent local, state, and national leaders of the profession carrying out scholarly and governing activities and having the opportunity to participate with these leaders (Herman, 2005). Additionally, membership in professional societies provides access to the "intellectual capital, expertise, and professional competency" of the profession at large (Herman, 2005, p. 257). Radiography role models, as a matter of principle and practice, should therefore foster leadership development in radiography students by facilitating in students and themselves enthusiastic, consistent, and robust membership in professional societies.

Mandated Formal Instruction for Clinical Educators

The potential impact of the clinical education experience on the personal, social, and academic outcomes of radiography students has been addressed in this report and is also documented in the body of literature of medical imaging sciences. The impact on healthcare students of the clinical educational environment spans numerous and diverse health care professions including nursing, physical therapy, athletic training, and radiologic technology (Baltimore, 2004; Curtis, Helion & Domsohn, 1998; Fortsch, Henning & Nielsen, 2009; Giordano, 2008; Lockwood-Rayermann, 2003; Lofmark & Wikblad, 2001; Linares, 1999; Myrick & Yonge, 2002; Strohschein, Hagler & May, 2002; Zilembo & Monterosso, 2008). And, calls have been made in the body of medical imaging sciences literature for increased support of individuals, namely radiologic technologists, who work with radiography students in the clinical environment through formal training of instructional methodology with the intent of improving the quality of the learning experience for radiography students (Fortsch, Henning & Nielsen, 2009; Giordano, 2008). This need has likewise been discussed in nursing, physical, therapy, and athletic training (Curtis, Helion, & Domsohn, 1998; Strohschein, Hagler & May, 2002; Zilembo & Monterosso, 2008).

When asked if they perceived that radiologic technologists, in general, are leaders, students in this study provided anecdotal information that indicated that while there were many radiologic technologists who worked well with students in a clinical environment, there were many who did not. One respondent stated, "*There were many technologists that I had worked with as a student who always complained about this field, at some point I felt as if this wasn't for me, either, but in the end, I have no regrets. Just being a student is hard as it is, and to hear almost everyone stating that they would have chosen a different career was hard."* Another student wrote, "*I found veteran (technologists) to be very judgmental and not willing to be patient and allow us to learn at our pace."* This anecdotal data support aforementioned empirical research in the field of radiography and other health care fields that suggests that the clinical educational process would benefit from the training of individuals who work with students in the clinical environment.

Much is asked of radiologic technologists and other clinical preceptors by radiography educational programs relative to the education of radiography students. Radiologic technologists who work with students in the clinical environment, like other health care professionals, must contend with increasingly heavy workloads, increasing needs of acutely-ill patients, shortages of personnel, and changes in the health care industry and organizations that trickle down to the department level and impact daily operations (Zilembo & Monterosso, 2008). The experience that students have with radiologic technologists can shape perceptions that students have of their future profession (Lockwood-Rayermann, 2003; Lofmark & Wikblad, 2001; Myrick & Yonge, 2002). And, students will likely perpetuate what they learned and how they were taught as a radiography student to future generations of students.

The role of the radiologic technologist in the education of students is recognized by the Joint Review Committee on Education in Radiologic Technology (JRCERT) as defined in the *Standards for an Accredited Educational Program in Radiography* (JRCERT, 2014a). The magnitude of the impact that the clinical learning experience has on radiography students, the demands that it places on individuals in the clinical environment who work with students, the propensity for clinical learning to profoundly impact the profession at large through the phenomenon of perpetuity, as well as the potential for clinical dynamics to significantly impact our patients merits the requirement of formal education and competencies for all clinical personnel who work with radiography students.

Incorporation of Adult Learning Theory into the Radiography Curriculum

Findings of this study support the need for all radiography educators to be knowledgeable of adult learning theory. Students in this study who were over 35 years old rated the transformational leadership of radiologic technologists statistically significantly lower than students 24 years of age and younger, but the older students did not rate other role models' transformational leadership lower than younger students. Additionally, a significantly larger number of students over 35 years old answered, "no" or "not sure" when asked if they perceived that radiologic technologists, in aggregate, are leaders compared to students age 24 years and younger. Older students provided negative anecdotal feedback to this question that seemed to be aimed toward the radiologic technologists role models in this study. These findings support the need for incorporation of adult learning theory into all aspects of the radiography curriculum including both didactic and clinical instruction. This is supported by anticipated enrollment growth in post-secondary education of returning adult students through 2022 that is projected to be greater than any other age bracket (U.S. Department of Education, 2014). The need for incorporating adult learning theory into the curriculum is recognized by other health care professions as well (Strohschein, Hagler & May, 2002).

Recognition of Radiologic Technologists as Leaders

Radiologic technologists in this study were the key role models whose transformational leadership scores, as rated by students, were most likely to predict whether students felt efficacious as leaders. Radiologic technologists will therefore have significant influence over radiography student's beliefs in their capability to organize and execute courses of action required to manage prospective situations as well as students' thoughts, feelings, self-motivation, and actions (Bandura, 1995). Tolley Gurley and Calloway (2011) purported that radiologic technologists are important members of the overall team that is responsible for the education of radiography students. The JRCERT mandates that radiologic technologists in an accredited program must "understand the clinical competency system, understand the requirements for student supervision, support the educational process, and maintain current knowledge of program policies procedures, and student progress" (JRCERT, 2014a, p. 44). In some radiography educational clinical environments, technologists are thought to "set the direction and tone of the clinical experience" (Fortsch, Henning & Nielsen, 2009, p. 118). And yet, radiologic technologists typically hold informal positions of leadership relative to students.

Empirical data of perceptions that radiologic technologists have about their own professional identify is limited, but Tolley Gurley and Calloway (2011) suggest that the professional identity of a radiographer is determined through self-perceptions combined with the perceptions of others including patients and colleagues. A logical assumption holds that radiologic technologists consider themselves, first and foremost, as practitioners. Social theorist, Emile Durkheim (1938), argued that within culture are interconnected signs, symbols, and categories, or "social facts" (Durkheim, 1938) that influence the way that members think. In the field of radiologic technology, strong symbolism and meaning are found in professional credentials that follow members' names such as "RTR, CT, M, and MRI." The theory of identity verification posits that individuals desire for others to validate their role identity (Turner, 2003) and that if that role is not validated, role confusion may ensue in the individual. Given the strong emphasis that radiologic technologists place on the symbolism of professional credentials that suggest desire for identify verification, it is logical to assume that a formal title will facilitate the professional identity of radiologic technologists as a leader in the education of radiography students. Additionally, and equally important, a formal title may increase perceptions among radiologic technologists that their roles as leaders are recognized and esteemed by others in the imaging department and within the organization, which in turn, may cause radiologic technologists to identify more strongly as leaders (Turner, 2003) and demonstrate a higher degree of leadership to radiography students.

Conclusions

This study explored radiography students' perceptions of the transformational leadership of their radiography role models, perceptions of opportunities for leadership in the field, and perceptions of their own self-efficacy with regard to transformational leadership in order to better understand how leadership development in radiologic technologists might be enhanced. This study was based on the premise that if radiography students have positive radiography role models in whom they see, hear, and, in a sense, feel leadership, the perceptions of leadership that students form will be positive and influential in their own leadership development and pursuits.

By observing leadership behaviors in their radiography role models, radiography students will know that radiologic technologists, in aggregate, are leaders; by witnessing their radiography role models in leadership positions, radiography students will know that opportunities for leadership exist for radiographers; and, by seeing their role models succeed in leadership positions, radiography students will identify with the role models and therefore think that they, themselves, can also succeed in leadership positions. And, these three factors – perceiving that radiologic technologists, in aggregate, are leaders; perceiving that leadership opportunities exist for radiographers; and perceiving that they, themselves, are efficacious with regard to leadership –will motivate radiography students to pursue leadership positions in their professional careers.

Students in this study reported observing a relatively high degree of transformational leadership in their radiography role models. But, the degree to which students in this study perceived transformational leadership in their role models did not similarly predict students' perceptions about leadership opportunities in the field or perceptions of their own self-efficacy with regard to transformational leadership. Instead, findings of this study suggest that the degree to which students identify with their radiography role models may be a more significant influential factor of students' perceptions about leadership opportunities in the field and their own self-efficacy for transformational leadership. Relationships consistently emerged in this study that indicated that radiography students identified with radiologic technologists, clinical instructors, and clinical coordinators, but most consistently with radiologic technologists. Students who had lower annual household incomes related to the leadership scores of radiologic technologists and clinical instructors more than the other three role models. This is likely because radiologic technologists and clinical instructors are the most similar to students in this sense compared to other role models. Younger students (24 years of age and under) positively related to leadership scores of radiologic technologists statistically significantly more than students over 35 years of age and more than any other radiography role model. And the leadership scores of radiologic technologists were the key predictor of students' self-efficacy for leadership. The leadership scores of program directors were statistically related to students much less often. Radiography students who attended radiography programs housed in colleges or universities and who earned an academic degree as opposed to a diploma or certificate were statistically related to program directors' leadership scores. Also, students' perceptions of their own self-efficacy for leadership was moderately positively correlated with the leadership scores of program directors and department directors but was more strongly positively correlated with the leadership scores of clinical coordinators, clinical instructors, and radiologic technologists. Additionally, students in this study who indicated that opportunities for leadership existed rated the leadership of radiologic technologists and clinical instructors statistically significantly higher compared to students did not think that leadership opportunities existed.

The findings noted above all point toward a high degree of influence that radiography role models who work with students in the clinical environment, particularly radiologic technologists, are likely to have on the leadership perceptions of radiography students. This is logical because students, as "brand new" members of the profession are striving to make sense of what it means to be a radiologic technologist – how to think, act, and speak like a radiologic technologist. Students will achieve this through professional socialization with other radiologic technologists with whom they feel most similar (Allen, 2005; Cooley, 1909). Furthermore, radiography students spend a considerable amount of time with radiologic technologists in the clinical environment. The clinical education experience has all the elements that, according to Charles Cooley's and George Herbert Mead's theories of role formation and developing a sense of self, will significantly contribute to radiography students' identity development as practitioners (Allen, 2005; Cooley, 1909; Mead, 1934; Powers, 2004). These elements include interactions that are lengthy, frequent, and intimate (Allen, 2005; Cooley, 1909; Mead, 1934; Powers, 2004). Students' integration of self with radiologic technologists is solidified even more by the oftentimes highly emotional and profound experiences that radiologic technologist mediate for students in the clinical environment (Curtis, Helion & Domsohn 1998; Fortsch, Henning & Nielsen, 2009; Giordano, 2008; Livsey, 2008). As a result, the role of the allegorical primary caregiver (Allen, 2005; Mead, 1934; Powers, 2004) of radiography students that early in the educational process may have belonged to the program director is eventually transferred to the radiologic technologist. Students will learn actively and passively from radiologic technologists not only what it means to be a practitioner, but also what it means to be a leader, and they will perpetuate what they see and learn about both roles to future generations of students. Consequently, radiologic technologists, like program directors in Turley's (2004) study "shape the knowledge, skills, and attitudes" of radiography students and will therefore indeed be "shaping the profession as a whole" (Turley, 2004, p. 15).

Findings of this study suggest that students' perceptions about leadership opportunities and their own self-efficacy for leadership are likely to be influenced the most by the role model with whom they identify the most. Students in this study may have been influenced by radiologic technologists most consistently because radiologic technologists, of all the role models, are likely to be the most similar to students (Allen, 2005; Cooley, 1909; Mead, 1934; Powers, 2004). This symbolic relationship is likely to hold true for radiography students beyond those who participated in this study. Consequently, one of the primary actions that the profession of radiography might take to help foster in our students self-efficacy for leadership is to ensure that students see radiologic technologists practicing transformational leadership and that students understand that radiologic technologists, with or without formal titles, are leaders and have leadership roles relative to the education of radiography students. But radiologic technologists, themselves, must be supported in their roles as mentor-leaders to radiography students. If radiography educational programs and the Joint Review Committee on Education in Radiologic Technology are going to place responsibility for the education of students on radiologic technologists, then radiologic technologists must be systematically equipped with the knowledge and skills necessary to effectively lead, mentor, and work with students in the clinical environment. At minimum, radiologic technologists who work with students should be required to undergo formal instruction relative to the clinical education of students and should also be afforded opportunity for continuous professional development that is on par with other faculty in the radiography educational program. Additionally, radiologic technologists who work with students in the clinical environment must be knowledgeable of the different learning styles of students. Given that returning adult students are projected to account for the largest increase (23%) in enrollment from 2011 through 2022 (U.S. Department of Education, National Center for Education Statistics [NCES], 2014), it is incumbent upon radiography educational programs to ensure that radiologic technologists who work with students understand and are able to recognize and respond to the the unique learning needs of returning adult students. This will not only enhance learning of the returning adult radiography student (Kidd; 1973; Mackerarcher, 2007; McClusky, 1970), but it will also likely enhance perceptions that returning adult radiography students have of radiologic technologists as leaders and mentors.

Radiography students who observe radiologic technologists in leadership activities will have a higher self-efficacy for leadership (Bandura, 1995) and may perceive to a greater extent that there are leadership opportunities in the field of radiography. Higher self-efficacy for leadership in program graduates will drive their "thoughts, feelings, self-motivation, and actions toward leadership development" (Bandura, 1995) and they will be more likely to demonstrate leadership behaviors (Bardou, Byrne, Pasternak, Perez & Rainey, 2003). Graduates of radiography programs who, as radiologic technologists, practice leadership and seek leadership opportunities will be contributing leadership to the profession. As radiologic technologists grow in leadership through practice, they are more likely to be recognized in the medical imaging department and in healthcare organizations as leaders. These contributions to leadership for the profession that result from radiologic technologists propagating leadership in future radiologic technologists is critical to the profession's effectiveness in growing our own leaders thereby ensuring adequate representation and voice for radiologic technologists in the health care arena.

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APPENDIX A

Survey Instrument

Leading the Way in Radiography

Please complete the following items based on your observations, experiences, and perceptions as a radiography (radiologic technology) student during the radiography (radiologic technology) educational process.

When we refer to "radiography role models" in this survey, we mean program directors, clinical coordinators, clinical instructors, directors of medical imaging departments, registered radiologic technologists, and leaders of professional societies for radiologic technologists.

Section 1: Program Information

1. What type of radiography (radiologic technology) program did you attend?
   a. _____hospital-based
   b._____technical school
   c. _____college or university-based
   d._____military
   e._____other. Please explain: ___________________________________

2. What was the highest award you received from the radiography (radiologic technology) program you attended?
   a. _____certificate or diploma (non-degree)
   b. _____associate degree
   c. _____bachelor's degree
   d. _____other. Please explain: ___________________________________

3. About when did you graduate from your radiography (radiologic technology)program?

   Month: _________ Year:___________

4. Was the radiography educational (radiologic technology) program that you attended accredited by the Joint Review Committee on Education in Radiologic Technology (JRCERT)?
   a. _____yes
   b. _____no
   c. _____not sure

For the two questions on this page, please provide information about the gender and number of radiography role models you spent time with while in the radiography (radiologic technology) educational program. If you never encountered a person in one of the roles below, please indicate "not applicable." Please then continue to answer the remaining questions.

5. Approximately how many of these individuals worked with you during your radiography (radiologic technology) educational process?

	Number of individuals who worked with you during your radiography educational program	**Not Applicable**
a. program director	______	______
b. clinical coordinators	______	______
c. clinical instructor	______	______
d. registered radiologic technologists	______	______
e. imaging department directors	______	______
f. officers in radiography professional societies	______	______

		Program Directors	Clinical Coordinators	Clinical Instructors	Registered Radiologic Technologists	Imaging Department Directors	Officers in Radiography Professional Societies
6.	Were these individuals with whom you worked all women, all men, majority women, or majority men?	◯ all women ◯ all men ◯ majority women ◯ majority men ◯Not applicable	◯ all women ◯ all men ◯ majority women ◯ majority men ◯Not applicable	◯ all women ◯ all men ◯ majority women ◯ majority men ◯Not applicable	◯ all women ◯ all men ◯ majority women ◯ majority men ◯Not applicable	◯ all women ◯ all men ◯ majority women ◯ majority men ◯Not applicable	◯ all women ◯ all men ◯ majority women ◯ majority men ◯Not applicable

Section 2: Rating Transformational Leadership Behaviors of Radiography role models

The next three pages contain statements about behaviors that people may exhibit. There are 10 statements per page. The questions on these three pages have been formatted so you can move through them easily and quickly.

7. Please indicate the frequency of the behaviors for the people listed for the people in the roles below that you encountered during the radiography educational process. If you encountered a number of people in a particular role, think of the "typical" person that you encountered in the role. If you have never encountered a person in one of the roles listed below, please indicate "not applicable by checking N/A."

		Program Director(s)	Clinical Coordinator(s)	Clinical Instructor(s)	Registered Radiologic Technologists	Imaging Department Director(s)	Leaders in Radiography Professional Societies
	***Enabling Others to Act**	(never) 0 1 2 3 4 (always) or Not Applicable	(never) 0 1 2 3 4 (always) or Not Applicable	(never) 0 1 2 3 4 (always) or Not Applicable	(never) 0 1 2 3 4 (always) or Not Applicable	(never) 0 1 2 3 4 (always) or Not Applicable	(never) 0 1 2 3 4 (always) or Not Applicable
1	[redacted]						
2	[redacted]						
3	[redacted]						
4	[redacted]						
5	[redacted]						
6	[redacted]						
	***Modeling the Way**						
7	[redacted]						
8	[redacted]						
9	[redacted]						

10	[redacted]						
11	[redacted]						
12	[redacted]						
	***Encouraging the Heart**						
13	[redacted]						
14	[redacted]						
15	[redacted]						
16	[redacted]						
17	[redacted]						
18	[redacted]						
	***Inspiring a Shared Vision**						
19	[redacted]						
20	[redacted]						
21	[redacted]						

22	[redacted]						
23	[redacted]						
24	[redacted]						
	***Challenging the Process**						
25	[redacted]						
26	[redacted]						
27	[redacted]						
28	[redacted]						
29	[redacted]						
30	[redacted]						

***Note:** The titles of the five dimensions were not included on the actual survey. They are included here for ease of reading.*

Section 3: Rating of Self-Efficacy for Transformational Leadership

On the next two pages, you will be rating yourself. Please read each statement below and then rate yourself in terms of your belief in your ability to engage successfully in the behavior described **at the time of graduation from your radiography (radiologic technology) educational program**.

In selecting your response, please try to be realistic about your beliefs as to your ability to successfully engage in the behavior at the time of graduation from your radiography educational program. Don't answer in terms of how you would like to have seen yourself, what you think you think you should have been able to do, or how you see yourself now.

	***Enabling Others to Act**	(cannot do) 0 1 2 3 4 5 6 7 8 9 10 (can do)
1	[redacted]	
2		
3		
4		
5		
6		
	***Modeling the way**	
7	[redacted]	
8		

9	[redacted]	
10	[redacted]	
11	[redacted]	
12	[redacted]	
	***Encouraging the Heart**	
13	[redacted]	
14	[redacted]	
15	[redacted]	
16	[redacted]	
17	[redacted]	
18	[redacted]	
	***Inspiring a Shared Vision**	
19	[redacted]	
20	[redacted]	
21	[redacted]	
22	[redacted]	
23	[redacted]	

24	[redacted]	
	***Challenging the Process**	
25	[redacted]	
26	[redacted]	
27	[redacted]	
28	[redacted]	
29	[redacted]	
30	[redacted]	

*****Note:* *The titles of the five dimensions were not included on the actual survey. They are included here for ease of reading.*

Section 4. Perceptions of Radiographers, In General, as Leaders and Leadership Opportunities in the Field.

9. Upon completion of your radiography (radiologic technology) program, when you thought about the profession of radiologic technology as a whole, did you perceive its members (radiologic technologists), in general, to be?
a. ____yes
b.____no
c.____not sure

a. If you answered "no" or "not sure" to Question 10, please briefly state why you chose that answer:
____
____

10. Upon completion of your radiography (radiologic technology) program, which of the following leadership opportunities did you think existed for you as a new graduate or as a future registered radiologic technologist?   Please check all that apply.

a.   _____None

b._____Leadership on committees in the work environment

c._____Mentoring new technologists

d,_____Mentoring students

e,_____Committee work in professional societies such as the Pennsylvania Society of Radiologic Technologists or the American Society of Radiologic Technologists

f,_____Officer positions (president, secretary, treasurer, etc) in professional societies such as the Pennsylvania Society of Radiologic Technologists or the American Society of Radiologic Technologists

g. _____Formal leadership positions in the imaging department such as lead technologist, supervisor, manager, or department director

h,_____Formal leadership opportunities in a health care organization such as vice-president, senior vice-president, president, or CEO.

I,_____Formal leadership opportunities in radiography education such as clinical instructor, clinical coordinator, or program director.

J,_____Formal leadership opportunities in academic organizations such department chairperson or dean.

K,_____Other opportunities in the field of radiography. Please describe:____

11. Please rank the following individuals according to who you, while a radiography (radiologic technology) student, learned the most from about positive leadership in the field of radiography (radiologic technology). Rank the person from whom you've learned the most as 1. If you have not worked with an individual identified below, indicate not-applicable by entering 0 (zero). If you did not learn positive leadership from any of the individuals below, please check the final response.

a. _____program director(s)
b. _____clinical coordinator(s)
c. _____clinical instructor(s)
d. _____ imaging department director(s)
e. _____registered radiologic technologist(s)
f. _____leaders of radiography professional societies
g. ______other. Please identify. ____
h. _____I did not learn positive leadership about the field of radiography from anyone while I was a radiography student.

12. What is your gender? ◯ Woman ◯ Man ◯ Identify differently or as neither

13 What is your age as of today, in years?__________

14. Please indicate your race(s) /ethnicity(ies).

a. _____Asian American/Pacific Islander
b. _____Black/African American
c. _____Caucasian/White
d. _____Hispanic/Latino
e. _____Middle Eastern/Arab
f. _____Native American/Native Alaskan
g. _____Other: __________________________

15. Please rate the level of formal <u>leadership education</u> you had before starting your radiography educational program. This could include workshops, seminars, or courses on leadership.
   a. _____none
   b. _____low
   c. _____medium
   d. _____high

16. Please rate the level of <u>leadership experience</u> you had before starting your radiography educational program. This could include formal or informal leadership positions in school, at work, or in the community.
   a. _____none
   b. _____low
   c. _____medium
   d. _____high

17. What was the household income where you lived while attending the radiography educational program (if you do not know, please estimate).
   a. _____Under $50,000 per year
   b. _____$50,000 - $100,000 per year
   c. _____Over $100,00 per year
   d. _____Prefer not to answer

This concludes the survey. Thank you for taking the time to share your views! Please submit your responses using the button below.

APPENDIX B

ENDNOTES ON DATA CLEANING

The details of how and why I recategorized four cases relative to the variable, “program type” are provided below.

a. Case 26 indicated “other” for program type and then went on to provide anecdotal information that explained that he attended a community college and earned an associate’s degree. I therefore recoded this case from “other” to “college.”

b. Case 35 indicted “other” for program type and then indicated anecdotally, “Military and College to attain ARRT.” I recoded this case to military.

c. Case 88 originally indicated that she completed a radiography educational program in which she earned a certificate. But, when answering the question about the type of program she completed, she chose the “other” category.” She provided anecdotal information that indicated that although she obtained a certificate, she was currently completing a bachelor’s degree. Because she indicated that she earned a certificate, I re-categorized her original program type from college to hospital. There were other cases that indicated that they earned a diploma but graduated from a college program. I did not re-categorize these cases because use of the term “diploma” may have been misleading within the context of this survey. College graduates receive a diploma that reflects their earned degree. As such, I could not confidently assume that all cases that responded that they earned a diploma but attended a college program erred in their identification of program type. However, Case 88’s anecdotal information inferred that she understood the meaning of a certificate. I therefore felt assured in re-categorizing Case 88 from "other" to "hospital based."

d. Case 111 indicated "other" under program type and then provided anecdotal information that he completed a "hospital school." I re-categorized this case to hospital program.

The details of how and why I recategorized three cases relative to the variable, "award received " are provided below.

a. Cases 25 and 130 indicated that they completed a college program but for award received indicated "other." Both respondents then went on to explain that they were currently working on a bachelor's degree. A logical assumption therefore holds that the respondents for these two cases earned an associate degree upon completion of their college-based radiography educational programs.

b. Case 52 indicated that she completed a hospital program, but for *highest award received,* she chose "other." She provided anecdotal information to indicate that the highest award she received was a "JRCERT award." This indicated that the respondent was confused by the intent of this question and did not realize that I was asking for her to identify the terminal award she received upon program completion. For Case 52, I was confident in re-categorizing her highest award received to certificate or diploma.