

Summer 2015

The Perfect Formula: Benchmarks that Best Predict Retention in Selective Admissions Programs

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THE PERFECT FORMULA:
BENCHMARKS THAT BEST PREDICT RETENTION IN
SELECTIVE ADMISSIONS PROGRAMS

A Dissertation
Presented to
The Faculty of the Educational Leadership Doctoral Program
Western Kentucky University
Bowling Green, Kentucky

In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Education

By
N. Joy Menser

August 2015

THE PERFECT FORMULA:
BENCHMARKS THAT BEST PREDICT RETENTION IN
SELECTIVE ADMISSIONS PROGRAMS

Date Recommended 5-27-15



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Dean, Graduate Studies and Research

6-18-15

Date

I dedicate my dissertation and my education accomplishments to the following individuals. All that I am, and all that I may become, I owe to three very special people: my husband and my parents. They have always believed in me and inspired me to reach further than I ever thought possible. Without their love, patience, guidance, and encouragement, I would not be where I am today. Larry, you were there when I received my first diploma and will be with me when I accept my last diploma. I know when you said “I do,” you did not know what you were getting into; but, honey, without you I could not have done any of this. Mom and Daddy, I only wish you could be there with me to see me reach my final goal. Although you are not with me in person, your spirits will always live within me. I have one last question: Do I make you proud?

To my two children Stephanie and Chad. Never stop believing in yourself, never stop learning, and never stop reaching for the stars. I believe in you and know that whatever you set your minds to, you will achieve. Never allow anyone to tell you that you cannot do something; if you dream it, by all means achieve it. Thank you for your support and encouragement; without both of you, none of this would have been possible.

ACKNOWLEDGMENTS

If I have seen further than others, it is by standing upon the shoulders of giants.
- Isaac Newton

I would first like to thank my committee chair, Dr. Aaron Hughey. Your patience, kindness, encouragement, and knowledge have been the driving force that has allowed me to reach my goal. I will never be able to find the right words to express my gratitude for everything you have done for me. To my committee members, Dr. Monica Burke and Dr. Joelle Carter, thank you for giving me so much of your valuable time. Your guidance has helped me complete this final process. I also would like to thank Dr. Barbara Burch. You are an inspiration to me. If I could achieve half of the success that you have, I will feel accomplished in life.

I started Western Kentucky University to seek a degree, but what I received were friends that will be with me a lifetime. To Dawn Winters, whose friendship, encouragement, reviewing, guidance, and patience has helped me complete my education. You were there when I was ready to give up, and you were always there to push me along. You are truly one in a million, and I love you to death. Thank you for everything.

To Meredith Skaggs for all your pep talks and for believing in me when I did not believe in myself. Thank you does not seem enough for everything you have done for me. To cohort IX, thank you everyone. Your encouragement, positive attitudes, and joking kept all of us together. Remember to enjoy the journey while completing your dream.

To Margaret Soder, you have been truly a blessing for all your help and encouragement. Thank you for your willingness to help me whenever I ask.

To my extended family, thank you all for everything. Especially to Davalene Fulks and Keith Patrick for the words of encouragement and always believing in me as I traveled this long road.

Michelle Tudor, thank you for picking up the slack, reading, and encouraging me throughout this process. Your help and kindness have been an inspiration to me. I hope as you travel your next educational path I can also be there to help you.

Thank you to all radioFigureers out there who had the courage to complete your doctoral degree and become one of the 1% in our field that has accomplished that goal.

To the graduating classes of 2013, 2014, 2015, and 2016 at Owensboro Community and Technical College in the Radiography program, thank you for putting up with me and your understanding as I worked toward my goal. Your kindness and thoughtfulness have inspired me to reach for the stars. Your patience and tolerance has allowed me to achieve my goal. I hope I inspired each of you as you have inspired me over the years.

Last, but not least, to my friends. I value each and every one of you. You have inspired me and encouraged me through phone calls, notes, and visits. Thank you for always being there for me and being more than a friend.

CONTENTS

LIST OF FIGURES	x
LIST OF TABLES	xi
ABSTRACT	xii
CHAPTER I: INTRODUCTION	1
Introduction.....	1
Historical and Political Context of the Problem.....	4
Significance of the Problem.....	5
Significance of the Problem within Allied Health.....	7
Conceptual Framework.....	12
Tinto’s Student Integration Model.....	13
Noel’s Model of Attrition.....	14
Bean’s Model of Student Retention.....	15
Astin’s Theory of Involvement.....	16
Love’s Learning Communities Model.....	17
Summary of Retention Models.....	18
Significance of the Study.....	20
Methodology.....	20
Data Analysis.....	23
Definition of Terms.....	23
Conclusion.....	25
CHAPTER II: REVIEW OF LITERATURE	27
Introduction.....	27

Community Colleges.....	27
Development and Growth.....	27
Purpose.....	31
College Leadership.....	33
Community College Admissions.....	35
Retention Issues.....	43
Retention Issues for Community Colleges.....	54
Selective Admissions.....	60
Allied Health Programs.....	60
Admissions Criteria.....	63
Selective Admissions.....	65
Admissions Criteria.....	69
Evaluating the Selective Admissions Process.....	76
Radiography.....	78
History of the Profession.....	78
Radiography Program Leadership.....	82
Admissions Committees.....	84
Lack of Research.....	86
Conclusion.....	90
CHAPTER III. METHODOLOGY.....	92
Introduction.....	92
Population.....	94
Instrument Development.....	95

Pilot Study.....	98
Ethical Considerations.....	100
Data Collection.....	101
Design and Statistics.....	101
Data Analysis.....	103
CHAPTER IV: RESULTS.....	106
Introduction.....	106
Methodology.....	107
Dependent Variables.....	107
Independent Variables.....	107
Study DemoFigureics.....	108
DemoFigureics Summary.....	
113	
Research Question Findings.....	114
Summary of Findings.....	137
CHAPTER V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS..	140
Introduction.....	140
Summary.....	140
Quantitative Data Analysis.....	144
Discussion.....	145
Interpretation of Findings.....	145
Discussion of Research Question 1.....	145
Discussion of Research Question 2.....	147
Discussion of Research Question 3.....	148

Discussion of Research Question 4.....	149
Discussion of Research Question 5.....	151
Discussion of Research Question 6.....	152
Discussion of Research Question 7.....	153
Discussion of Research Question 8.....	154
Discussion of Research Question 9.....	155
Summary of the Study and Findings.....	156
Recommendations.....	158
Limitations.....	158
Recommendations on the Application of the Findings.....	159
Conclusion.....	160
REFERENCES.....	162
APPENDIX A: Accredited Radiography Programs by Academic Level	
of Achievement.....	194
APPENDIX B: Permission from original author to use and make	
modifications to survey tool.....	195
APPENDIX C: Survey Tool.....	196
APPENDIX D: Kentucky Community and Technical College System	
IRB Approval.....	206
APPENDIX E: Western Kentucky University IRB Approval.....	207
APPENDIX F: Letter of Survey Explanation.....	209
APPENDIX G: Letter of Invitation to Participate in Survey.....	210

LIST OF FIGURIES

1a. Traditional admissions criteria for two-year programs	116
1b. Traditional admissions criteria for four-year programs.....	116
2a. GPA utilized for two-year programs	118
2b. GPA utilized for four-year programs	118
3a. Reference letters utilized by two-year programs	120
3b. Reference letters utilized by four-year programs	120
4a. Interviews utilized by two-year programs	123
4b. Interviews utilized by four-year programs	123
5a. Standardized tests utilized by two-year programs	125
5b. Standardized tests utilized by four-year programs	126
6a. Psychomotor tests utilized by two-year programs.....	128
6b. Psychomotor tests utilized by four-year programs.....	128
7a. Non-Traditional criteria utilized by two-year programs.....	130
7b. Non-Traditional criteria utilized by four-year programs.....	131
8a. Non-Traditional criteria utilized by two-year programs.....	133
8b. Non-Traditional criteria utilized by four-year programs.....	133
9a. Prerequisites required by two-year programs	136
9b. Prerequisites required by four-year programs	136

LIST OF TABLES

1. Demographics of Radiography Programs in Kentucky	99
2. Cronbach Coefficient Alpha Calculations for Subscales	100
3. Graduation Grouping by Program Affiliation	102
4. Survey Responses by Program Affiliation	108
5. Title of Person Responding to Survey Tool by Affiliation	109
6. Setting of Program by Affiliation	110
7. Entry Level Curriculum by Program Affiliation	110
8. Frequency of Students Admitted by Affiliation	111
9. Number of Students Applying, Admitted and Percentage Admitted by Program Affiliation	112
10. Average Graduation Rate by Program Affiliation	113
11. Average Number of Traditional Admissions Criteria	115
12. Type of GPA Utilized for Admissions Criteria	117
13. Type of Reference Letters used for Admissions Criteria	119
14. Interview Utilized	122
15. Standardized Tests Utilized	124
16. Psychomotor Tests Utilized	127
17. Non-Traditional Admissions Criteria	129
18. Radiography Department Observations	132
19. Prerequisite Classes	135

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August 2015

210 Pages

Directed by: Aaron Hughey, Monica Burke, and Joelle Carter

Educational Leadership Doctoral Program

Western Kentucky University

This study ascertained the admissions criteria utilized by Radiography programs with high graduation rates and determined whether a relationship exists between admissions criteria and graduation rates. With the high demands for healthcare professionals, preserving the number of students accepted into a cohort throughout the two-year program can be an overwhelming task. These programs should make every effort to admit and graduate those who meet the needs of the public, needs both diverse and subject to change. Radiography program directors and admissions committees are considered the “gatekeepers” of the profession. Yearly, more candidates apply than seats available. Therefore, the directors and committees are faced with the daunting task of selecting students they feel will be successful.

Developing a selection system that is fair and equitable to all individuals is a difficult task. Selective admissions measures should be evaluated on the basis of validity, fairness, and feasibility. In the past, a lack of available research has forced program directors to evaluate their admissions process with those in other allied health fields. This research adds to the knowledge sought each year by program directors, who are held accountable for students they admit, as well as those they do not admit.

Nine research questions guided this study, which sought to determine the selection criteria utilized by programs with high graduation rates. Results revealed that

programs with high graduation rates in both two- and four-year programs utilized more criteria for their selection process than those with moderate to low graduation rates. In addition, a significant difference was seen in criteria utilized for interviews, types of reference letters, and the number and type of prerequisite classes employed as part of the admission criteria by programs with high graduation rates. Radiography program directors can utilize the results to reformat their current admissions process to improve graduation rates in their programs.

CHAPTER I: INTRODUCTION

Introduction

Higher education structures and policies currently demand transformative thinking, as federal and state government educational budgets limit access to resources. As governmental agencies reduce funding to institutions of higher education, it is imperative for individual programs and campuses to develop alternative strategies for closing the gap in funding. Nowhere is this gap more evident than the allied health fields of study.

The Health Professions Network (2005) stated that the United States continues to experience a decline in educationally prepared, licensed healthcare workers. Lok and Dower (2008) proclaimed that supplying the growing demand of qualified allied healthcare professionals, to include radiology personnel, is a challenge. In a study by the American Society of Radiologic Technologists (2000), the authors reported that, within the healthcare field of study, the specialty of radiologic technologist demonstrated the greatest shortage, at 15.3%. This percentage was higher than that for nurses and pharmacists, which were noted at 13.0% and 12.7%, respectively (U.S. Department of Labor, Bureau of Labor Statistics [BLS], 2010; Occupational Outlook Handbook, 2010; Rundall, 2006). An obvious growing need exists for qualified healthcare professionals, as well as a need and the importance of providing fully staffed healthcare departments by graduating highly-skilled, competent radiologic technologists into the workforce.

This economic problem accompanies the practical and moral concerns of retention and graduation. The following provides an introduction to the value of educational opportunities, retention of students, and the direct relationship between programmatic graduation with institutional and student success.

The economic value of educational opportunities becomes particularly relevant within the context of community college mission statements. According to Halsey (1993), community colleges were historically and philosophically founded on open-door admission policies. The community college system was developed to provide affordable and accessible educational opportunities for the members of the surrounding communities (Grindel, 1997). With the increasing demands on institutional budgets and shrinking funding sources, tuition has become the primary means of maintaining financial resources, even in the community college system. This predicament of less funding and more demand has placed pressure on institutions to, not only enroll more students (focus on admissions), but also to consider the implications of attrition and retention rates.

Community colleges provide the primary environment for Radiography programming (see Appendix A). Community colleges utilize open admissions policies, which allow the institutions to serve a wide variety of students. However, open admissions does not translate to all students at any educational level entering college-level coursework. Many community colleges allow open admissions, but general education courses require specific placement or testing scores. The open admissions policy continues to contribute to the need for community college allied health programs in order to clearly identify factors that will help to predict a student's success once he or she has been accepted into these highly competitive selective admissions programs.

By nature, allied health programs restrict the number of students accepted into the program due to the limited space available at clinical facilities in which students receive hands-on training. In limiting the number of students, selective admissions procedures must provide the admissions committee with clear guidelines to select students who

possess the desire and ability to enter and complete the rigorous programs that prepare them for a career in healthcare settings. The purpose of this research was to ascertain the factors of the selective admissions process specifically for Radiography programs. Information gathered as a result of this study will aid programs in creating and revising admissions and selection criteria. Due to a gap in publications and research on this matter, the available research in this field has provided little to no support for current program directors to move forward in developing stronger admissions criteria and respectable graduation rates for Radiography programs.

The value of retaining students in higher education is economically comprehensible; however, the societal need for graduates is more apparent when discussing particular technical degrees and allied health programs. Healthcare professions must continue to monitor the aging population and to ensure an adequate number of qualified registered/licensed healthcare professionals. The needs of the healthcare industry for qualified employees continue to grow as the demands from an aging population on the healthcare system increase. However, if students are not adequately trained, certified, and graduated to replace retiring employees, who will serve the public? The value of retention and attrition research is more than an economic concern for higher education; it is a societal concern as well. For the purpose of this research, the focus remained on allied health and, more specifically, Radiography programs. The following examines the problems faced by Radiography programs to standardize admissions criteria, the lack of research available to guide programs in selecting candidates, the purpose of the research, the significance of the study, and a brief description of the methodology.

Historical and Political Context of the Problem

Subsequent to World War II, the number of high school graduates has surged, and higher education leaders now face the largest influx of students planning to move into postsecondary education (Katsinas & Bush, 2007). This influx, according to Hunt (2006), has made “[h]igher education [into] the ‘engine’ of economy and democracy in our nation” (p. 4). Not since the launch of the G.I. Bill after World War II have American students and politicians embraced the idea and rewards of a college education as a means to stimulate the economy. According to Hunt, in 1937 approximately 1.5 million, or (15%) of 18 to 20 year olds attended college immediately after high school. However, after World War II and the advent of the G.I bill, the admissions numbers nearly doubled to 2.7 million. Hunt also stated that, in comparison, prior to the current recession the enrollment numbers in higher education were approximately 9 million students. During and after the recession, the current enrollment showed more than 17 million students attending college full and part time. The influx nearly doubled the rate of college attendees. Enormous gains in student numbers usually would be applauded, but the recession also brought cuts to education, causing turmoil for educational administrators. Kanter (2011) affirmed that education became one of the key focus areas for strengthening the economy in the United States. President Barack Obama placed an emphasis on, not only increasing the number of students enrolling in higher education, but also on retaining and graduating them (Kanter, 2011). As a result of the 2007 recession, the United States’ educational system suffered one of the largest collapses in state revenue, affecting the K-12 and higher educational systems in a dramatic fashion (Boehner & McKeon, 2003). Concurrent with a decline in state support, a more complex

problem emerged with the transforming college campus. As quickly as individuals would enroll in college to combat unemployment, students would leave for the first job that was offered. Thus, colleges began to be criticized for, and internally aware of, attrition and retention of students. This problem, not only affected higher education, it also began to affect the industries that depended on higher education institutions to supply their workforce (Davies & Guppy, 1997).

Significance of the Problem

The dichotomy between retention and institutional economics engendered a potential perfect storm for educational administrators. Currently, higher education faces continual budget cuts from the state and federal government. Institutions of higher education have battled these losses by increasing their dependence on tuition dollars which are impacted by the lowered enrollment numbers (Johnson, Oliff, & Williams, 2011). Belcher (1987) emphasized that the ongoing struggle to balance budgets is particularly challenging in a community college environment. The primary mission of the community college system is to provide affordable educational opportunities to the communities served by the colleges. Heller (2001) claimed that the implications of raising tuition come at a high societal cost. Higher education organizations work to avoid steep increases in tuition by seeking other sources of revenue, such as an increased focus on preventing high rates of attrition (Gilmour & Lewis, 2006b).

Gallie (2005) defined attrition as the “number of students beginning the course minus those completing the course” (p. 70). However, members of higher education should not be surprised that multiple definitions of the construct exist (Hagedorn, 2006). The concern for attrition has been heightened due to the nature of the economic and

enrollment conditions currently facing higher education. Kippenbrock, May, and Younes (1996) asserted that student attrition is an incessant problem and has remained high since 1910. The United States Department of Education, National Center for Education Statistics [NCES] (2003) examined the current condition of attrition rates, finding approximately 48% of first-time undergraduates began their pursuit of college at a two-year institution. The report identified 757,565 students who started at a two-year public institution and found a surprisingly small number of students returning the following academic year to persist toward graduation (446,136). This number equates to a 58.9% retention rate. In addition, of those who began college in 2008, only 31% of first-time, full-time undergraduate students completed either a degree or certificate within 150% of the normal time (NCES, 2003).

According to Robertson, Canary, Orr, Herberg, and Rutledge (2010), quantifiable student attainment indicators are among the more commonly identified components, such as scores on standardized college-entry exams, individual class grades and/or overall GPA, and credit hours earned in sequential terms, which denotes progress toward the degree. Additionally, student success can be measured using traditional measures, including degree completion, graduate school entrance test scores, graduate and professional school matriculation, and performance on discipline or field-specific examinations. Examples of field-specific examinations include state or national board exams that permit individuals to work in their field of study (Robertson et al., 2010). Furthermore, other measurable indicators of success used by some organizations are post-graduate employment and net income (Kuh, Kinzie, Buckley, Bridges, & Hayek 2006). In a study reported by the Massachusetts Board of Higher Education, success was defined

as an all-inclusive phenomenon that incorporates the multiple facets of personal development and the manifold objectives of higher education. Boylan (2007) noted that several community colleges report their success rate using graduation rates collected and published by the national Integrated Postsecondary Education Data System (IPEDS) (n.d.). The IPEDS measure originates with an entering fall cohort of first-time, full-time, degree-seeking students. The system monitors student progress to degree completion. Success is defined as completing a degree or certificate within 150% of “normal time to completion” at the institution in which they initially enrolled (Boylan, 2007, p. 3). Boylan affirmed that, for community colleges, this constitutes a two-year degree obtained within three years of enrollment for standard degree programs. The purpose of this research was to understand the factors pertaining to student success, specifically within the selective admissions process in Radiography programs.

Significance of the Problem within Allied Health

Although extensive research has been available on student success and retention in college and allied health programs, such as nursing, dental hygiene, physical therapy, and surgical technicians, limited research has been conducted to identify predictors that determine retention of students within Radiography programs. Radiography program directors and admissions committees struggle to identify a viable set of predictors that will determine whether a student admitted into a selective admission Radiography program will complete the program. Selecting the best potential students involves using evaluation criteria that are fair and efficient. Lazarus and Van Niekert (1986) defined an appropriate evaluation process as:

[...] one that is just, objective, equitable and unprejudiced. A selection process is just and objective when the prerequisites are explicit and open to reliable measure. There are no hidden criteria. Prerequisites are explicit when they are clearly defined and available to applicants. (p. 343)

Extensive research completed over the years has developed an understanding of the factors that could best predict a student's success in college (Boylan, 2007; Cook, 2010; Gillis, 2007; Green & Baird, 2009; Kippenbrock et al., 1996; Mangan, 2013; Yukselturk & Inan, 2006). However, few studies are available to direct Radiography program directors in selecting students for each cohort.

Currently, a growing demand exists for well-educated, clinically competent allied healthcare professionals, in addition to an immediate concern of the impending shortage that is predicted to increase over the next decade as retirements occur within the current workforce (Health Care Human Resource Sector Council, 2003). According to Alexander (2000), state representatives, college presidents, and programmatic accrediting agencies expect programs to reveal evidence of student success in postsecondary education.

A common proposal to reduce the shortage of healthcare professionals is to expand the number of students enrolled in each cohort. However, allied health programs must limit their enrollments due to limited clinical facilities in which students receive hands-on training (Naomi, 2004). A demand remains for program directors to diminish the healthcare professional deficiency by preserving a greater numbers of students (Wharrad, Chapple, & Price, 2003). Thus, the most desirable solution is to admit a cohort of students, move that group of students through the program, and graduate the

same number originally admitted due to the limited seats available within allied health programs (Holt, 2005; Sadler, 2003). According to Wells and Baird (2001), the growing demand and increased retention rates of healthcare professionals have created the opportunity for a “renewed and critical focus on student attrition” (p. C2-1).

Shehane (1996) discovered that Radiography programs do not use universal selective admissions models. Shehane (1996) observed that, due to the lack of universal admissions models, admission validity cannot be determined. The lack of research available for program directors to reference leaves admissions criteria to the standard options: high school GPAs, prerequisite GPAs, and interviews. As stated by Espen, Wright, and Killion (2006), the specialization of the discipline and the limited amount of research that focuses on Radiography programs have forced program directors to depend on research available outside of their specific profession and discipline in order to set standards by which to select cohorts. However, this process is a poor match due to the vast difference in the curriculum. The selected candidates are expected to complete the program of study, in addition to being successful on their National Licensure Board exam, which impacts the accreditation of the program (Espen et al., 2006; Schulz, Dowd, & Fischbach, 1995; Shehane, 1996).

Attrition in allied health programs has been a challenge, as demonstrated in a study conducted by Gupta (1991). Gupta’s study revealed attrition rates ranging from 28.7% for respiratory therapy technician and surgical technologist programs to 2.1% for anesthesiologist assistant programs. In addition, it revealed Radiography as having an attrition rate of 14.5%. In the study, for-profit institutions also showed a significantly higher attrition rate than those owned by the federal government. According to Gillis

(2007), the selection process is vital in selecting candidates who will be successful in the long-term completion of the degree. Student success is, not only relevant in terms of the selective admissions process, but also in offering positions to students who will persist in the program. Once classes have begun, it is impossible to replace a student who decides to terminate due to the pace of the program and the amount of information covered.

Institutions of higher education deal with increasing financial demands with less government funding and more budget cuts. Boehner and McKeon (2003) proclaimed that institutions are pressured to find the right mix that will enhance the program's retention rate as enrollment and tuition revenue increase in value. Bennett and Wakeford (1983) reported that allied health programs differ in a variety of ways, including academic curriculum, program length, structure of learning experiences, and requirements of the career field. The variations extend to the selective admissions process. Ferenchak (2009) attested that most allied health programs require a selective admissions process that varies, to include numerical data such as overall GPA, individual course grades, and standardized test scores. Other researchers also have demonstrated the need for qualitative data such as references and interviews (Balogun, 1988; Platt, Turocy, & McGlumphy, 2001; Salvatori, 2001).

After reviewing the state of student retention and graduation research in allied health programs past and present, this study attempted to identify criteria that can be used by Radiography program directors and admissions committees to improve retention within the selective admission process and programs. Therefore, this research sought to determine the criteria that best predict a higher graduation rate for Radiography programs. The following criteria, stated as null hypotheses, guided this study:

1. Are there significant differences in the number of traditional admissions criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates?
2. Are there significant differences in the number of specific GPAs selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.
3. Are there significant differences in the number of reference letters selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.
4. Are there significant differences in the number of interview criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.
5. Are there significant differences in the number of standardized written instruments selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.
6. Are there significant differences in the number of psychomotor tests selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.
7. Are there significant differences in the number of non-traditional admissions criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.

8. Are their significant differences in the number of departmental observations criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.
9. Are their significant differences in the number of prerequisite classes required between programs with high graduation rates, moderate graduation rates, and low graduation rates.

Conceptual Framework

According to Merriam (1998):

The choice of a theoretical model/conceptual framework...will guide the research process in terms of the identification of relevant concepts/constructs, definitions of key variables, specific questions to be investigated, selection of a research design, choice of sample and sampling procedures, data collection strategies...data analysis techniques, and interpretation of findings. (p. 47)

Conceptual frameworks serve as a guide through scientific inquiry. The objective of this study was to analyze whether certain cognitive and non-cognitive characteristics are important traits in the choice, retention, and completion of students selected for an allied health educational Radiography program. In order to determine the best conceptual framework, five theories relating to student retention were reviewed: Tinto's Design of Student Incorporation (1993), Noel's 7 Themes of Attrition (1985), Bean's Design of Student Attrition (1982), Astin's Theory of Involvement (1984), and Love's Learning Communities Design (2005).

Tinto's Student Integration Model

According to Johnson (1997) and Braxton (2001-2002), Tinto's retention model has been a foundation in addressing retention issue in higher education. Tinto's original model was grounded on the foundation that students enter college with various human characteristics and family histories, including academic skills, race, and gender. In addition, social and economic status, as well as the values and expectations of the parents or guardians, affect the college student. In 1982, Tinto described integration as the way in which a student communicates and shares common viewpoints and the values of peers and educators. The student's ability to effectively communicate and openly share viewpoints becomes the social framework within the classroom community. These attributes that students bring to college can be based on social and academic experiences related to family histories. Tinto (1982) also stated that student attrition is more likely among students who are ineffectually integrated into the college culture, both in the intellectual aspect and the social perspective. The institutional factors that play a role in this model are student support services that include academic tutoring and advising, as well as social integration programs.

Three decades after his original model was published and after several revisions, Tinto (1993) restructured his original Student Integration Model. He concluded that students interrupt their pursuit of higher education for several reasons, including cognitive limitations, lack of motivation and/or commitment, and being unprepared for the higher demand of academic life. In addition, Tinto (1993) stated that many students leave higher education due to a lack of financial support and personal reasons. Tinto

noted that, when students persist in higher education, it usually can be related to a positive academic or social experience.

According to Cabrera, Nora, and Castaneda (1993), empirical evidence has supported Tinto's Student Integration Model. Social integration can have a direct impact on whether a student is successful in higher education. If a student is self-disciplined, self-directed, and motivated to achieve a dream, he or she has a higher success rate in higher education. As stated earlier, these attributes can be related to human characteristics and family histories.

Noel's Model of Attrition

Noel's model presented 7 Themes of Attrition (1985) that were influenced by Tinto's original Student Integration Model developed in 1975. In Noel's model, each theme represented an interaction between the student and the academic or social environment within the college. Noel emphasized that, when students withdraw from college, the following usually are attributed to their reasons: academic boredom, academic uncertainty, transition or adjustment problems, unrealistic expectations about college, lack of academic preparation, incompatibility, and irrelevancy.

Noel (1985) incorporated both individual and institutional factors into his model, stating that individual factors may include academic uncertainty, unrealistic expectations about higher education, lack of academic preparation, and irrelevancy; whereas, institutional factors include academic boredom and possibly inadequate faculty. However, another issue related to the 7 themes could include transition or adjustment difficulties. In relating this to Tinto's model, students who have resources available to

them, such as tutoring and student activities, adjust more readily to campus life and their new surroundings.

Noel (1985) avowed that many students feel overwhelmed when making a career choice; therefore, they feel uncertain about their academic choices. In addition, they may feel confused and may be unrealistic about a career choice, of which they initially were confident prior to entering higher education. Another issue Noel (1985) observed was that many students face academic under-preparedness; this becomes a frustrating situation for both students and faculty members. Finally, when students view college as irrelevant to achieving their long-term goals, they may view the college experience as insignificant.

As stated by Laudicina (1997), Noel's 7 Themes of Attrition model has been well researched and utilized to address issues of retention in higher education. With this model, students who experience one or more of the seven variables are considered at risk of leaving higher education. Noel advised higher education faculty and staff to be aware of students who exhibit these characteristics and to provide appropriate intervention prior to the student leaving.

Bean's Model of Student Retention

Bean (1982) suggested that behavioral intentions are the catalysts for whether students persist or depart from higher education. Bean postulated that an individual's behavioral intentions are influenced by attitude; whereas, attitude is shaped by beliefs. To relate this to student retention, this theory connects with a student's beliefs being based on academic and social experience within the institution. These experiences may influence activities the student attends, to the courses he or she takes, to include the

student's social network circle (Cabrera et al., 1993). Cabrera et al. (1993) highlighted that Bean believed that external factors should be considered in retention of students. These factors may include financial resources and the level of support the student receives from family.

Cabrera et al. (1993) observed that Bean's model included individual and institutional factors. Individual factors include financial resources in conjunction with family support, although these factors also can be viewed as institutional. If a college is capable of educating students and their family members about financial resources, the financial burden on the students and those who are financially supporting them will be reduced. This aspect of Bean's model would fall under the support services provided by the institution.

Astin's Theory of Involvement

The fourth concept, currently utilized to address the issue of maintenance, is Alexander Astin's Theory of Participation (1984). Twenty-six years ago, Astin (1993) theorized that the primary driver for a student to return to college is the extent to which that student is both culturally and educationally incorporated. Successful incorporation is dependent upon the amount of positive energy and inspiration a student invests in the academic experience. If a student is willing to direct both energy and mental effort into the academic experience, that student will acquire reasonable levels of success in the academic environment. According to Astin (1993), a student can control his or her success by intentionally investing in both the academic and social features of an institution.

Astin's (1993) concept varied from the others, in that the concentration was on the student's motivation. The structure of Astin's concept was focused on the learners regarded to be overachievers who display powerful energy both in and out of the classroom. They make use of the resources that are available to them as scholars. According to Astin's (1993) concept, the learners who select to disengage are more likely to dismiss the benefits of the educational and public resources available to them, hence producing less efficient outcomes. Astin (1993) also postulated that learners have the energy to manage their own destinies by guiding their initiatives and being accountable for their actions. This allows learners to route their initiatives toward their education (Astin, 1993).

Love's Learning Communities Model

The last design of retention related to the study is Love's Learning Communities Model (LCM; 2005). This model was developed by Ann Goodsell Love. According to Love (2005), the LCM is a valid device for improving retention in higher education environments. In addition, the LCM increases active learning of students, provides immediate feedback, creates high objectives for staff and learners, encourages regard for various learning designs, and increases group development. Love (2005) reported that the reason the LCM is an effective model for retention is that the design provides the opportunity to link or group students around interdisciplinary designs and programs for a cohort of learners. The LCM provides the opportunity to rebuild students' time and learning encounters, while promoting perceptive relationships between learners and faculty.

Love (2005) posited that, although the primary objective of researching various aspects of students in particular areas is to increase student retention, the model also increases student accomplishment by interesting students in the study process. This is achieved through an array of pedagogical approaches by enhancing collaborative and supportive study through professional teaching, discussion groups, problem-centered study, meta-cognition exercises, and self-evaluations.

Love (2005) stated that study in various areas has been effectively utilized in a wide range of classroom configurations such as developing research groups, newcomer projects, general education, writing programs, and various undergraduate and graduate programs. Love claimed that the primary goal of the LCM is to increase higher education student retention, enrich educational performance, and heighten university, student, and instructor satisfaction. This was mentioned in cross-sectional research of first-year learners conducted at Wagner University in New York. According to Love, retention of learners who took educational challenge programs improved from 58% to 80%; active supportive study improved from 69% to 84%; university student staff incorporation improved from 69% to 72%; enhancing educational encounters improved from 54% to 77%; and helpful university surroundings improved from 50% to 58%. Love added that, when staff and learners are willing to discover and engage in a study model, LCM can be an effective tool for dealing with retention issues.

Summary of Retention Models

When analyzing the student and institutional aspects of these models, a blend of both aspects emerges. Student motivation would be considered a personal factor when exploring issues of retention (Bean, 1982). Astin's (1984) perception of participation

placed the primary liability for success on the student. However, when examining the social and educational resources that are provided to the student body, institutional aspects indubitably come into play (Love, 2005); i.e., students cannot acquire institutional resources if the institution does not provide them.

Research has attempted to evaluate the benefits of Astin's (1984) concept. According to Berger and Braxton (1999), learners who can efficiently merge academics and social subsystems have a higher opportunity to continue and to be successful in their education at their institution. Most significant, learners must display a beneficial mindset combined with reliable levels of motivation. This, in turn, will generate positive results for both the learners and the institution (Astin, 1984).

When evaluating Tinto's Design of Student Incorporation (1993), Noel's 7 Themes of Attrition (1985), Bean's Design of Student Attrition (1982), Astin's Theory of Involvement (1984), and Love's Learning Communities Design (2005), each model appears to be of value for the process of retention. In addition, these designs have utilized both individual and institutional components when evaluating retention. However, the use of all five models would be a daunting process. Thus, the aforementioned studies related to Tinto's Design of Student Incorporation (1993) and Noel's 7 Themes of Attrition (1985) guided the research for the current study. By utilizing the concepts from both theories, the researcher was able to frame a key question: What factors were used in selecting the students to enter the radiologic technology program that contributed to their success?

Significance of the Study

The value of an improved understanding of the selective admissions process and graduation rates for college students is of economic and societal importance. As the value is observed through economic and social sectors, the lack of research supporting Radiography programs has compounded the need for this research on multiple levels. Cognitive variables appear to be sufficient for success in radiologic technology programs, yet double digit attrition of 21.6% exists nationwide, per the American Society of Radiologic Technologists (2000). Radiography programs are limited in the number of students that can be managed due to the need for clinical space. Students must be afforded a quality opportunity to learn in a practical and realistic environment. The limited clinical space is viewed as a valuable resource given only to the most qualified and most likely to persist student. Thus, the purpose of this research was to identify factors that best meet this high demand.

Methodology

According to Creswell (2008), quantitative research seeks to quantify data and generalize results from a sample of the population of interest. In addition, it offers the ability to measure trends, attitudes, or opinions of a sample population. The intent of this quantitative study was to generalize from a sample of the population in order to determine extrapolations about attributes, beliefs, or behaviors of this population (Babbie, 2001), thus, providing a means to examine the potential connection between admissions criteria and retention in Radiography programs.

Data were collected through questionnaires distributed to Radiography program directors in Joint Review Committee on Education in Radiologic Technology (JRCERT)

(n.d.) accredited programs. Through the use of a questionnaire, the study sought to identify the most effective admissions tools in determining successful completion of a Radiography program. Success was defined as, not only completing the program, but also passing the National Board Exam.

The Radiography program directors were selected from the JRCERT website, which is the only programmatic accrediting agency for Radiography and radiation therapy educational programs. Following the development stage, the pilot model instrument was emailed to identified program directors with accredited programs within the state of Kentucky, which constituted a small sample of participants ($N = 15$). The data were used to assess basic item characteristics and internal consistency for each subset and concurrent validity. The research questionnaire was refined on the basis of these outcomes to ensure the data appropriately supported the research question.

The trustworthiness of data obtained through research is dependent upon the validity and reliability of the instrument used to acquire the data. The use of the pilot-tested questionnaire of the defined sample population group reflected the validity of the questionnaire (Merriam & Simpson, 1995). The correlation coefficient of the pilot study was performed to determine whether the results measured the parameters outlined for the study. It was determined that three questions should be changed to open response, and one question was written to provide a range for the participant to choose. After a detailed discussion with a methodologist, this question was changed to fill-in-the-blank.

After revisions to the research tool, the survey was launched via email nationwide to all program directors who currently lead accredited Radiography programs. A time frame of three weeks was allowed, as well as a link to the survey. A reminder email was

sent weekly for three weeks asking participants to complete the survey. The data were then subjected to analysis of variance. The goal of the statistical analysis was to provide a predictive research study, as well as forecast the value of the variables (admissions criteria) used by programs with high retention rates. This process reflected the value of the various admissions criteria to be used when selecting students for each cohort.

As with any study, limitations existed, of which four were noted. The first was an initial concern for the cooperation of the Radiography program directors in completing the survey. It was imperative that the research tool be limited in scope to respect the time and demands of these individuals. However, at the close of the survey, 66.34% of those who received the survey had responded in some form.

The second limitation was related to the nature of Radiography program admissions. The process is highly competitive; therefore, program directors may have misrepresented information. This demonstrates the Hawthorne effect, defined by Slavin (2007) as “a tendency of subjects in an experimental group to exert outstanding efforts because they are conscious of being in an experiment, rather than because of the experimental treatment itself” (p. 33). This limitation could have provided invalid data that misrepresented the true retention of individual programs.

The third limitation concerned the requested data, specifically the age of the ACT or standardized test scores. In many situations, ACT scores are accepted at community colleges regardless of the date of completion. This may have been an issue if the research had compared ACT scores over various decades.

The fourth and final limitation included associate and baccalaureate degree programs. This may have been an issue when comparing data due to the level of

educational knowledge required for various educational degrees. Baccalaureate Radiography programs require students to accomplish two years of prerequisite work prior to entering the program. Once a student has invested this amount of time toward an educational goal, he or she may complete the degree whether the individual actually accepted a position in the respective field of study.

Data Analysis

Descriptive statistics using analysis of variance were utilized for this research. The descriptive study identified various behaviors related to the factors for selecting students. A correlation study was performed to determine a relationship between the variable and graduation rate within a Radiography program. This study sought to determine whether a significant relationship exists between the criteria chosen for admissions and the graduation rate. Correlation studies have been shown to provide insights and results that enable Radiography professionals to select individuals capable of completing a formal education in the Radiologic Imaging Science Program (Shehane, 1996). This provided valuable information for the researcher to demonstrate whether one factor was more significant in determining a student's success once admitted into the Radiography program.

Definition of Terms

Allied Health Professionals: “Professionals involved with the delivery of health or health-related services pertaining to the identification, evaluation, and prevention of diseases and disorders; dietary and nutrition services; and rehabilitation and health systems management, among others. Allied health professionals, to name a few, include dental hygienists, diagnostic medical sonography, dietitians, medical technologists,

occupational therapists, physical therapists, radioFigureers, respiratory therapists, and speech-language pathologists” (Association of Schools of Allied Health Professions, n.d.).

Attrition: “The number of students beginning the course minus those completing the course” (Gallie, 2005, p. 70).

Community College: “Any institution accredited to award the Associate in Arts or an Associate of Science Degree as its highest degree” (Cohen & Brawer, 1989, p. 4).

Joint Review Committee on Education in Radiologic Technology (JRCERT): “The independent accrediting agency recognized by the United States Department of Education to accredit Radiography and other specialized modalities within Imaging Science” (Ferenchak, 2009, p. 20).

Radiography Program Director: “The individual responsible for budget planning, organization, and administration of the program. In addition, he or she also conducts ongoing program assessment and assumes a leadership role in the continued development of the program and assuring program effectiveness” (JRCERT, n.d.).

Radiographer: “A radiologic technologist who uses critical thinking, problem solving, and judgment to perform diagnostic images” (Torres & Dutton, 2010, p. 2).

Retention: “The maintenance of continued enrollment for two or more semesters, specifically from fall term to spring term and/or completion of a degree/certificate or transfer to a four-year college” (Crawford, 1999, p. 13).

Selective Admission: “The process by which an institution admits applicants into the technical phase of training based on merit and performance on specific admissions criteria” (Shaab, 2013, p. 19).

Admissions Criteria: “The designated set of cognitive and non-cognitive data that is used to compare and accept an individual into a selective program” (Kudlas, 2006 p. 165).

Conclusion

Institutions throughout the United States have sought to reduce attrition for all academic programming to benefit the organization economically and the community intellectually. As funding from state and federal governments decreases, the dependency for tuition dollars increases, and the need to retain students becomes a high priority. The increasing demands on educators to provide healthcare workers add to the complexity of the retention problem. Therefore, the identification of a successful formula to admit and retain students in Radiography programs would strengthen several institutions and healthcare agencies.

As the population of the United States increases, the need for qualified healthcare professionals increases as well. In order to meet this demand, it is of utmost importance to determine successful strategies that will increase retention rates across allied health Radiography programs. In order to provide qualified practitioners to meet the demand of an aging population, students admitted into Radiography selective admissions programs must complete the program once admitted.

The purpose of this study was to add to the body of knowledge concerning the criteria needed to meet the demand for qualified healthcare radiographers. Chapter II presents a review of current research on the centrality of the literature review in research preparation. In addition, the chapter provides an overview of literature and research that

has been conducted on other allied health programs. Chapter III describes the methodology, research design, and procedures for this investigation. Chapter IV presents both a written, tables, and figures summary of the results of the study, analyses, and narrative explanations for the primary research question. In closing, Chapter V provides a summary of the findings, conclusions, and recommendations for future studies and limitations of the current study.

CHAPTER II: REVIEW OF LITERATURE

Introduction

To fully explore relationships between admission processes, standards, and student achievement in Radiography programs, a clear understanding of the literature related to these entities is necessary. Throughout the years, several studies have been conducted to find the correlation between students who begin college and complete their educational career vs. students who enter college but never complete. Although most colleges' missions include helping students to complete their educational goals, the need is even greater to assure student success due to federal and state budget cuts and the potential for funding based on accountability and graduation rates. Although low retention/graduation rates affect all programs and departments, colleges with technical programs, such as allied health, appear to struggle more due to the academic rigor of the programs. As little research is available to assist Radiography program directors in selecting students who will enter their program and graduate within two years, the issue of attrition continues to plague this sector of education. As part of this research, three broad areas were reviewed: community colleges, selective admissions, and Radiography programs.

Community Colleges

Development and Growth

Affordable education has been a dream of most Americans; however, access was not expanded in public higher education until the Morrill Act of 1862 (the Land Grant Act) (Drury, 2003). In 1890, the dream expanded for minorities due to the second

Morrill Act. Under this act, a student who was denied admission because of race resulted in federal funds being withheld from the particular college, unless the state provided a separate institution for minorities (Drury, 2003). Thus, providing affordable education for anyone desiring to attend college was established through the Morrill Act, in addition to the concept of community colleges. The concept of community college has been in existence for over 200 years. Although the aforementioned acts brought about several changes in higher education, growth of junior colleges was extremely slow during the 20th century.

Illinois became the home of the first community college in the United States in 1901. The college was an extension of Joliet High School, in which administrator's added a fifth and sixth year to their current curriculum (Kasper, 2003). According to Drury (2003), only three public junior colleges were in existence in 1910. Between 1907 and 1917, California passed various legislation that authorized secondary schools to offer postsecondary classes, in addition to providing funding for independent regions to establish junior colleges (Tillery & Deegan, 1985). The country saw some grow in this arena in the next four years with the startup of 14 public junior colleges and 32 private colleges (Drury). At the inception of junior colleges, school leadership was quite different than leadership seen today. These districts had their own boards and separate budgets and policies that governed the colleges. Drury stated that the desire for junior colleges was related to the general population's sense that higher education benefited society as a whole (2003).

Although society pushed for more junior colleges, during the early years they were faced with low enrollment and limited availability of classes (Kasper, 2003). Junior

colleges commonly offered vocational courses during this period; however, several focused their resources on offering liberal arts courses that could transfer to four-year universities (Drury, 2003). The need and desire for these higher education institutions continued to grow. In 1921, the number of community colleges both public and private increased to approximately 200. However, the largest growth of community colleges can be attributed to the military, according to Cohen and Brawer (1989).

The Great Depression in the 1930s had a major impact on community colleges. During this time, community colleges began to provide job training programs to alleviate widespread unemployment that plagued the United States (Kasper, 2003). The phenomenon that community colleges could be utilized to provide job training continued through the 1950s (Vaughan, 1992). The most notable landmark event that put community colleges at the height of their growth was not peace time. On the contrary, the Serviceman's Readjustment Act of 1944, more commonly referred to as the GI Bill, was instrumental as well (Witt, 1994).

As World War II began to call more young men to serve their country, community colleges experienced a decrease in enrollment, although this phenomenon was short lived due to the Selective Service. According to Witt (1994), community colleges benefited in two ways. The Selective Service was forced to grant deferments to all eligible men who were attending college; thus, enrollment increased as some individuals realized that enrollment in college would prevent them from being mandated to fight in a war. The second reason related to the government's need to extend the 1944 GI Bill was to cover Korean War veterans as they returned home. This extension was termed the Veteran's Readjustment Act (Witt, 1994). Once the war ended, community

colleges again appreciated a drastic increase in enrollment (Cohen & Brawer, 1989). As more community colleges were opened, the need to fill seats became an issue. The enrollment growth also reflected the needs of the community.

A major growth in enrollment occurred again in the 1960s, as the Baby Boomers began to reach college age and more parents desired that their children have a college education. This desire provided for the establishment of over 400 two-year public community colleges (Cohen & Brawer, 1989). Thus, several new community colleges were established, and enrollment soared from approximately 1 million students during 1965 to a staggering 2.2 million by the 1970s (Kasper, 2003). From 1970 to 1980, community colleges experienced another growth that raised enrollments to 4.3 million, as more technical programs began to utilize these structures to train the industry workforce (Kasper, 2003).

Growth within community colleges has continued. A report by the *Chronicle of Higher Education* (1998) indicated that, in selected states with particularly sizable community college systems, such as California, Illinois, and Texas, community college students comprised a far more preponderant proportion of total higher education enrollments. Reports of fall enrollments in Illinois showed that approximately 350,000 students were enrolled in public community colleges, compared to 200,000 students in public four-year colleges, which is a margin of approximately 2:1. These figures may underestimate the enrollment of community colleges in total higher education in Illinois, as they do not include noncredit participants who are an increasingly paramount population (Brubacher & Rudy 1997; Carevale, 2000). Levin (2007) stated that community colleges are considered the “gateway” to higher education and serve a very

different population.

As evident by the research, the need for viable community colleges continues to be crucial. Due to the diverse population they serve, it is imperative that the state and federal government continue to provide support for these institutions, as they serve the community to train the blue collar workforce, and they continue to collaborate with universities to provide opportunities for minority and underprivileged students to complete their first two years of education prior to transferring to a four-year institution.

Purpose

Since their inception, community colleges have served various roles and for a myriad of reasons. According to Dougherty and Bakia (1999), one of the main reasons that industries sought training from community colleges was because they were by far more affordable, as they received funding from state and local subsidies. During the late 1970s, many states established grant programs to subsidize employee training at community colleges. In addition, the overhead cost of community colleges was offset by local tax revenues.

Community colleges have continued to grow over the years. These colleges delivered more than 6.5 million credits in 2005 and served close to half of the undergraduate students seeking degrees in the United States (D'Errico, 2010). Levin (2007) noted that community colleges have witnessed the transformation of the population's demographics over the last several years. They currently are experiencing an increase in non-traditional students, which has been attributed to the decline in economic conditions.

A research project by the Community College Survey of Student Engagement

(CCSSE) (2002), as reported by Levin (2007), indicated that 75% of 33,500 degree-seeking community college students were high risk. Community colleges frequently attract students who are underprepared, displaced workers, and those who are older than the average college student. Unfortunately, this group is what Mangan (2013) described as high risk. Mangan discovered that students over the age of 24 who enter college graduate at a much lower rate (44%) than those who began immediately following high school. The implications of the research by Mangan and by Levin may be considered, as they reported that the average age of community college students was 29.

As community colleges were created to serve a different purpose and audience, the standards to which they are held may be unlike those to which universities are held. However, Feldman (1993) found that community colleges are grouped into the same category as universities. Although both are higher education institutions, the difference between the two is the foundation on which community colleges were built and, for many years, to which they were held accountable. According to Ashar and Skenes (1993), community colleges and universities share common traits within student populations in terms of attendance, curriculum, and achievement. However, the goals of the two student groups often differ. The community college environment supports a diverse range of students in age, academic abilities, and backgrounds. It is difficult to generalize the definitions and measures of student retention in universities, compared to community colleges (Braxton, Sullivan, Johnson, & Smart, 1997; Mohammadi, 1994). Feldman (1993) also stated that most community colleges are defined as comprehensive institutions, not only authorized, but in most cases mandated, by state government to engage in economic development activities and to provide occupational education as well

as traditional collegiate courses (Dalton, 1998; Grindel, 1997; Horton, 1997; Owen, 1998; Pickar, 1998).

Community colleges currently fulfill an assemblage of roles in order to serve their communities, providing a multitude of educational classes, programs, and services with a broad and sometimes contradictory set of intended outcomes. Rouse (1994) noted that community colleges are chartered to serve their respective communities and are expected to meet the needs of a particular community, or of any industry that may move into that community.

With the demand on community colleges to meet the needs of the community and the population of students they attract, they experience an ongoing struggle, as they are measured by the same standards as universities. Thus, community college leadership must be innovative in the ways in which they secure funding and provide offerings that continue to increase enrollment.

College Leadership

According to Piland (2003), community colleges were once led by secondary school principals and superintendents. Most of these individuals were prepared for the position through on-the-job training and possibly some graduate work. However, as community colleges evolved and began to meet the needs of universities by providing the first two years of higher education, the need for stronger leaders emerged. At the time that community colleges became comprehensive, the leadership of those campuses assumed a more complex role. Zwerling (1980) researched the institutional factors that had the greatest impact on student retention in community colleges. He noted that, rather

than focusing retention issues on the student, the focus should be shifted to the community college itself and its leadership. He felt that college presidents should develop faculty who are capable of advising, increase the emphasis on college work rewards, and provide more financial aid to these students.

Consider the question, what is college leadership doing to improve retention? Although several theoretical methods and models are available that have been tied to the reason leadership does not take a strong stance in improving college retention, the question still remains unanswered. Mansfield, O'Leary, and Webb (2011) stated that it is more than an administrative problem. Improving retention across the campus must be a college-wide initiative. All faculty and staff members must be willing to be involved in the process. However, the level of willingness and communication of these needs are an additional challenge for administration.

Long and Franklin (2004) asserted that campus leadership should assess the needs for retention at their institutions. Resources such as retention software exist and can impact the rate of persistence when fully utilized. Additional solutions may involve restructuring a department or unit to address the need. Ultimately, leaders must invest time in discussing student barriers and maximizing resources to provide a platform that encourages graduation. D'Errico (2010) added that community colleges clearly are different as far as leadership and faculty. Faculty at community colleges carry a higher teaching load than those at universities, and their focus is expected to be only on teaching.

Leadership within community colleges must continue to seek ways to grow their institutions. In order to secure funds and provide needed educational resources,

community college leaders must become pioneers of the 21st century. The promise of state and federal funding continues to dwindle, and the dependence on tuition dollars is even more important. With issues of retention rates and a population of students who begin their college career much less prepared than in the past, leaders face several obstacles that could impact the viability of their institution.

Community College Admission

Community colleges have accomplished a number of complex and competing foci as a component of their open-access mission (Cross, 1985). According to Witt (1994), after the influx of students from the Vietnam War leveled off, many administrators scrambled to determine a means to fill the seats at community colleges. The American Association of Community Colleges [AACCC] (2014) is credited with discussing the possibility of opening the doors of community colleges to the community at large (Witt). Forecasts also were made that community colleges could serve the role of transfer and vocational preparation (Cohen & Brawer, 1989).

Bragg (2001) summarized that community colleges originally served as transfer institutions in the early years, and the population of students was comprised of primarily white males. Community colleges have evolved, and their students have become far more diverse than those normally seen on four-year campuses. To meet the needs of their student populations, community colleges have been required to diversify their curriculum. The diversity of current community colleges can be traced to the Truman Commission Report, which emphasized the inequities of higher education and the importance of the need to expand access to higher education beyond high school. The Truman Commission proclaimed:

If the ladder of educational opportunity rises high at the doors of some youth and scarcely rises at all at the doors of others, while at the same time formal education is made a prerequisite to occupational and social advance, then education may become the means, not of eliminating race and class distinctions, but of deepening and solidifying them. It is obvious, then, that free and universal access to education, in terms of the interest, ability, and need of the student, must be a major goal of American education. (U.S. President's Commission on Higher Education, 1948, p. 36, as cited in Phillippe & Patton, 2000)

Phillippe & Patton (2000) attributed this report to the vision that has permeated today's U.S. system of community colleges.

According to Dougherty and Bakia (1999), one of the reasons that industries sought training from community colleges was due to their affordability, as they received funding from state and local subsidies. During the late 1970s, many states established grant programs to subsidize employee training at community colleges. These programs were successful, as the overhead costs of community colleges were offset by local tax revenues.

The current economic growth has focused primarily on knowledge-based individuals. In order to reach this goal, admission to community colleges will become more accepted (Stein, 2011), as high school students who have been deemed academically at risk are encouraged to pursue higher education. If the current push for higher education continues, along with the existing curriculum used by primary schools, the demand for remedial classes will increase over the next several years (Hunt, 2006).

As such, more individuals plan to attend college, although they are inadequately prepared for the rigorous course content. Therefore, potential college graduates seek admission to community colleges; consequently, an open-door policy has been in place for community colleges since the 1960s (Stein, 2011).

At the onset, the intent of the open-door policy was to allow anyone with an interest in higher education the opportunity to pursue his or her dream if the individual possessed a GED or high school diploma. The policy was adopted to help those without access to universities and to jump-start the economy (Stein, 2011). As more individuals desire higher education but graduate from high school deemed not ready for college, the need to increase offering of remedial classes has increased (Emanuel & Adams, 2011).

In today's society, higher education has been under more scrutiny than ever. The cost of education has tripled at minimum, unemployment rates have risen in the last decade, student debt has been inevitable, and less than 10% of community college students have graduated within three years (Complete College America, 2014). Public institutions of higher education are held accountable for their outcomes, which were predicted by student achievement and graduation rates. According to Lederman (2011), performance-based funding is the newest trend toward escalating retention and completion rates for higher education across the country. Currently, 26 states are working toward outcome-based funding (Complete College America, 2014).

Public colleges and universities at one time were given financial support based solely on the number of students in the classroom. With the outcry of the American people and the government under scrutiny for frivolous spending, the government is changing and funding is now based on the number of students completing their education.

With the current combination of federal student grants and state appropriations, dropouts and stopouts cost taxpayers nearly four billion dollars at two-year community colleges (Gainous, 1999).

Tennessee has implemented one of the most aggressive models currently in existence. All state funding allocated for higher education is based solely on completion measures (Complete College America, 2014). However, Lederman (2011) reported that funding based on performance must be “substantial in order to see results with outcomes” (para 3).

These new standards have caused many colleges to review their admission requirements, admitting students selectively and competitively based on admission requirements and the likelihood that the students will complete their education. Although this technique is applicable to universities, it is only somewhat applicable to community colleges that have historically functioned on an open-door policy. Thus, everyone who desired a higher education, regardless of age, gender, or socio-economic background, was permitted an opportunity to further their education. This policy benefited several individuals who would not otherwise have been able to attend college. Doyle (2010) proclaimed that the open-door policy was responsible for the largest increase in graduation rates over the past decade.

Community colleges face a barrier that many universities have not had to address. The entering freshman at a community college typically is considered a non-traditional student by age and lifestyle; many are inadequately prepared, are first-generation college students, and come from lower socio-economic backgrounds, forcing them to be more dependent upon financial aid in order to attend (AACC, 2014). Although the dynamics

conflict between the populations served by universities and that of community colleges, all higher education institutions are pressured to increase completion rates, as cost per student and operating budgets continue to increase, but state and federal funding continues to decrease, not only for the institution, but also for the student (Bragg, 2001). Therefore, it is imperative that students who decide to further their education plan to complete their degree in a timely manner to benefit the institution and the economy.

Can an open-door policy be the demise of community colleges? Every higher education institution deals with budget constraints, but are community colleges taking a bigger hit because of their open-door policies? As the government is more closely examining financial aid, degree requirements, and graduation rates, students who are unprepared for college place a larger burden on community colleges and, in many cases, contribute to the low graduation rates. This challenges community colleges with the burden of preparing students for college level classes while maintaining high graduation rates. While universities have the ability to selectively admit students, community colleges must accept anyone who has graduated from high school or possesses a GED. According to Levin (2007), community colleges over the last several years have witnessed a transformation of the demographics for the population they serve. The entering community college freshman typically has been considered a non-traditional student by age and lifestyle, many were academically unprepared and likely first-generation college students, and the majority came from a lower socio-economic background, forcing them to be more dependent upon financial aid in order to attend (AACC, 2014). Community colleges currently are experiencing an increase in non-traditional students, which has been attributed to the decline in economic conditions

(Levin, 2007). Higher education enrollments have increased dramatically since the 1960s. Moreover, although research forecasts have predicted smaller cohorts of 18 to 24 year olds over the last decade, persistent increases in both full- and part-time enrollments have continued. Much of this growth has been the result of increased participation by non-traditional students, including women, adults over the age of 25, and part-time students (Andres-Bellamy & Guppy, 1991; Anisef, 1989; Gilbert & Guppy, 1988).

Dunstan (1987) stated that supply and demand of opportunities in higher education have increased for the following reasons: the prospect of well-paid employment and promotion within career lines, the need to update knowledge and skills in response to changes in knowledge-based technologies, shifts in career opportunities in some fields, individuals enrolling in programs that enable them to develop deeper or more varied skills or to change jobs, shorter working hours and more leisure time for retirees, and increased demand from adults who did not benefit from higher education opportunities upon leaving high school, e.g., women, minority groups, immigrants, and other "disadvantaged" individuals. Mounting pressure for increased accountability by institutions of higher education, together with the changing demographic composition of the student body, have stimulated the development of more detailed and sophisticated retention models that reflect the lives of current postsecondary students.

Zumeta (2001) noted that, as the world settles into the 21st century, higher education institutions in the United States face a number of challenges related to various societal and environmental forces. A new economic incentive is mandating states to redefine relationships by pressuring institutions to become more accountable, more efficient, and more productive in the use of state and federal dollars (Alexander, 2000).

According to Zusman (2005), higher education is considered the largest discretionary item in all state budgets. Thus, higher education funding has shifted with the state of the economy. In the early 1990s, many states cut higher education funding unequal to the consumer price index. Once again, at the turn of the century, higher education experienced another cut as the economy plunged. These cuts equated to states providing 12% less funding to higher education in 2004 than 15 years earlier (Zusman, 2005). It has been well documented that, as unemployment rates increased, attendance in higher education also increased. Conversely, as unemployment rates decreased, attendance in higher education decreased as well (Hossler & Maple, 1993; Kane, 1995; Manski & Wise, 1983; Rouse, 1994; St. John & Noell, 1989; St. John, 1990).

St. John (1990) stated that colleges base their budgets on tuition dollars due to the decrease in state funding. Therefore, it is imperative that students return every semester and complete their educational goals, regardless of the state of the economy.

According to Heller (2001), community colleges are under scrutiny as a result of the federal government's focus on accountability and the competition for state funds traditionally allotted to higher education institutions. In a turn of events, policymakers are considering connecting taxpayer dollars to outcomes and graduation rates versus enrollment numbers (Hunt, 2006). In addition, families who invest a larger portion of their income toward educating themselves and their children also seek justification for the tuition dollars they expend.

Meyer (1971) found that community colleges are grouped into the same category as universities. According to Ashar and Skenes (1993), community colleges and

universities share common traits within student populations in terms of attendance, curriculum, and achievement. However, the goals of the two student groups often differ.

The community college environment supports a diverse range of students in age, academic abilities, and backgrounds. It is difficult to generalize the definitions and measures of student retention between universities and community colleges (Braxton et al., 1997; Mohammadi, 1994). In addition, community colleges are defined as comprehensive institutions that are, not only authorized, but in most cases mandated, by state government to engage in economic development activities and to provide occupational education as well as traditional collegiate courses (Dalton, 1998; Grindel, 1997; Horton, 1997; Owen, 1998; Pickar, 1998). Rouse (1994) also pointed out that community colleges are chartered to serve their respective communities and to meet the needs of a particular community or industry that may move into that community. This adds to the burden of dealing with students considered academically at risk.

Hagedorn and Castro (1999) noted, that when compared to four-year institutions, community colleges face inequality in relation to the level of accountability due to the variance of the student population, including socioeconomic status, race, gender, age, and family status. Despite these struggles, maintaining a precise account of student attendance is key in maintaining a creditable reputation and in securing adequate funding to meet budget demands (Tichenor & Cosgrove, 1991).

The demand for accountability is not a new phenomenon for higher education leaders. According to Kane (1995), earlier attempts by state and federal leaders to measure institutional effectiveness and operations have been met with a docile resistance, or benevolent neglect, within higher education. Although some leaders continue to

follow this trend, many are quickly understanding the consequences of not providing this data.

According to the BLS (2012a), as higher education administrators struggle to discover a solution for attrition, economists are also looking toward higher education to grow the workforce. Higher education no longer is for the elite; it is for any individual who plans to seek a job in a workforce that requires some semblance of postsecondary education. In 2002, the U.S. Census Bureau illustrated the need for higher education through unemployment rates. The unemployment rate for individuals between the ages of 24 to 64 was only 3.4% in 2001. However, of the 3.4% of individuals not working, 4.2% were high school graduates, and a mere 2% were college graduates. When broken down further, individuals with some college but had not earned a degree constituted 2.9% of the 4.2% of workers laid off. Interest in entering college has increased, although completion of college is on the decline, which impacts more than only the college one chooses to attend.

Today, community colleges fulfill a multiplicity of roles within their communities, offering a myriad of educational programs and services with a broad and sometimes contradictory set of intended outcomes. As community colleges continue to struggle with retention, and new mandates from state and federal government continue to plague funding, today's leadership must be strong and innovated in maintaining these institutions' viability.

Retention Issues

McGivney (2003) asserted that student attrition from higher education is a growing concern for institutions, funding bodies, students, and the economy, as the cost

of an education continues to upsurge. Long and Franklin (2004) also contributed the push for accountability and concern with attrition to the current state of the economy.

According to Radin (2000), billions of dollars each year are allocated to financial aid in the US. In a 1999 report from the College Board, the federal government reported that it had spent \$46 billion in grant aid and subsidized loans to college students in the 1998-1999 academic year. In addition, colleges and universities spent an additional \$12 billion for scholarships to support students. Attrition continues to plague higher education, and the effect is costly. Corman (1992) indicated that the research on student attrition has serious implications for the future of higher education, not only for four-year universities, but also for two-year community colleges both public and private. When students invest in higher education through loans and do not graduate, serious negative consequences result for the students and the economy.

As higher education administrators struggle to discover a solution for attrition, they also are under scrutiny to educate the workforce for the 21st century. Higher education no longer is for the elite; employers seek a workforce in the 21st century that has some semblance of postsecondary education. The U.S. Census Bureau (2002) illustrated the need for higher education through unemployment rates. The unemployment rate in 2001 for individuals between the ages of 24 to 64 was only 3.4%. However, of the 3.4 % who were not working, 4.2% were high school graduates, and a mere 2% were college graduates. When broken down further, individuals with some college but had not earned a degree constituted 2.9% of the 4.2% workers who were laid off.

Symonds, Schwartz, and Ferguson (2011) reported that, in order to compete in the global economy, one must possess some form of postsecondary education. This was demonstrated by the statistics indicating that 63 million jobs were added to the economy between 1973 and 2007; however, individuals with only a high school diploma declined by two million over this same period, whereas the number of individuals with some college experience increased. This equated to less than 41% of the workforce being individuals with a high school diploma or less. Interest in entering college has increased, although completion has been on the decline. This factor impacts more than only the college one chooses to attend. It also impacts the individual's ability to provide for his or her family and reduces the chance of becoming unemployed.

In an article entitled "Student Success" (Retention, 2006), retention was noted to be a buzzword since 1962; the first two conferences were not held until May of 2006 to provide evidence-based practices and strategies to help administrators explore ways to improve their retention rates. The decision to hold these conferences stemmed from colleges' needs, both two-year and four-year, as they continued to struggle to increase retention rates. The goal was to convene a committee of individuals representing colleges across the United States in order to explore recommendations and strategies to target various geographic areas and students from different socioeconomic backgrounds.

Zumeta (2001) stated that, as the world settles into the 21st century, higher education institutions in the United States face a number of challenges related to various societal and environmental forces. A new economic incentive is mandating states to redefine relationships by pressuring institutions to become more accountable, more efficient, and more productive in the use of state and federal dollars (Alexander, 2000).

Accountability is not a new demand for higher education leaders. According to Kane (1995), earlier attempts by state and federal leaders to measure institutional effectiveness and operations have been met with a docile resistance, or benevolent neglect, within higher education. Although some leaders continue to follow this trend, many are quickly understanding the consequences of not providing this data. Barnett (1992) noted that higher education systems have entered "the age of disenchantment": "society is not prepared to accept that higher education is self-justifying and wishes to expose the activities of the secret garden. With greater expectations being placed on it, higher education is being obliged to examine itself or be examined by others" (p. 16).

The stimuli that drive these changes include the turbulent economy, explosion of technology, public and governmental demands for accountability, and the ongoing decline in higher education graduation rates (Helms-Mills, 2003; Roueche, Roueche, & Ely, 2001). In the late 1990s, Heller (2001) identified three major challenges that higher education institutions face in the future: (1) affordability, (2) access, and (3) accountability.

Zumeta (2001) reported that government involvement has increased, as taxpayers are demanding that higher education become more accountable. According to Kelderman (2014), lawmakers no longer freely provide funding for higher education. However, they now attach strings to the funds they provide, in addition to the money collected by institutions in the form of tuition. While the government has placed a stronger hold on these funds, it also threatens actual measures to limit tuition unless higher education institutions demonstrate responsible spending practices. Legislators not only mandate colleges and universities to submit retention figures but they also pay close attention to

the way that colleges spend and save the money they receive, in addition to placing performance benchmarks for some. One area of interest is whether the money they save is utilized for financial aid for low-income students.

Although accountability and funding have become ubiquitous from state and federal government agencies in America over the last 15 years, empirical research has shown very little indication that performance information impacts budget decisions made by state and federal governments (Gilmour & Lewis, 2006a, 2006b; Joyce, 1999; Long & Franklin, 2004; Moynihan, 2008; Radin, 2000). Moynihan (2008) stated that, although government officials demand this information, little to no commitment has occurred to mandate a true reform, and other factors limit the influence of performance-based funding. As Moynihan emphasized, performance must be seen in more than numbers; rather, indicators must be evaluated prior to harsh quick decisions. This leads to the question regarding the reason policymakers have been quick to adopt performance instruments, despite not using the information that is generated (Kettl, 2000; Melkers & Willoughby, 1998; Moynihan, 2008).

As both Gilmour and Lewis (2006b) and Moynihan (2008) have pointed out, a second area of concern involves whether colleges are meeting state and federal benchmarks by reducing funding, which would continue to negatively impact performance. Thus, one would believe that the university would need additional support to improve its benchmarks.

Concern with attrition rates is not a new phenomenon; although, the way in which to reduce attrition rates is of major concern, one that college administrators have discussed, as well as state and federal government officials (Kowalski, 1977). The race

to solve this problem is ongoing, and the research is growing relative to ways to ameliorate this issue. Before the problem can be solved, one must have a comprehensive understanding of the definition of “attrition.” As defined by Gallie (2005), attrition is the number of students who begin the course minus those who complete it. With this definition in mind, research has indicated various reasons that students withdraw from college.

Retention is yet another word commonly heard on college campuses. According to the NCES (2003), retention is defined as:

A measure of the rate at which students persist in their educational program at an institution, expressed as a percentage. For four-year institutions, this is the percentage of first-time bachelors (or equivalent) degree-seeking undergraduates from the previous fall who are again enrolled in the current fall. For all other institutions this is the percentage of first-time degree/certificate-seeking students from the previous fall who either re-enrolled or successfully completed their program by the current fall. (p. 1)

Although the definition appears to provide a clear and concise definition of retention, research has continued to reveal that many administrators struggle with providing statistics that are a true representation of their campus. Although leaders struggle with the correct means to figure retention and attrition rates, several studies have been ongoing to gain a better understanding of the reason students leave college before completion. Summerskill (1962) reviewed several retention studies. The meta study revealed that retention rates varied from 18% to 88%, depending upon the institution. This prompted a call for a standardized formula to measure retention rates across all institutions. The

discrepancy that was noted related to the various methods used to measure retention. More than four decades after the Summerskill review, a universal formula has not been developed to measure retention. However, the United States government has launched a federal definition of graduation rates as part of the Student Right-To-Know and Campus Security Act (Pub. L 101-542). Although the government has in place a universal formula, many individuals struggle with the correct way to utilize the formula. Hagedorn (2005) indicated that the ability to obtain true transfer rates from community colleges to four-year institutions, and to utilize the correct formula for measuring a college's retention rate, is a challenge. Several notable researchers have devoted a significant amount of time working toward a solution to student retention. Some of their findings will be discussed in the following sections.

Several studies have been conducted to understand the factors that influence a student's withdrawal. Various aspects that have been examined include academic ability, conservatism, and neuroticism (Long & Gordon-Crosby, 1981); situational factors including stress (Lindop, 1987, 1991; Menzies, 1961a, 1961b; Parkes, 1985; Wernick, 1984); and social support (Brown, 1987). The focus of such studies has been the identification of characteristics of students likely to complete their education (Huch, Leonard, & Gutsch, 1992; Long & Gordon-Crosby, 1981), as well as the identification of areas in which intervention programs may reduce attrition (Brown, 1987; Harvey & McMurray, 1994; Wernick, 1984). According to Clagett (1982) and Willner (1982), students who enter college without a declared major have an average dropout rate of 62%, compared to students who declare a major at the onset, with a 38% dropout rate. However, research has demonstrated that the point at which an individual is most likely

to leave is within the first semester of attendance (Blanc, DeBuhr, & Martin, 1983; Bradburn, 2002; Driscoll, 2007; Horn, 1998; Kambouri & Francis, 1994; Malicky & Norman, 1994; Rendon, 1994, 2000; Sadler, Cohen, & Kockesen, 1997; Wylie, 2005). However, the reasons for leaving can be very different (Kowalski, 1977).

Demetriou and Schmitz-Sciborski (2011) reported that several expansive theoretic models have been utilized as analytical instruments for retention. Tinto's (1975) model derived from Durkheim's social integration theory joined with personality characteristics and societal pressures. Considering the individual traits such as attitudes, motivation, and other variables, Tinto's (1975) model examined social integration in accordance with these traits. He suggested that other aspects worthy of consideration were whether the individual began the process with an understanding of a greater reward upon completion of his or her educational training, or the various life events with which an individual must deal while pursuing an education in order to understand the reason the student left college prior to completing a degree. It also is believed that a student who becomes integrated with the campus usually demonstrates a higher rate of retention (Tinto, 1975). Other studies by Astin (1975) and Pascarella and Terenzini (1980) stated that an individual's personality traits can help other researchers to understand the manner in which the student deals with social pressure and enhances social connection with the institution.

Tinto (1975) suggested the use of a causal model when determining the reason students leave college prior to completing an education. The model included four sets of principal constructs: (1) background characteristics, (2) initial commitment, (3) academic and social integration, and (4) persistence-withdrawal. Tinto felt that this model would help researchers and higher education administrators to gain a better understanding of the

reason students left college early and also would provide a greater understanding of ways to intervene prior to a student dropping out (Tinto, 1975).

Bean (1986) stressed that retention theories should be considered relative to individual programs; the types of students in attendance (traditional or non-traditional); the type of college (two-year vs. four-year, private vs. public); and the reason a student leaves the institution. The models include a wide range from definitional distinction to major philosophical commitments. Tinto (1975) determined the importance of understanding the difference between academic failure and a student's voluntary withdrawal. Roueche and Pitman (1972) used a more philosophical approach and felt that "all students can learn — not just those who have previously demonstrated success" (p. 20).

Anderson (1985) developed a force field model that has shown promise in predicting retention. This model placed more emphasis on understanding the competing forces in a student's personal life that compelled him or her to complete a degree or prevented him or her from completing a degree. Anderson emphasized that students are human and they, as everyone, deal with various pressures that can affect and determine the ultimate direction of their lives.

Clagett (1982) explored a different model that focused on the student's commitment and competency. This model determined that students who were committed and competent to accomplish the work would succeed in their college pursuit. However, students who were competent but had little to no commitment may be unsuccessful. The same can be true for a student who is committed but incompetent: he or she likely would remain until forced out (academic failure).

Noel (1985) and Belcher (1987) discussed a value-added assessment model that offered a means to evaluate retention, while considering the barriers faced by community colleges. This concept specifically examined the option of limiting the assessment, not only to counting degrees and certificates, but also examining the students' variance in attitude during their time in college. This model was developed from students' decisions to transfer to four-year universities in order to complete their degrees. The pursuit from a two-year to a four-year degree indicated that students' attitudes were transformed by wishing to pursue additional educational goals.

Bakerson (2009) researched a program that has demonstrated an increase in retention rates entitled The First Year Experience (FYE). This program was implemented at Western Michigan University in 2006-2007 and was designed to help students reach their academic goals. The program mandated a new student orientation and a four-day transition program in residence halls. Participation resulted in a significant higher rate of persistence than those who did not attend.

Mansfield et al. (2011) indicated that retention continues to be a topic of conversation, yet the means to address the concerns have only begun to surface, particularly on a community college level. Allied health programs and community colleges face limited and fewer resources, a problem that campus leadership must proactively address.

According to Mansfield et al. (2011), 40% of the undergraduate population in the US is represented by 20 states and Puerto Rico. This population implemented Access for Success in 2007, with two main focuses: (1) increase the number of college graduates within their individual states, and (2) validate that the college graduates represented the

high school graduates within the same state. In addition, this program's goal was to account for students who otherwise would not be accounted for using the Integrated Post-secondary Education Data System (IPEDS). IPEDS is commonly used to report completion rates, but the data measure only the students who begin and graduate from the same college. Thus, a secondary goal was developed to provide an opportunity to follow these students across the entire system, rather than only one institution. This allowed states to fill in the gaps with students who otherwise would be considered dropouts. In 2009-2010, by combining this information with the National Association of System Heads and The Education Trust, the gap was nearly closed, providing more realistic data (Mansfield et al., 2011).

Astin (1993) noted that each model has its own limitations, although each helps to explore the options beyond raw data of the number of students who complete a degree or earn a certificate. Rather, this model examined the reason students leave prior to completing a degree or certificate, and analyzed the data to gain a better understanding of retention issues.

As early as 1872, The National Education Association addressed the issue of retention in a paper entitled, "The early withdrawal of pupils from school: Its causes and its remedies" (Kowalski, 1977). According to Demetriou and Schmitz-Sciborski (2011), Tinto and Bean were considered to be the pioneers in both the research and the model used for retention, and the importance of the issue has created a virtual explosion that continues today. In an effort to grasp an understanding of the way in which colleges and universities have defined retention, an ERIC search returned in excess of 3,000 hits. A scholarly peer reviewed journal dedicated solely to the subject the *Journal of College*

Student Retention: Research, Theory & Practice, currently is in operation, and new books and monographs are regularly being published (Demetriou & Schmitz-Sciborski, 2011).

A contemporary retention researcher, John Braxton, edited a book in which several authors reworked and examined college student retention and recommended new views on the revered theories that potential could more appropriately address the needs of diverse college students. As retention issues continue to plague higher education, the scramble to resolve this issue continues to be the focus of many researchers. Scholars and researchers were concerned with retention in 1872, and growing concern continues today.

The caliber of students, educational background, and various factors have an impact on whether a student will complete his or her educational goals. However, colleges are faced with rectifying these obstacles in order to secure the much needed funds from state and federal government. These issues are, not only forcing universities to rethink the students they admit, but community colleges also are faced with an even larger daunting task due to their open-door admissions policies. Various elements have been mentioned, and techniques have been suggested to improve retention. However, to date, no perfect formula or technique has been supported through research data.

Although universities struggle with retention, as community colleges operate on an “open-door policy,” they struggle even more.

Retention Issues for Community Colleges

The impact of retention on a college campus is obvious, as more institutions strive to find formulas to fit the needs of the campus and the students. Kowalski (1977) stated

that attrition is a word that is heard, not only on university campuses, but also is commonly spoken on community college campuses.

According to Bushnell (1991), all colleges and universities are required to submit retention data to governing agencies. However, within the data collection process, little attention is given to the student population or campus mission. Community colleges serve a population known to possess increased percentages of risk factors for completion (Hagedorn & Castro, 1999; Roman, 2007). Despite these struggles, all institutions must maintain an exact account of student attendance in order to measure completion rates that ethically apply to funding models (Tichenor & Cosgrove, 1991). According to D'Errico (2010), community colleges primarily (1) serve commuter student populations, (2) utilize an open admissions policy, and (3) serve a broad spectrum of students. With the additional variables that identify success, retention strategies become complicated issues. Thus, it is valuable to narrow the focus of discussion to community colleges as a particular context.

As community colleges face the same standards as universities, educating the underprepared student continues to be difficult. Universities seek sources of funding that are unavailable to many community colleges, such as alumni, sports activities that bring in donations or revenue, and grants for research. In addition, community colleges were established based on open-door access to everyone, whether college ready or not. With state and federal funding tied to outcome performance, some universities are beginning to no longer offer remedial classes, which puts that burden back on community colleges. Rendon (2000) stated that community colleges possess the ability to become role models

for universities in terms of building upon learning theories to serve a diverse and highly non-traditional student population.

Hellmich (1989) noted that community colleges face the largest challenge relative to retention due to their open-access policies. As community colleges welcome all students, regardless of their ability, the focus must continue to be placed on students with poor academic skills (Hellmich, 1989). Although every student who desires an education should be afforded the opportunity, it is important to understand that "[...] deficiencies accumulated over twelve or more years of elementary and secondary schooling cannot be corrected in a semester or even one year" (Richardson, Fisk, & Okun, 1983, p. 164).

Hagedorn and Castro (1999) indicated that community colleges face additional challenges due to their level of accountability, to include the turnover of students based on the variance of the student population, including socioeconomic status, race, gender, age, and family status. Despite these struggles, maintaining an exact account of student attendance is key in maintaining a creditable reputation and securing adequate funding to meet budget demands (Tichenor & Cosgrove, 1991).

Tinto (1982) suggested that, with the closer examination of community college retention, attention should be focused on students' financial needs, differences in gender, and the factors regarding career development. Tinto concluded that the university must be committed to the student. Colleges must set high expectations, be willing to support the student's efforts, provide honest and timely feedback, and be involved in the student's life. Students at community colleges face a wide range of issues that residential students at four-year universities do not usually encounter. Community colleges must recognize the concept that retention strategies for their locations look different than those of four-

year residential institutions. Again, as Tinto (1982) discussed, the reasons students persist in their educational journey do not mirror the reasons students fail to obtain degrees.

Several research studies have been completed by Tinto (1975, 1982, 1993, 1999, 2004), indicating that the most common reason for high attrition rates in community colleges is because some students return to school after a long absence; other students juggle work and family responsibilities. Bailey et al. (2004) reported that many students express concerns about their readiness for coursework, finding time to study, and needing transportation to and from the campus. Tinto (1982) stated that community college students have families, work more hours, are more likely to attend part time, and more often begin college without a clear direction of their plans. All of these factors lead to a need to focus on retention at community colleges.

Community colleges serve a different job market than four-year institutions, thus placing a smaller emphasis on the completion of academic credentials (Grubb, 1993, 1996, 2002). Kolesnikova (2009) and Van Noy (2011) asserted that the pre-baccalaureate labor market is inherently more unstable than the baccalaureate market. Students may be engaged in socio-academic interactions with fellow classmates, faculty, and other college staff that shape their definition of the current labor market opportunities and influence their perceptions of the labor market environment (Stuart, Rios-Aguilar, & Deil-Amen, 2014). Through interactions, relationships, information gathering, and conversations both on and off campus, students also may realize that employers place a lesser value on the credentials in some fields of study (Stuart et al., 2014). Thus, if

students feel there will be no payoff as a result of the time and cost of acquiring a degree, it becomes easier for them to decide to withdraw.

Tinto (1975) also related student success and completion to the current job market. If the job market is stable for the student's selected career field, and the enrollment behavior is positive, the student is more likely to complete a degree. Conversely, if the job market is declining or considered unhealthy, students may be quicker to withdraw from their education based on uncertainty related to the expected economic returns on their degree (Stuart et al., 2014).

When individuals make a decision to return or continue their education, they must evaluate the economic gain for their decision. Students usually enter higher education with a set of goals and expectations, which normally are based on personal characteristics and past educational experiences. Once enrolled, their educational goals may be altered due to their personal experience on and off campus related to acceptance by family members and in their work lives (Stuart et al., 2014).

Astin (1975) and Johnson (1997) reported that as many as 66% of the dropouts from community colleges were self-supported students, and they worked more than 36 hours per week. In two independent studies conducted by Clagett (1982) and Willner (1982), respectively, the researchers found that students who enter college but have not declared a major drop out at a rate of 62%, a significant increase from their more focused peers. In addition, 75% of the students who enter college change their majors during their academic careers. During this transition, a student's risk of dropping out increases (Gordon, 1985; Noel, 1985). Noel (1985) suggested that community colleges use a value-added model, focusing their retention efforts on pushing students toward emotional

growth; their interactions with others and the skills they attain are the focus for educational outcomes. The relational focus speaks to the psychological demands of the student, while influencing the attainment of educational competencies. According to Stuart et al. (2014), prior to a student's decision to complete a degree, transfer to another higher education institution, or quit school, the student's initial goals are modified as a direct result of his or her experience while attending college at either a university or a community college.

In the fall of 2007, six community colleges in New York participated in Accelerated Study in Associate Programs (ASAP) (Napolitano & Wu, 2010). ASAP utilized a selection method for students with regard to their economic status and focus on the relationship between the student and the advisor. Students were assigned to 21 designated advisors and were required to meet with them twice a month during each semester. This program was considered successful when a student who had previously quit college participated in the program and graduated with a 3.3 GPA (Napolitano & WU, 2010).

According to Rutschow et al. (2011), the Lumina Foundation for Education launched a program in 2004 entitled "Achieving the Dream: Community College Counts." This program focused on low-income and African American students, respectively. The concept involved a review of student records to determine performance over time and to identify barriers that prevented them from being successful. Some of the targeted areas were administration, teaching methodology, professional development, and focus on students who enter college at the remedial level. This information was used to develop interventions that would provide this group of students with the ability to be

successful, and the outcome was positive. More students progressed through remedial education and moved on to complete a degree (Rutschow et al., 2011).

Although several studies have been conducted in the past and continue today, a quick fix has not appeared on the horizon. Therefore, community colleges should continue to seek ways to improve student completion rates, increase enrollment, and work within the confines that have been set for them. Community college faculty have the ability to become role models for universities by building on learning theories and understanding that all students have the ability to learn, as long as they possess the desire to accomplish their educational goals.

Selective Admissions

Allied Health Programs

Allied health programs face different barriers when dealing with retention rates. As stated by Semler (2001), students accepted into allied health program traditionally were limited to the number of clinical sites available. Therefore, not every student who applied was accepted. Furthermore, in most cases, three to five students were turned away for every student accepted. The selected students were subjected to a rigorous admissions process to ensure their success in the program.

Proper training of an individual for a career in the allied health field involves dedication, time, and commitment. When students apply for an allied health program, they often do not understand these attributes. Therefore, it is difficult to determine the students who will be successful, and those who will decide they are unable to complete their career goals.

Gillis (2007) noted that, due to the vast amount of information covered in allied health programs, it is academically impossible for students to be successful in entering the program after it has begun. Therefore, the student must be admitted in a timely manner in order to persist. Otherwise, a valuable spot may open due to drop out, and the ability to replace the empty position is academically unfair and unrealistic.

Roman (2007) stated that students in allied health programs often face retention risk factors such as first-generation status, belonging to a minority group, a poor economic background, or academically underprepared. In most cases, many students have been required to complete a certain amount of essential college prerequisites prior to their admittance into an allied health program. This thought process leads one to believe that they are prepared to deal with the demands of an allied health program, which is far from true.

Kavannah (1981) asserted that the increased academic requirements and curriculum format impact the success of allied health students, explaining that a large amount of time is divided among didactic information, lab skills, and clinical rotations. In order to be successful, students must spend a significant amount of time in a lab setting to practice their skills. It is imperative that the student is successful in the clinical setting. According to Jenkins and Cho (2012), clinical rotations require the student to travel from college and, in most instances, the ratio of contact hours to credit hours is significantly different. Thus, most of the student's time is spent in a clinical setting, which can create a hardship on a student who must deal with child care or financial issues. When a single parent attempts to complete an allied health program, he or she must ensure child care for the children. The clinical rotation can require a student to be in a clinical setting

anywhere from 6 to 10 hours per day, unlike traditional college classes in which the student may need child care for only one to two hours. Additionally, if the student is the breadwinner of the family, the amount of available time to work may be restricted due to the hours required for clinical education. Allied health programs tend to be highly structured, with licensing requirements dictating course content (Roman, 2007).

The arduous curriculum is only one reason that students are unsuccessful. In a study by Gupta (1991), men who were enrolled in allied health programs were more likely to drop out than women. Gupta also revealed a significant variance in retention depending upon the program of study and the type of institution. When students attended a vocational or technical program, the retention rate was higher, at 24.3%.

According to Mese and Spano (1989), the retention rate at the Medical Campus of Miami-Dade Community College had decreased to a point that the college devised a strategic plan to target high-risk students. This method employed measures that integrated academic support services, emotional support, and personalized communication outreach with the students considered to be at risk. Although the retention rate improved over a two-year period, some barriers could not be changed. One was that the college could not control the amount of time the program required of the student. The family is faced with a hardship due to reduced income, therefore adding stress to the student. Miami-Dade College found that, although they had good intentions, they were unable to fix all problems faced by students.

According to Wells and Baird (2001), allied health programs generally do not suffer from lack of interest or low numbers of applicants; however, they struggle with selecting the appropriate students who are academically prepared to enter into a

comprehensive, fast-paced, demanding program. Not only do the individuals need to be successful both didactically and clinically, they also must prepare for a certification exam with content based on all the material that was covered throughout the program. With the explosion of the biomedical knowledge base, preparing students to enter a healthcare profession is a challenge.

Admissions Criteria

Higher education faces an old problem for new reasons, although retention and attrition have been a topic of discussion for over 100 years. Higher education in the 21st century faces reduced funding from state and federal government when a higher graduation rate cannot be demonstrated (Alexander, 2000). Administrators are evaluating current admissions practices, as well as exploring new practices that can guarantee that an entering freshman will persist and graduate in a timely manner (Zumeta, 2001). Higher education has struggled with retention issues dating back to 1872, when the first notable paper was published on this issue (Kowalski, 1977). This issue has become even more pressing, as higher education is now in an era of accountability (Callan, 1975).

Higher education has depended upon standardized tests for several years to determine whether a student will be successful in college. The most common standardized test used for admission is the Scholastic Assessment Test (SAT), or American College Testing Program (ACT) test. According to Atkinson and Geiser (2009), fewer than 1,000 students took the first College Board exam offered in 1901. Today, more than 1.5 million take the SAT, an estimated 1.4 million take the ACT, and many opt to take both prior to entering college, although recent studies on student success

and traditional standardized tests (i.e., ACT and SAT) have revealed that they may not be the best predictors of a student's persistence and success in higher education.

Atkinson and Geiser (2009) noted that high school grades, in combination with standardized test scores, are a better predictor of success, although they indicated that one area of concern involves the difference in grading scales used by many high schools. As these are not uniform across the United States, the use of high school GPA as an admission criterion is debatable.

In a large scale study at the University of California, Geiser and Santelices (2007) tracked long-term outcomes of entering freshmen using high school GPAs. The study showed a significant difference in students' graduation rates when their overall high school GPA was higher, as opposed to those with high ACT or SAT scores. The researchers concluded that a student's overall GPA was effective long term and reflected persistence, as opposed to a four-hour test.

The validity of the SAT test was studied by Trusheim and Crouse (1981) to determine its usefulness in predicting student success in higher education. Their conclusion suggested that the use of SAT scores and high school records added virtually no useful predictive information over selection based on student high school records alone.

According to Rooney and Schaeffer (1998), more than 275 higher education institutions no longer rely on the ACT and SAT scores when admitting the freshman class. According to their study, administrators have deemed these standardized tests to be significant barriers to entry for thousands of academically qualified minority, first-generation, and/or low-income students, including the female population. Although the

ACT and SAT purport that student test scores can predict success in college, Rooney and Schaeffer reported that many colleges analyzed their admission numbers and determined that standardized tests were poor predictors of first-year college performance.

Higher education has depended upon standardized tests for years, although research has begun to reveal that it is not a guaranteed predictor of student success. As universities continue to struggle to find admissions criteria that can predict a student's successful completion, programs that limit admission within these institutions also struggle to find some semblance to ensure they accept students who will persist and complete in a timely manner. As funding and accountability become more aligned, the race to find the perfect formula when admitting students continues to plague higher education.

Selective Admissions

Cohen and Brawer (1989) stated that community colleges traditionally operate with an open-door admissions policy to provide an educational opportunity to individuals who would otherwise not be able to afford it. Although this practice can allow a student admission into a community college, it does not guarantee admission to allied health programs. Kavannagh (1981) noted that allied health programs traditionally use selective admissions practices when admitting students into their individual programs. Some feel that the selection functions as a "gatekeeper" by controlling entrance with limited access (Carnegie Council Series, 1977).

Schulz et al. (1995) declared that healthcare professions are not career matches for all students. Thus, the selective admissions process encourages a more active dialogue between faculty, advisors, program directors, and potential allied health students

as to the expectations of the academic program and those of the chosen career path (Schmalz, Rahr, & Allen, 1990).

As described by Schmalz et al. (1990), the purpose of selective admissions is two-fold. First, logistically speaking, every student admitted into an allied health program must spend a specific amount of his or her educational experience in clinical settings. Clinical facilities must be approved by the accrediting body of the program. In order for a program to obtain permission to utilize a clinical site, an application must be submitted, in addition to a fee that typically is paid through the program's annual budget. The approval process by the accrediting agency may require up to three months. Therefore, Schmalz et al. stated that the amount of students admitted is directly related to the number of clinical sites available in which to place these students throughout their educational experience.

Ward (2009) indicated that selective admissions allows program administrators and committees to hand-select students they deem to be academically prepared and motivated to complete the program within the confines of available space. Kudlas (2006) noted that selective admissions provides programmatic control at various levels of the students admitted to the respective program. However, the factors considered for admitting students are based upon the preference of the program, the admissions committee, and varied reports on student success.

In some situations, selective admissions allows programmatic control over those who are accepted and those who are not; however, programs must utilize a selective admissions process for a very valid reason. As reported by Barfield, Folio, Lam, and Zhang (2011), the most common reason is related to the limited number of clinical

facilities in which to place the student after acceptance into the program. A clinical site must be available for every student in order to complete the skills-based portion of the program.

Barfield et al. (2011) claimed that the admissions criteria may vary based on the institution and the individual program. Programs generally admit only the number of students to fill the clinical sites with which they are affiliated. Once the program begins its curriculum schedule, it is impossible to admit a student to replace one who decides to leave the program. Due to its relation to retention, creating admissions criteria is a crucial part of operating a program.

Selective admissions is an integral part of all allied health programs due to limited clinical site placements (Schmalz et al., 1990). In addition to the logistical needs, programs must consider the market demand for the field. However, all programs suffer the same restrictions for clinical space. The task of selecting candidates who will be successful is paramount to communities, schools, and prospective students. According to Glick (1994), communities expect programs to produce individuals suitably prepared to fulfill the multitude of roles expected of healthcare professionals. Students selected for admission who cannot satisfactorily complete a rigorous science curriculum represent a failure of the admission practices (Esen et al., 2006).

Although various factors relate to the need for selective admissions, this process is decided by more than one factor or individual (Ward, 2009). In many cases, a committee is appointed, and several cognitive and non-cognitive factors are considered when selecting students.

Not only is it disheartening to select students who do not complete the program, but it also is costly. Lecca, Valentine, and Lyons (2003) found that the cost of educating and training allied health students is extremely high. The estimated cost to educate these professionals in 1993 ranged from \$13,500 per year for an occupational therapist to over \$19,000 for a laboratory technician. Espen et al. (2006) explained that, given the limited institutional resources and workplace demands, it is imperative that decisions for admission are based on criteria that can identify those students who can be successful. Program directors continue to face the problem in which the number of qualified applicants outnumbers the available slots. Leiken and Cunningham (1980) stated that the goal of all program officials is to admit students, help them progress, and have them graduate and become gainfully employed in their field. Students who are accepted into the allied health programs must overcome various barriers. As noted by Reddick, Bethea, and Holland (2012), these barriers may consist of “lack of knowledge about financial resources, inadequate preparation for the rigorous curriculum, and life issues” (p. 846).

The selective admissions process is critical for most allied healthcare fields. Due to the limited clinical sites and the importance of selecting the appropriate candidate, these programs must evaluate every candidate prior to admission. Universities continue to struggle with retention, graduation rates, and finding a formula when admitting students, as do allied health programs. However, with the demand for accountability in order to secure funding, the need to evaluate the criteria for admission is of utmost importance.

Admissions Criteria

As students enter institutions of higher education, they enter into a psychological contract with the university (Tinto, 1993). Tinto (1993) stated that this unspoken contract consists of students' expectations of the institution with regard to the support it provides for the best interest of the student. Students expect a level of challenge and work; however, in considering the selective admissions process, students expect fairness, transparency, and academic performance to determine admission as a gateway to their future career path (Gupta, 1991).

Research has revealed that undergraduates' grade point averages (GPA) can predict graduate school success; conversely, this is not the only predictor. Shiypuri et al. (2006) noted, "A great deal of research indicates that scores on standardized tests, such as the SAT and ACT, as well as past academic performance, are the most valid predictors of success in college" (p. 69). Although these tests may predict success in college, they may not necessarily predict success in allied health programs.

Wolkowitz and Kelley (2010) examined predictors for student success in nursing programs. The results revealed that many assessments were used that factor into the admission and placement process. The findings demonstrated that the most common predictors were the ACT scores, SAT scores, Nursing Entrance Test (NET), and interviews. The researchers found "no universal conclusion could be drawn from the analysis of various cognitive predictors" (p. 499). However, the results demonstrated that the predictors most prevalent for early nursing program success were science GPA, followed by reading GPA, written/verbal scores, and math GPA.

Leiken and Cunningham (1980) studied allied health programs in a university setting and found that the “Allied Health Professions Admission Test (AHPAT) is significantly correlated with allied health GPA, and improves predictions of GPA when used with an equation along with prior GPA and type of school (community college or university)” (p. 138). The study noted that, while AHPAT predicts to some degree whether a student would be successful in an allied health program, admissions committees should not rely only on this test. They should also consider other factors such as recommendations, evaluations, and the committee interviews.

Research conducted by Ferencak (2009) revealed three types of measurements that have been used consistently in assessing an applicant’s experience and personal abilities outside of academic assessments: (1) the interview process, (2) personal observations, and (3) recommendation letters. Constructive data on applicants’ personal qualities and experiences can be extracted during the interview process, and through recommendation letters and observations.

Many individuals view the interview process as an opportunity to evaluate personal attributes, and the interview is considered important in deciding a candidate’s suitability for a chosen field (Adams, Brandenburg, & Blake, 2000). Others have indicated that the interview process is too subjective to fairly assess ability or “fit” in an allied health program.

Goho and Blackman (2006) asserted that a key consideration when identifying measures of selective admissions criteria is the ethical implications of subjective tools, such as an interview. Interviews lack the transparency of other quantifiable data, such as

GPA, standardized test scores, and grades in prerequisite courses such as science and math.

Pros and cons exist in the interview process as part of the program acceptance criteria. Dyer (1963) cautioned against interviews, as the inclusion of subjective measures that are a part of interviews may damage the student's trust of the institution because the measures of success may vary dependent upon the committee or traits unrelated to the program or career field. As such, results published by Hoad-Reddick and MacFarlane (1999) verified that candidates who performed well during the interview process were more likely to succeed in their second semester. However, as Bennett and Wakeford (1983) pointed out, "The interview is the most commonly used [subjective] method of obtaining information for making selection decisions" (p. 19) to date. Goho and Blackman reported in 2006 that approximately 80% of allied health committees used interviews as part of the admissions process. They observed, "While the interview can provide information about the people skills of the candidate, as well as writing skills, it lacks incremental value, with a potential of bias for reliability and validity regarding the person conducting the interview" (p. 335).

Although interviews have been commonly used, various complications are related to the process. No specific model exists for an interview (Sterk & Prywes, 1970). Numerous studies have demonstrated that interviewers often have opposing opinions concerning the conclusions they make on individual candidates; more often than not, their decisions are inaccurate (Bennett & Wakeford, 1983; Sterk & Prywes, 1970). As Powis (1998) pointed out, "Objectivity and reliability of an interview can be severely hampered when the questions are not predetermined and constant, a questioning strategy

is not established, a scale is not calibrated to grade answers, and it is performed by untrained staff” (p. 1149). Powis strongly lobbied for interviewers to be trained in general interviewing techniques, unambiguous interview content, scoring against standard criteria, and inter-rater reliability in order to validate their use. In a study that used interviewing to predict student success in occupational therapy, one major problem was discovered, which was inter-rater reliability of the interviewers (Breland, 1981; Levine, Knecht, & Eisen, 1986).

Goho and Blackman (2006) indicated that the term “interview” can differ significantly among interviewers; and interviews can vary according to the number of individuals involved in the observations, the structure of the interviews, and the various attributes being assessed by the interviewers. Some are formatted wherein applicants are rated on different characteristics; others may ask only for the judgment of the interviewer on whether the candidate can be successful, whether he or she possesses the appropriate personality traits, and whether he or she would fit into the clinical setting. When using a structured interview process, an outstanding interview is strongly associated with an increased possibility of acceptance (Willingham & Breland, 1982). The unstructured interview is the exception.

McDaniel, Whetzel, Schmidt, and Maurer (1994) explained two interview processes: the structured and the unstructured interview. A structured interview is conducted with an individual or group of individuals in a controlled environment. During the structured interview, each candidate is asked the same questions by the same interviewers, and each interview is scored with the same measurement. Johnson (1990) noted that, when an unstructured interview is used as part of the admissions criteria, little

to no predictive validity was seen in whether students would complete the medical training program for which they were applying. Another process that utilizes interviews is selection interviews, in which only particular candidates are interviewed, while others may be admitted without using the interview process (Goho & Blackman, 2006). Goho and Blackman (2006) determined that this investigative meta-analysis inadequately predicted academic success and could have only a modest ability to predict clinical performance.

Dyer (1963) stated that key indicators of the candidate's personal history (i.e., work history, experience in healthcare, etc.) demonstrated the value of the interview as a means for admissions selection. Dyer also stated that these indicators can be evaluated only when the interview committee has employed extensive thought in creating the structure of the interview and the committee has been properly trained in interview techniques. In addition, the interviewer must maintain the same conditions in all interviews and must use a set pattern of questions. Additionally, the same interviewer must ask each individual the same questions, and the responses must be recorded verbatim, rather than recording impressions (Goho & Blackman, 2006).

A study by Stronck (1979) emphasized that interviews should not play a role in admissions processes. A similar study performed by Chassin (1976) revealed that interviews appear to provide a biased advantage to the interviewee who demonstrates the most charisma. One primary concern with interviews was their tendency toward mediocrity (Weinstein, Brown, & Wahlstrom, 1979). Weinstein et al. (1979) determined that interviewers are more inclined to seek out the candidates who are only pedestrian, rather than those who are excellent. It was noted that a small correlation (0.12) exists

between predicting the success of a student in clinical fieldwork and the results of a pre-admission interview (Carnegie Council Series, 1977).

According to Walsh and Ishida (1990), despite the inadequacies of the interview process, it continues to be a common practice in health-related educational programs. Using interviews as part of the selection process assumes a greater significance in order to select the best candidate from a large pool of applicants, although some may not be well represented through the use of objective measures. Conversely, Bennett and Wakeford (1983) noted that interviews potentially can provide information on characteristics, such as the ability to relate to and work with others, self-assurance, conflict resolution, and motivation, which are necessary traits for a successful career.

According to Southerland (2014), a lawsuit was filed by The American Center for Law and Justice on behalf of Brandon Jenkins against the officials at the Community College of Baltimore County (CCBC) in Maryland because he was not accepted into the radiation therapy program. During an interview, the question was asked, “What is the most important thing to you?” Brandon answered, “My God.” Although Jenkins met the standards set by the program as a competitive candidate and scored the maximum points allowed during his observation, he was denied admission due to his response. When Jenkins asked the program director for the reason he was not admitted, he was told:

I understand that religion is a major part of your life, and that was evident in your recommendation letters. However, this field is not the place for religion. We have many patients who come to us for treatment from many different religions and some who believe in nothing at all. If you interview in the future, you may

want to leave your thoughts and beliefs out of the interview process.

(Southerland, 2014, p. 29)

Southerland reported that, due to the bias of the interview committees, lack of training, and the lawsuits that have occurred related to interviewing candidates prior to admission, this practice has become less utilized. Several programs continue to rely on the process, and this particular practice has a significant role in determining those who will be permitted to begin the program.

In several healthcare-related programs, the admissions process consists of two components: assessing cognitive ability and assessing non-cognitive attributes (Agho, Mosley, & Williams, 1998; Johnson & Edwards, 1991; Kwan, Childs, Cherryman, Palmer, & Catton, 2009; Scott et al., 1995). In order to assess these components, programs have used a variety of tools, to include but not limited to standardized testing, high school GPA, math and science GPA from prerequisite classes, interviews, reference letters, observations, and first come-first served procedures to select students each year (Agho et al., 1998; Baker, 1994; Hughes, 2013; Kenny, 2010; Ehrenfeld, Rotenberg, Sharon, & Bergman, 1997; O'Donoghue, 2008; Standridge, Boggs, & Mugan, 1997; Johnson, Johnson, Kim, & McKee, 2009).

In a study by Schulz et al. (1995), researchers focused on non-cognitive factors such as family situations, financial difficulties, health reasons, employment opportunities, and dislike for the program or field of study. The results found some of these factors to be more significant to attrition than cognitive factors. The need for radiographers is evident; however, graduating an adequate number of competent and diverse radiographers has been challenging, with little research to guide program directors in

selecting the appropriate candidates (Espen et al., 2006; Kudlas, 2006). According to Espen et al. (2006), other criteria such as grades and scores on a standardized tests have added to the individualism of applications, which may provide a greater wealth of information and may assist admissions committees in selecting, with greater confidence, the mix of applicants who will comprise each cohort.

As evident by the aforementioned research, positive and negative correlations can be seen for the various admissions criteria when selecting students. More data are essential in justifying that an interview is a crucial component to determine whether a candidate will be successful in a selective admissions program. These data provide little to no direction for program officials in selecting a cohort of students each year. The need to evaluate the admissions criteria and to review the latest research is expected of program officials.

Evaluating the Selective Admissions Process

The ability to select the best potential students requires that the admissions committee develop and continue to refine an appropriate and adequate assessment procedure. Lazarus and Van Niekert (1986) described a fair evaluation process as one that is:

just, objective, equitable and unprejudiced. A selection process is just and objective when its prerequisites are explicit and open to reliable measures, there are no hidden criteria. Prerequisites are explicit when they are clearly defined and available to applicants. (p. 543)

The main focus of selection requirements is to reduce the number of applicants and to admit those students who are most likely to succeed both in and out of the classroom (Truell & Woosley, 2008).

Kwan et al. (2009) noted that the selective admissions process is necessary in order to protect the nature of the field of work and the outcomes for the institution; however, it is vital to understand the implications of the selective admissions process upon retention and attrition rates. Program directors and college administrators should examine the impact of selective admissions criteria on attrition and retention rates. According to Wells and Baird (2001), a successful outcome for patients depends a great deal upon the education and clinical experiences of the healthcare professional.

Healthcare programs have sought to admit students who meet the academic requirements, perform equally well as practicing providers, and possess the personal characteristics valued by the leaders in society (McCurdy, 1997). As previously explained, admission into health-related programs is competitive due to the limited clinical sites and placement. Thus, the committee must select the candidates with the greatest prospect for success (Agho et al., 1998; Goho & Blackman, 2006; Schmidt & Rader, 1999). Identifying students who are more likely to succeed should improve the retention rates of the program and prevent students from occupying the limited positions.

The process is ongoing relative to finding data to ensure that students admitted will complete the program. Through an extensive search, a plethora of data was determined to be available for allied health programs, but limited data are available that relates directly to Radiography programs. Although this has been a topic of concern for several years, the limited data on Radiography programs does not clearly delineate

criteria that can be utilized to ensure student success.

Radiography

History of the Profession

According to Harris (1995), a veteran of the Civil War and rural county doctor named Dr. Eddy Jerman was hired in 1917 by Victor X-Ray Company to head its education department. Jerman embraced this new challenge and took an active interest in the operation and installation of the equipment. His first class of students graduated in 1918 from the Roentgen Technique program. Victor benefited by increased sales of equipment due to the program established by Jerman. Jerman was the founder of the first formal education program for Radiography and was instrumental in establishing the American Association of Radiological Technicians (AART). The AART eventually became known as the American Society of Radiologic Technology (ASRT).

Shaver (2003) reported that the American Registry of Radiological Technicians (ARRT) (2014) was formed in 1929, and the first certification exam for radiographers was established. By 1950, 7,500 technicians were registered by the ARRT. According to the ARRT, the advancement of technology in Radiography equipment has changed, educational requirements have expanded, names have changed, and 43 states now have laws that require individuals who operate equipment producing radiation to be formally educated and licensed (ARRT, 2014). Radiologic Technicians are now referred to as Radiological Technologists; an individual must possess an associate's degree in order to be eligible to sit for the National Board Exam, currently known as the American Registry of Radiological Technologist. To date, the ARRT has a registry of 323,492 Registered Technologists in the United States.

Education in the healthcare field was at one time predominately housed within technical schools. As the profession evolved and technology moved the field forward, the need for a higher degree level was determined by the licensing body. Although several programs had already moved toward an associate's degree curriculum, the ARRT (2014) mandated in 2015 that all individuals seeking to take their Primary National Board exams must graduate with a minimum of an associate's degree.

Most Radiography programs are offered at community colleges; therefore, the program manages a significant number of non-traditional students (Agho et al., 1998; Baker, 1994; Ehrenfeld et al., 1997; Hughes, 2013; Johnson et al., 2009; Kenny, 2010; O'Donoghue, 2008; Standridge et al., 1997). As research has demonstrated, this factor only adds more significance in determining the correct formula for selecting students for each cohort (Espen et al., 2006; Kudlas, 2006).

As the nation prepares for the influx of an aging population, the need for healthcare providers once again is the focus of many administrators. This focus also extends to elected officials, medical facilities, college administrators, and program directors.

Healthcare professionals. Retention and attrition often have been discussed within higher education, as well as allied health programs. An increased demand on higher education institutions exists to meet the need for qualified, credentialed healthcare workers due to the aging general population and current workforce (Layman & Bamberg, 2006). Barfield et al. (2011) reported that, by 2016, more than 10 million healthcare professionals will be needed to care for the aging population. The increase for allied health professionals likely will outpace the supply of program graduates, resulting in a

workforce shortage.

In order to provide quality patient care, a team of highly skilled, well-educated medical professionals is essential (Roberts, 2014). As Roberts (2014) has indicated, the team includes several career fields that include individuals with specialized training in various healthcare fields, and they encompass a wide range of educational and technical skills. Each department within a healthcare setting provides an interracial role in the health and well-being of the patients for whom they care. The individuals who fill these vacancies are those with specialized training in which they are clinically competent and educationally prepared.

According to The Association of Schools of Allied Health Professions (ASAHP) (n.d.), these professionals are defined as “the segment of the workforce that delivers services involving the identification, evaluation and prevention of diseases and disorders; dietary and nutrition services; and rehabilitation and health systems management” (para 5). They include, but are not limited to dental hygienists, diagnostic medical sonographers, dietitians, medical technologists, occupational therapists, physical therapists, radiographers, respiratory therapists, and speech language pathologists.

Allied health professionals encompass approximately 60% of the healthcare workforce (BLS, 2014a). Therefore, these highly skilled individuals are in high demand. Carnevale, Smith, and Strohl (2013) noted that, by the year 2020, the demand for healthcare workers will increase twice as fast as the national economy, i.e, job growth will increase from 15.6 million to 19.8 million between 2010 and 2020.

In addition to the demands to provide healthcare workers, allied health programs face additional challenges from federal policies and regulations to develop students into

employees (Shehane, 1996). The federal government is increasingly holding higher education institutions and allied health programs accountable for the portion of their student population that is currently defaulting on student loans (Layman & Bamberg, 2006). Layman and Bamberg (2006) claimed that, likewise, workforce needs can change from one section of the state to another, or across the country, and from one profession to another. As Layman and Bamberg concluded, “[t]he complexity of these situations increases the environment turbulence for schools of Allied Health” (p. 53).

The education required and the length of time an individual will be in school for allied health careers varies depending upon the specialized care provided by each career area (Roberts, 2014). The education can range from certificate programs, to diploma programs, to associate’s degree programs, to baccalaureate degree programs (Layman & Bamberg, 2006). The individual educational healthcare program curricula are based on guidelines provided by their accrediting body (American Medical Association [AMA], 2012).

Kavannah (1981) noted that attrition issues in allied health continue to be of concern and leave program directors frustrated when admitting students. When allied health programs suffer from retention issues, the healthcare community is directly impacted via a shortage of trained professionals (Kavannah, 1981). Currently, the U.S. population is growing at a rate of 25 million each decade (BLS, 2012). As Baby Boomers age, and the current workforce ages, the shortage of allied health professionals is inescapable (Reddick et al., 2012). The BLS (2012) reported that, in order to maintain the current level of healthcare expected from the citizens of the United States, the amount of trained and academically prepared individuals needs to increase by 33.3% by the year

2016. However, with the trend of retention issues, a shortage of 1.6 million to 2.5 million is predicted by 2020. Moskowitz (2007) noted that the gap in future healthcare workers will grow wider, unless the retention issues are resolved.

According to Noble and Sawyer (2004) and Swanson (2009), as an aging population increases, the demand for healthcare workers increases as well; and the market for radiographers once again is impacting the way these programs view their selection process. By identifying justifiable admissions selection criteria and predictors of success, the allied health education programs can possibly reduce attrition rates; maintain full cohorts; and, in turn, provide the healthcare community with an adequate number of specialized healthcare providers.

Radiography Program Leadership

According to Halsey (1993) and Hayward (2006), higher education is experiencing significant changes, from the influx of students to budget cuts. Students enter college less academically prepared, while attempting to comprehend tuition fees, choices of classes, and majors. These students view themselves as consumers of higher education with expectations related to choice, quality of learning, and support services that are provided by colleges (Hayward, 2006). The significant changes increase the need for effective leadership for the faculty and staff who are critical points of influence within the organization (Shaver, 2003).

A study by McKimm (2004) recognized program directors as an integral part in providing academic leadership. As program directors are the interface between the college and the work environment, their influence places them in a unique position to make individual institutional policy directives that are interpreted into an operative

education within the curriculum. Times of substantial change bring an amplified need for effective leadership, particularly for those considered to be at precarious points within a college's development. Program directors currently occupy a critical point of impact, but their leadership qualities frequently are unnoticed and underdeveloped and, therefore, represent an unexploited opportunity for colleges (Shaver, 2003). In order to maximize the impact of program directors on the value of a learning experience for students, colleges should focus their attention on gaining a deeper awareness of the way in which program directors influence and use positional authority to control and transform policy into practice (Milburn, 2010).

Over a decade ago, a study by Bradley, Brennan, and Little (1992) concluded: the ambiguity of the role [of program director] and uncertain status attached did not seem to accord well with its centrality to the prime institutional purpose of educating students; whilst accepting that specific roles and responsibilities of program directors vary throughout the sector (for example, some have budgetary and line management responsibilities), current descriptors suggest the importance and centrality of function remains (namely, academic leadership, curriculum innovation, and accountability for the delivery and quality of program). (p. 15)

Bradley et al. (1992) found that the leadership style of the program director and the support from administration play a crucial role in the program directors' decisions for the well-being and growth of the program. Without substantial support from administration of the decisions of the program director, little to no growth will occur. In many situations, the program director is the face of the program (Shaver, 2003). He or she is responsible for all decisions, including the admissions process (Shaver, 2003). When the

program director does not have the support of the administration or other representatives to whom he or she answers, issues may become confounded (Bradley et al., 1992). As the program director manages the multiple needs of stakeholders, including students, communities, and potential employers of program graduates, faculty, prospective students, and various accreditation agencies, the lack of a cohesive strategic plan toward a shared mission can gravely impact a program when committees and leadership disagree on key components of program success (Bradley et al., 1992).

According to McKimm (2004), determining the way academic staff and senior university administrators view the leadership role of program directors; the program directors' perceptions of their role; and, perhaps most important, the factors that determine credibility emerges as a critical factor for clarification and, when combined, form the premise upon which this study was conducted. Program directors of allied health career fields play an integral part within higher education, the community at large, and the field of healthcare. They need to, not only have a clear understanding of their role, but also have the support of administration when making decisions. Networking and research are key for program success, and the ability to disseminate the information to key stakeholders also is important.

Admissions Committees

According to Agho et al. (1998), numerous allied health programs select their cohorts with the help of an admissions committee. The goal of the committee is to identify and select students with the academic skills and personal backgrounds necessary to successfully complete the degree requirements and to make meaningful contributions to the field. Nayer (1992) stated that:

the purpose of the admission procedures is to select students who will complete the educational program and go into professional careers, do well in the program, perform creditably in professional practice and possess the traits of character and ethical values desired of a professional person. (p. 41)

DeAngelis (2003) asserted that the path that eventually leads to becoming a radiographer begins with an admissions committee. When selecting students, the committee is charged with focusing on applicants who are considered the most qualified academically (Kavannah, 1981). A common question that guides admissions committees is: Who exhibits the greatest probability of success in the program? Success is not limited to only academics, but it also is the applicant's ability to pass the particular national board/licensure examinations and to be hired in his or her profession (DeAngelis, 2003; Goho & Blackman, 2006). All of these outcomes impact the long-term success, accreditation, and reputation of the Radiography program.

Kavannah (1981) stated that admissions committees usually are composed of various individuals within the college and clinical settings. Those selected should have insight into the career field and can objectively judge the applicants (Goho & Blackman, 2006). Only a limited number are selected to attend the Radiography program, and the burden of that selection is generally placed on the admissions committee (DeAngelis, 2003). Program directors are considered gatekeepers of the profession; thus, it is imperative that the admissions committee works closely with the program director (Espen et al., 2006)

Key factors that must be considered when accepting students include the ability of the candidate to learn and execute new skills, in addition to personality traits that are

key in the medical field (Roberts, 2014). The aforementioned attributes are crucial when the committee narrows the pool of applicants from 120 to only 15 to 20 who are accepted (Kudlas, 2006). Thus, the committee is responsible for choosing students who demonstrate the greatest potential for success and can be successful practitioners (Kavannagh, 1981).

Determining those who are allowed to attend allied health programs is a daunting task for program directors and admissions committees. Allied health education program directors often must deal with selective admissions policies that result in large numbers of rejected applicants (Kern, 2011). Decisions on criteria to be used and its rank in the decision process have come to “depend upon selection and guidance techniques that maximize descriptive impartially and minimize prescriptive implications” (Fishman, 1992, p. 668). Although the challenge to identify successful students can be complicated due to the limited student capacity set by accreditation agencies and the availability of clinical sites, it becomes imperative that the admissions committee identify factors and seek students with the potential for success in these smaller programs.

Lack of Research

An abundance of research has focused on selective admissions within allied health programs, including nursing, athletic training, dental hygiene, occupational therapy, respiratory care, and midwifery (Agho et al., 1998; Baker, 1994; Ehrenfeld et al., 1997; Hughes, 2013; Johnson et al., 2009; Kenny, 2010; O'Donoghue, 2008; Standridge et al., 1997). Despite varied and plentiful research in the allied health field, little has focused on admissions standards for Radiography programs. The sparse literature that exists has clearly demonstrated that undergraduate diagnostic radiology education,

curriculum, and pedagogy vary widely among disciplines and colleges within disciplines (Barlev, Lautin, Amis, & Lerner, 1994; Subramaniam & Gibson, 2007). Tay, Kamei, and Tan (2009) recently summarized the scarcity of literature that has addressed this issue with one concise statement: “Evidence-based radiology education and radiology education research are glaringly lacking” (p. 195).

Tay et al. (2009) noted that selective admissions within Radiography relies heavily on research that has been utilized for other allied health careers. Admissions criteria used by other programs as predictors of success cannot be generalized to Radiography programs, although they could have related value. In a study performed by Kavanagh (1981), cognitive factors of academic success were examined, and a high correlation was found between high school GPA and grades in the Radiography program. Kavanagh reported that the research findings were inconsistent with other related Radiography research. According to the JRCERT (n.d.), 484 certificate programs and 267 degree programs were available in 1985 for Radiography. Kwan et al. (2009) noted that far more certificate programs were available, and the programs did not require prerequisite classes prior to admission; therefore, these programs were forced to rely on high school GPA as a predictor of student success.

Clearly, the demand for radiographers and allied health professionals is directly aligned with the functions of higher education on multiple levels (admissions, retention, and financial) (Kenny, 2010). The resources to train these individuals are of high cost and limited access, yet are necessary in order to fulfill the demand for healthcare professionals to serve the communities for which these institutions of higher education strive to serve.

Radiography program directors face a lack of research that has focused on admissions criteria and retention of students admitted to Radiography selective admissions programs. While most studies have focused on retention of nursing students, minimal research is available to guide the admissions process for program directors (Espen et al., 2006). According to the JRCERT (n.d.), 70% of the accredited programs are associate's degree programs, and 6.79% are bachelor's degree programs, with 22.65% offering certificate programs.

Data provide a foundation for the critical elements appropriate for selective admissions processes. Hoad-Reddick and MacFarlane (1999) stated that the research examines the concept of selective admissions within allied health disciplines. However, this academic understanding of admissions factors on retention does not extend to the field of Radiography to the extent of other fields. No criterion is considered right or wrong, and often "represent conclusions which are at best non-conclusive and when more realistically evaluated, are actually quite biased" (p. 80).

Although research has examined the concept of selective admissions, the need to understand the importance of placing more emphasis on diversity when accepting a cohort of students also is lacking. As the population continues to become more diverse, it is important that the healthcare field also provide a diverse population to care for the patients. In a report by Sullivan (2004), educators were encouraged to closely examine diversity when selecting students and graduate a more diverse population of students, resulting in improved quality and access of healthcare for minority patients. This will provide a sounder and stronger healthcare system for all citizens. In addition, it will help to alter health policies that currently are more aligned to a population that is not diverse

and prepare a generation of healthcare professionals who are culturally dynamic and prepared to face the upcoming challenges of more diverse populations. Sullivan (2004) also stated that a more diverse population will provide additional individuals from diverse backgrounds to explore the issues that healthcare professionals encounter in various ways and to provide a different perspective of the problems.

As stated by Baldwin, Woods, and Simmons (2006), approximately 74% of higher education mission statements include some type of verbiage related to their pledge to diversity within the institution. However, a mere 33% of those institutions use race as a factor in their admissions process. Baldwin et al. also found that only 3% of allied healthcare programs have a statement that provides additional points in accepting students from a diverse background. As many programs deal with accrediting bodies, one must look toward them to provide a more diverse population of students being accepted. However, that is not the case, as programs are held to a standard in which students must pass state or national board exams. Thus, more programs look at high ACT or SAT scores and high overall GPAs when selecting students, therefore leaving a vast amount of minority students out of the equation.

In a study by Donini-Lenhoff and Brotherton (2010), little change was noted between a survey conducted in 1989 to 1990 and the same survey repeated in 2006 to 2007. The results revealed:

For the 1989–90 academic year, enrollments in 2,879 allied health educational programs included 63,366 whites (82.5%), 8,433 blacks (11.0%), 4,993 Hispanics (6.5%), and 2,931 Asians or Pacific Islanders. During the 2006–07 academic year, the percentage of black enrollees increased to 16.1% (10,110), to 8.7%

(5,492) for Hispanic enrollees, and to 4.4% (2,754) for Asian or Pacific Islander enrollees, out of 62,896 total. (pp. 104-105)

As the research has shown, this is an area that has been given inadequate attention when considering a selective admissions process. Although these students may require more help during the program, the benefit of providing a more diverse allied healthcare workforce is well worth the effort to explore this as part of the admissions process. Thus, the need for more research is evident as related to admissions criteria for Radiography programs. The reasons vary from government mandates on accountability to supplying an educated, diverse, and competent workforce that will care for the diverse aging population. This current study attempted to add to the lack of research for Radiography programs to utilize when selecting students for individual cohorts.

Conclusion

Student departure is viewed on a scale as a direct process seeking to determine predictors of affluence in order to avail individuals to prosper through to program completion within community college settings. The literature has demonstrated the complexity and the multifaceted nature of student retention in higher education institutions, to include allied health programs. The struggle to retain students in some states directly affects funding from federal and state government agencies, and this practice soon may occur in all states. In addition, low retention in Radiography programs affects the need for licensed competent healthcare workers in the United States. Healthcare is important, as it is integral to the economy and health of the aging population. However, it is evident that studies in healthcare associate's degree programs regarding persistence are limited within the broad range of student retention, particularly

within imaging science programs.

In this chapter, the literature provided a foundation on which to help the reader understand the available research on allied health selective admissions programs and the lack of research available for selective admissions Radiography programs. Clearly, a need exists for a better understanding of the criteria used in the selective admissions process in order that measures can be employed to improve retention rates and meet the forecasted demands for healthcare professionals. Much of the current research has focused on various other programs within the allied health field, although a void exists in the research for selective admissions Radiography programs.

This study focused on graduation rates in radiology technology programs within two- and four-year institutions. However, student attrition and retention models provided the basis for the overall study. The purpose of this research was to fill the void of information available to Radiography program directors and attempted to provide criteria to guide Radiography admissions committees with a better understanding of standards that are used by Radiography program administrators who appreciate higher graduation rates.

CHAPTER III: METHODOLOGY

Introduction

This chapter describes the methodology used to conduct this quantitative study and includes information about the population, instrument pilot testing, survey procedures, and data analysis. The intent of this study was to evaluate factors that may have had an impact on student graduation in allied health Radiography programs and that may predict higher graduation rates in two- and four-year Radiography programs. Additionally, factors were identified that could be utilized in a predictive model for student success prior to program admission.

Categorically, within traditional admissions criteria, the factors utilized were the impact of traditional admissions criteria, the use of GPA, the scale used for GPA, utilization of reference letters, criteria used for interviews, standardized and psychomotor tests used, in addition to the prerequisite classes that are required. For non-traditional admissions criteria, an examination was conducted relative to whether departmental observations were utilized and the prerequisite classes that were required.

The study sought to determine whether the variables previously listed can be utilized in the future selection process of students seeking admission to Radiography allied health programs. The study was designed to answer the following research questions:

1. No significant difference will be found in the number of traditional admissions criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.

2. No significant difference will be found in the number of specific GPAs selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.
3. No significant difference will be found in the number of reference letters selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.
4. No significant difference will be found in the number of interview criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.
5. No significant difference will be found in the number of standardized written instruments selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.
6. No significant difference will be found in the number of psychomotor tests selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.
7. No significant difference will be found in the number of non-traditional admissions criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.
8. No significant difference will be found in the number of departmental observations criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.

9. No significant difference will be found in the number of prerequisite classes required between programs with high graduation rates, moderate graduation rates, and low graduation rates.

Population

The population for this study included all Radiography program directors responsible for accredited programs in the United States and Puerto Rico ($N = 618$). All programs are required to maintain records on retention in accordance with the JRCERT (n.d.). A total of 737 Radiography programs are recognized by the ARRT, an organization that administers the National Board exam for graduates of Radiography programs and maintains the registry of all licensed radiographers. Of the 737 programs recognized by ARRT, 618 are programmatically accredited by the JRCERT. Of the 618 programs accredited, the institutions offer either an associate's degree, a bachelor's degree, or are considered certificate programs. It should be noted that, by 2015, all certificate programs had been mandated by the ARRT to convert their program to an associate's degree (ARRT, 2014).

The JRCERT was contacted to obtain a list of all accredited Radiography programs in the United States and Puerto Rico. The information, with program director names and both physical and email addresses, was the most recent and updated database for accredited Radiography programs, and included certificate programs, associate's degree programs, and bachelor's degree programs. From the list of programs, all populations were studied to include community colleges, hospital-based programs, and universities. The distribution list by state, level of institution, and degree awarded is

listed in Appendix A. Program success was defined as a student who entered the program and successfully graduated in two years from the start of the original cohort.

All participants were fully informed regarding the nature of the study and the possible risk involved. The nationwide study and consent was approved by the Western Kentucky University Institutional Review Board for Research Involving Human Subjects and the Kentucky Community and Technical College System Review Board. Participants were assured of confidentiality of all information obtained through the study.

Instrument Development

The sequence of defining the objectives, selecting a sample, choosing or developing a questionnaire, preparing a letter of explanation, and establishing dates and acceptable methods of gathering data followed the guidelines outlined by Creswell (2008). The value of a well-developed instrument is vital to the success of a quantitative study; therefore, tools were utilized that had been tested for key attributes such as reliability and validity. For the purpose of this research, the instrument was patterned after research studies performed by Semler (2001) and Fehrenbach (1999) in the realm of dental hygiene. The process of identifying the instrument, modifying the tool, and gathering initial data is discussed in the next section.

Semler patterned a study in 2001 based on a previous study conducted by Fehrenbach in 1999. Semler's study was distributed to 256 accredited dental hygiene programs in the United States. Although it focused on dental hygiene programs, it was the foundation for the current study on accredited Radiography programs. Semler's study disseminated the traditional criteria and procedures, such as prerequisite GPA, references, interviews, prerequisite science GPA, and both standardized and psychomotor tests that

are used for selection into accredited dental hygiene programs. In Semler's study, a consistent positive correlation was noted between prerequisite GPA, science GPA, references, and writing skills. Positive correlations were the same for prerequisite courses in anatomy and physiology, microbiology, chemistry, English, and psychology. In addition, Semler found that programs that accepted students on a first-come, first served basis showed a correlation between chronological program acceptance and improved retention rates.

The survey instrument was formatted to serve the needs of this research study. The questions were evaluated and modified to reflect the common standards used in selecting students in two- and four-year Radiography programs (Clark & Sharf, 1983; Cohen & Brawer, 1996; Drees, 2006; Geiser, 2008; Oja, 2012; Ramineni, 2012; Sparkman, Maulding, & Roberts, 2012). After several unsuccessful attempts to contact Semler for permission to use and adapt the survey tool, the researcher contacted Fehrenbach (1999), the original developer of the instrument modified by Semler (2001). Contact was established via email, and consent was granted from Fehrenbach for the tool to be used with modifications (Appendix B).

The questionnaire consisted of three sections. Section one was comprised of questions related to demographics and characteristics of the program, to include:

- Person reporting information
- Highest degree awarded by institution
- Entry level curriculum setting of program
- Applicant pool
- Number of students selected each year

Section two included admission criteria utilized by various two- and four-year programs when selecting students, to include:

- Traditional admission criteria
 - GPAs utilized
 - Reference letters
 - Interviews
 - Standardized test
 - Psychomotor test
- Non-traditional criteria
 - Department observation
 - Number of hours
 - Exams
 - Prerequisite classes required for degree completion

Section three included institutional characteristics, to include:

- Number of students accepted for each cohort
- Number of students who graduated from the cohort to which they were accepted
- Number of students who took the ARRT exam from each cohort
- Number of students who passed the ARRT exam on first attempt
 - Number of students who passed the ARRT exam on the second attempt
 - Number of students who passed the ARRT exam on the third attempt

The complete survey instrument can be found in Appendix C.

The survey was launched via email; therefore, it was important to determine a platform that would be best suited for the research. After an extensive review of the various survey platforms, Qualtrics was determined to be the most appropriate platform. In addition to the ease of use, the ability to collect data from multiple sources and the ability to make adjustments to the instrument made Qualtrics an obvious choice.

Pilot Study

The pilot study was distributed to accredited Radiography program directors in the Commonwealth of Kentucky. Currently, 15 Radiography programs exist within the state. Of those, one currently has had its accreditation suspended, two were at proprietary schools, two were housed within universities, and 10 of the remaining 15 were housed within the KCTCS system. For a listing of Kentucky Radiography programs accredited by the JRCERT, see Table 1.

An application requesting permission from the Kentucky Community and Technical College System (KCTCS) Internal Review Board (IRB) was obtained prior to the pilot study (Appendix D). The approval form will be on file with the data for a period of no fewer than five years after the completion of the study.

Fourteen surveys were sent, with a response rate of 71.4%. After evaluating the goal of the study and the responses, the researcher determined that the study would be better served if three questions were modified. Further, the format of questions 9, 10, 11, 12, 13, 14, 17, 18, 19, 20, and 23 were changed from “yes/no” to “select all that apply.”

Table 1

Demographics of Radiography Programs in Kentucky

Program	Degree Awarded
Morehead State University	Associate Degree
Northern Kentucky University	Bachelor of Science
Spencerian College (Louisville)	Associate of Applied Science
Spencerian College (Lexington)	Associate of Applied Science
Bluegrass Community and Technical College	Associate of Applied Science
Madisonville Community College	Associate of Applied Science
Western Kentucky Community and Technical College	Associate of Applied Science
Elizabethtown Community and Technical College	Associate of Applied Science
Jefferson Community and Technical College	Associate of Applied Science
Somerset Community College	Associate of Applied Science
Southeast Community and Technical College	Associate of Applied Science
Southcentral Kentucky Community and Technical College	Associate of Applied Science
Owensboro Community and Technical College	Associate of Applied Science
Hazard Community and Technical College	Associate of Applied Science

Six program directors returned the pilot study. Due to the low response rate, a full survey test-retest could not be performed to estimate reliability. Cronbach's Alpha Coefficients were calculated on each of the 10 survey subscales using the returned survey results ($N = 226$). These results are reported in Table 2. Had the participation rate in the

pilot study been greater, survey items with poor coefficients could have been improved with additional pilot testing.

Table 2

Cronbach Coefficient Alpha Calculations for Survey Subscales

	Survey Scale	N Completing Scale	N Of Scale Items	Scale Alpha
Scale 1	Traditional Admission Criteria	226	12	0.285
Scale 2	Specific GPAs	226	4	0.379
Scale 3	Entry Level GPAs Required	226	3	*
Scale 4	Reference Letters	226	4	0.719
Scale 5	Interviews	226	8	0.962
Scale 6	Standardized Written Instruments	226	6	0.328
Scale 7	Psychomotor Test	226	3	0.043
Scale 8	Non-traditional Criteria	226	4	0.668
Scale 9	Departmental Observations	226	4	0.342
Scale 10	Prerequisite Classes	226	14	0.800

*Scale 3 insufficient responses to calculate

Ethical Considerations

Data collected for this research was on a voluntary basis. In accordance with the American Psychological Association (APA), the researcher was cognizant of "the welfare and protection of the individuals and groups" (APA, 2002, p. 3) who participated in the study. Additionally, guidelines established by the Internal Review Board were followed. The research will be secured for a period of no fewer than five years, after which the data

will be shredded and deleted.

Data Collection

An introduction email was sent to all program directors on the JRCERT list to explain the goal of the study and to encourage participation (Appendix D). The survey was launched three days subsequent to the introduction email. The questionnaire was loaded into Qualtrics, and a link to it was distributed by email to program directors. The email was formulated to include a consent form that communicated to participants that proceeding with the study was considered implied consent (Appendix E).

The goal of the study was to obtain a 30% response rate on the questionnaire. As there are more certificate and associate's level programs than bachelor's programs, it was determined that a balanced return from each academic level of achievement was not possible (i.e., associate's, bachelor's, and certificate programs) (see Appendix A).

The survey remained open for a period of three weeks. After the first week, a reminder email was sent to all participants encouraging completion of the survey. The researcher waited an additional week and initiated reminders within a network of program directors encouraging them to support peers in completing the survey, providing potentially valuable information for the profession.

Upon completion of the research, all participants were given the opportunity to provide their email address if they desired a copy of the analysis and conclusions derived from the data. Of the participants, 42.32% requested the analysis and conclusion once the study was completed.

Design and Statistics

Johnson and Christensen (2008) suggested that, when using variables that are

cognizant to determine the future, it is termed prognostication. In this case, the objective was to predict the independent variables that were paramount prognosticators of an outcome (e.g., graduated/did not graduate) for allied healthcare Radiography students.

The goal of the study was to analyze the Admission Criteria Scales based upon graduation rates at each participating institution. The survey data were imported into the Statistical Analysis System (SAS) from the online survey platform.

In order to classify the data, two groups were formed: responses from both two-year and four-year programs. The data were further classified by graduation rates. For each program, the distribution of graduation rates was calculated. Of the 226 returned surveys, 221 had sufficient data for classification. The distribution for each group was then divided into three categories: upper third, middle third, and lower third. This categorization formed the classification variable for the ANOVAs to examine the survey scales for each response group for each research question. Table 3 displays the final configuration of the program and graduation rate clarifications.

Table 3

Graduation Grouping by Program Affiliation

Program Type	Graduation Group	<i>N</i>
Two-year	Low (0-77%)	60
	Moderate (78-87%)	56
	High (88-100%)	56
Total		172
Four-year	Low (0-79%)	16
	Moderate (80-89%)	16
	High (90-100%)	17
Total		49

Data Analysis

The data were analyzed using frequency distributions, measures of central tendency, and Analysis Of Variance (ANOVA).

Section one of the questionnaire provided the demographics of the individual programs reporting, which included:

- Title of person reporting the data
- Institution affiliation of the program
- Setting of the program
- Entry level curriculum
- How often are students admitted into the reporting program?
- How many candidates apply for each cohort?
- How many students are selected into each cohort?

Data from this section were analyzed using frequency distributions, means, and Analysis of Variance (ANOVA).

Section two of the questionnaire provided information on specific admission criteria used when accepting students. The admission criteria consisted of 10 scales:

- Scale 1: Traditional admission criteria (12 items)
- Scale 2: GPA used for admission criteria (4 items)
- Scale 3: Reference letters used admission criteria (5 items)
- Scale 4: Style of interviews used for admission criteria (9 items)
- Scale 5: Standardized written instruments used for admission criteria (6 items)
- Scale 6: Psychomotor tests used for admission criteria (2 items)

- Scale 7: Non-traditional admission criteria
- Scale 8: Criteria used for departmental observation
- Scale 9: Prerequisite classes required for entry level Radiography curriculum

This information was analyzed using a summary of means, standard deviations, and ANOVA. The principle analysis consisted of contrasting responses to each of the 10 survey scales by graduation rate (see Table 3) using ANOVA. This contrast provided a gauge of the effect of each admission criteria as a function of graduation rate and allowed the researcher to determine whether significant differences existed between the three graduation groupings and the number of admission criteria items used in each scale.

Section three of the questionnaire provided information on the institution characteristics of the reporting programs for 2012, 2013, and 2014, to include:

- Number of students who took the ARRT national board exam
- Number of graduates who passed the ARRT national board exam on their first attempt
- Number of graduates who passed the ARRT national board exam on their second attempt
- Number of students accepted into each cohort for 2012, 2013, and 2014
- Number of students who graduated from the respective cohort in 2012, 2013, and 2014

The researcher compiled the total accepted students vs. the total number of graduated students from cohort years 2012, 2013, and 2014 for all programs. Two-year and four-year programs were then differentiated from one another. For both two-year

and four-year programs, respectively, the data were listed in order from the highest to the lowest graduation rates. Each list was divided into thirds: high, moderate, and low graduation rates. Frequencies and descriptive statistics for all sample demographic information were utilized.

In this chapter, a review of the methodology was provided, from the inception of the researcher's desire to examine this area of academic inquiry to the development of a statistical plan of analyzing and reviewing the data in context to the Radiography program. Chapter IV reaches into the analysis of the data and provides insights to answering the research questions.

CHAPTER IV: RESULTS

Introduction

The purpose of this study was to examine the admissions criteria used by Radiography programs with low, moderate, and high graduation rates with more traditional and/or non-traditional criteria when accepting students into each cohort. This research was conducted to expand the knowledge and fill the gap for the lack of research focused on allied health Radiography programs. The results were based on the returned surveys with usable data ($N = 221$). This chapter presents the results of the study to allow a clear understanding of the variables that Radiography programs with high graduation rates utilize when accepting students into their programs.

The intent of this study was to evaluate factors that may impact student graduation in allied health Radiography programs and that may predict higher graduation rates in two- and four-year Radiography programs. Additionally, factors were identified that could be utilized in a model for student success prior to program admission. Categorically, within traditional admissions criteria, the factors utilized were the impact of traditional admissions criteria, the use of GPA, the scale used for GPA, utilization of reference letters, criteria used for interviews, standardized and psychomotor tests used, and prerequisite classes required. For non-traditional admissions criteria, the type of criteria was examined, that which was measured when departmental observations were used, and the prerequisite classes that were required for each program. The study sought to determine whether the variables can be utilized in the future selection process of students seeking education in Radiography allied health programs.

Methodology

The study utilized descriptive statistics, to include a summary of means, standard deviation, and Analysis of Variance (ANOVA). In order to find the differences between the variables used when selecting a cohort of students, and to relate those differences to programs with high graduation rates, it was determined that this method was appropriate.

Dependent Variables

The dependent variables were the 10 survey scales:

- Traditional admissions criteria (12 items)
- GPA used for admissions criteria (4 items)
- Reference letters used for admissions criteria (5 items)
- Style of interviews used for admissions criteria (9 items)
- Standardized written instrument used for admissions criteria (6 items)
- Psychomotor tests used for admissions criteria (2 items)
- Non-traditional admissions criteria
- Criteria used for departmental observations
- Prerequisite classes required for entry level Radiography curriculum

Independent Variables

The independent variables were the graduation rates from the 221 programs that submitted usable data. Graduation rates were calculated from questions 23.1 through 23.6. The participants were asked to indicate the number of students selected into each cohort for the years 2012, 2013, and 2014. They were then asked the number of students who graduated from each cohort for the years 2012, 2013, and 2014. Each set of

numbers was divided into either two-year or four-year programs. The numbers were then divided into three groups represented as high, moderate, and low graduation rates.

The data collected were analyzed using the Statistical Analysis System (SAS, 2014, SAS Institute, Gary, NC). This method was appropriate with one independent variable with multiple levels and more than one dependent variables. The alpha level established for all significance testing was 0.05.

Study Demographics

A total of 618 surveys were sent to Radiography programs accredited by the JRCERT. Of the 618 surveys sent to program directors, 410 were returned. After review of the data, it was determined that, if participants did not answer Question 4 asking about program affiliation, that data would not be used. Upon further investigation, some participants had not answered Question 37, which related to graduation data. Since this was the focus of the study, those surveys also were not utilized. Once this data were removed, as demonstrated by Table 3, the response rate was 35.7%, representing 77.83% of usable data for two-year programs and 22.17% representing four-year programs. Table 4 through 10 display the demographics of the institutions that participated in this study. Table 4 summarizes the school affiliation of the respondents.

Table 4

Survey Responses by Program Affiliation

Affiliation	Total Number of Programs Reporting	Percentage
Two-year	172	77.83%
Four-year	49	22.17 %
Total	221	100%

The program director is responsible for collecting and monitoring all data for the program. Table 5 illustrates that 97.67% of data for two-year programs, and 100% of the data for four-year programs, was reported. This related to 98.19% of the data on the survey tool being reported.

Table 5

Title of Person Responding to Questionnaire by Program Affiliation

Affiliation	Institution Dean or Director of Health Service	Radiography Program Director	Institution Admission Program Director	Total number of programs reporting
Two-year	3	168	1	172
Four-year	0	49	0	49
Total	3	217	1	221

Radiography programs can be housed in various intuitions. Table 6 represents the type of institution in which the programs were housed. Of the two-year programs, 17.44% were housed in a technical college, as opposed to 2.04% of four-year programs, for an overall total of 31 represented by technical colleges.

Ninety-two, or 53.48%, of the reporting participants representing two-year programs were reported as community college settings, and only three, or 6.12%, of four-year programs indicated affiliations with a community college. Thus, 95 programs were classified as community colleges.

Slightly over 1.16% (2 participants) of two-year programs were classified as allied health departments within universities, and 65.30% (32 participants) of four-year programs were classified as allied health departments within universities. Thus, 15.38% (34) of the participants represented programs housed within a university.

The last category was represented by stand-alone health occupations annex buildings and/or hospital-based programs. Of the two-year programs, 27.91% (48 participants) reported this type of setting, and 26.53 % (13 participants) of four-year programs reported affiliation with this type of setting, representing 27.60 (61 participants) of all participants.

Table 6

Setting of Program by Affiliation

Affiliation	Technical College	Community College	Allied Health Department at University	Other	Total number of programs reporting
Two-year	30	92	2	48	172
Four-year	1	3	32	13	49
Total	31	95	34	61	221

Note. The “Other” category consisted of private and affiliate institutions.

Table 7 demonstrates that the majority of Radiography programs participating in the study awarded an associate’s degree (73.75%). The next largest frequency was reported as other, representing hospital-based programs, junior colleges, or stand-alone institutions. This group comprised 12.22% of the total respondents. The lowest percentage was 6.78, which consisted of programs that stated they did not have an entry level curriculum to their Radiography program.

Table 7

Entry Level Curriculum by Program Affiliation

Affiliation	Two-year Associate's		Four-year Bachelor's		Does not have		Other		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>
Two-year	134	77.90	0	0.0	14	8.14	23	3.37	172
Four-year	29	58.18	15	30.61	1	2.04	4	8.16	49
Total	163	73.75	15	6.79	15	6.78	27	12.22	221

Note. "Other" category consisted of hospital-based programs, junior colleges, or stand-alone institutions.

The frequency by which a cohort of students is accepted was determined by three factors: the institution in which the program was housed, the program itself, and/or the current or projected market demand. Table 8 validates that the current market for radiographers was low, with 94.57% of the two- and four-year programs admitting only once per year. Of the participants who responded, less than 1% currently had open admissions for students.

Table 8

Frequency of Student Admitted by Program Affiliation

Affiliation	Once a Year		Bi-Annually		Open start date		Total
	<i>N</i>	%	<i>N</i>	%	<i>N</i>	%	<i>N</i>
Two-year	162	94.18	7	4.07	2	1.2	172
Four-year	47	95.92	1	2.04	0	0	49
Total	209	94.57	8	3.62	2	.99	221

Note. Open start date reflected that a student can begin the curriculum at any time.

Table 9 demonstrates the mean class size by institution, 19.47 for two-year programs and 23.55 for four-year programs, although two-year programs typically had smaller classes than four-year programs. The mean number of applicants ranged from 63.85, represented by four-year programs, to 76.37 for two-year programs. Overall, two-year programs had a higher number of students applying each year than four-year programs.

Table 9

Number of Students Applying, Admitted, and Percent Admitted by Program Affiliation

Affiliation	2012			2013			2014		
	<i>N</i>	<i>N</i>	%	<i>N</i>	<i>N</i>	%	<i>N</i>	<i>N</i>	%
	<u>Appl</u>	<u>Admit</u>	<u>Admit</u>	<u>Appl</u>	<u>Admit</u>	<u>Admit</u>	<u>Appl</u>	<u>Admit</u>	<u>Admit</u>
Two-year	12,093	3,296	27	11,754	3,304	28	11,123	3,270	29
Four-year	3,115	1,154	37	3,092	1,126	36	3,001	1,121	37
Total	15,208	4,450	29	14,846	4,430	30	14,124	4,391	31

Note. The table represents the number of students that applied each year and corresponds with the number of students accepted into each cohort.

Table 10 represents the graduation rate for a period of three years in relation to two- and four-year programs. The data were analyzed using descriptive statistics with Analysis of Variance. In Question 37, the participants were asked the number of students they had accepted into each cohort for three consecutive years. Within the same question, participants also were asked the number of students who graduated from each designated cohort two years after being accepted into the program. The mean graduation rate was calculated, although all numbers reported were charted for two-year and four-

year programs, respectively. These numbers were then charted in descending order. The numbers provided a graduation range for two-year programs of 33.90 to 100, and 60.42 to 100 for four-year programs. The programs were divided into three categories. For two-year programs, the high ranged from 87.50 to 100, the medium ranged from 87.10 to 77.94, and the low ranged from 77.78 to 33.90. Respectively, four-year programs were grouped using the same format, with the high being 90.28 to 100, medium from 88.37 to 80.00, and low denoted as 79.49 to 60.42. Thus, the results were referenced to graduation and delineated as either low, medium, or high.

Table 10

Average Graduation Rate by Program Affiliation

Affiliation	Graduation rate for 2012	Graduation rate for 2013	Graduation rate for 2014	Total Graduation rate	Total number of programs reporting
	Mean	Mean	Mean	Mean	Total
Two-year	81.40	80.50	80.70	81.06	172
Four-year	82.50	83.40	83.06	83.24	49
Total	81.64	81.07	81.22	81.54	221

Note. The table represents the graduation rate for students admitted into each cohort. The groups represent two- and four-year Radiography programs.

Demographic Summary

The demographics of the programs that provided usable data revealed that 77.83 were two-year programs, whereas 22.17 were four-year programs. Of those responding, 217 program directors completed the survey.

A total of 92 programs were affiliated with community colleges, and 32 were considered allied health departments within a university setting. The entry level curriculum revealed that 77.90% awarded an associate's degree, whereas 30.61%

awarded a bachelor's degree at the completion of the program. However, both two- and four-year programs demonstrated that they admitted students only once per year, for an overall average of 94.57% of programs reporting. As stated earlier, most Radiography programs were housed within community colleges; therefore, a higher number of two-year programs were expected to respond to the survey.

For the programs that provided usable data, two-year programs had the largest pool of applicants in 2013, with a total of 3,304, while four-year programs had the highest applicant pool in 2012, with 1,154 students. Conversely, the mean graduation rate for two-year programs was 81.40 in 2012 and 83.40 in 2013 for four-year programs. The following research questions guided the study.

Research Question Findings

***RQ1:** No significant difference will be found in the number of traditional admissions criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.*

To address RQ1, a one-way ANOVA was performed. The results indicated a significant difference for only the two-year Radiography programs, $F(2,165) = 14.55$, $p < .0001$. Table 11 summarizes the results for RQ1.

For two-year programs, Tukey's Post Hoc test revealed that a significant difference existed between the high and moderate graduation groups, as well as between the high and low graduation groups. The high graduation group utilized significantly more traditional admissions criteria.

Table 11

Average Number of Traditional Admissions Criteria Items Utilized by Two- and Four-Year Radiography Program Affiliated, by Graduation Rate

Program Type	Graduation Rate	N	M	SD	Post Hoc Grouping
Two-year	Low (0-77%)	56	3.51	1.65	A
	Moderate (78-87%)	55	3.87	1.50	A
	High (88-100%)	57	5.03	1.53	B
Four-year	Low (0-79%)	16	3.68	1.25	n/a
	Moderate (80-89%)	16	3.93	1.34	n/a
	High (90-100%)	17	4.64	0.99	n/a

Note. For Post Hoc Grouping, means with the same letter, within the same program type were not significantly different.

Figure 1a and 1b report the percentage of programs selecting specific admissions criteria by their graduation rate grouping. As shown in Figure 1a, high graduating two-year programs utilized nearly double the reference letters and interviews, as opposed to the moderate to low graduating programs. Figure 1b demonstrates that four-year programs with high graduation rates used interviews nearly twice as much as programs with low to moderate rates.

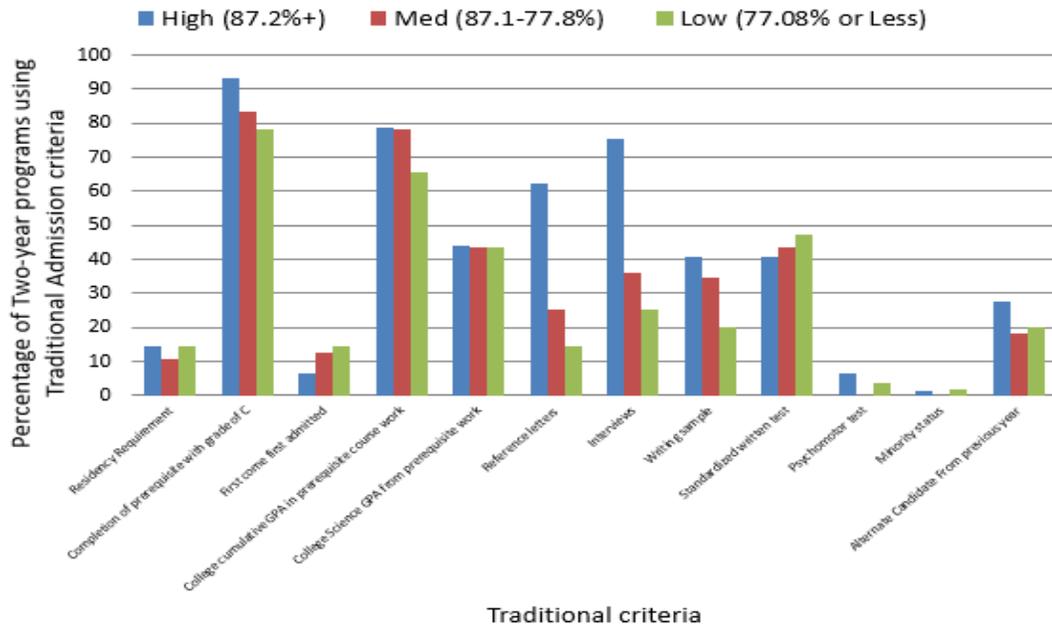


Figure 1a. Percentage of schools using traditional admissions criteria by graduation rate grouping two-year programs ($N = 172$).

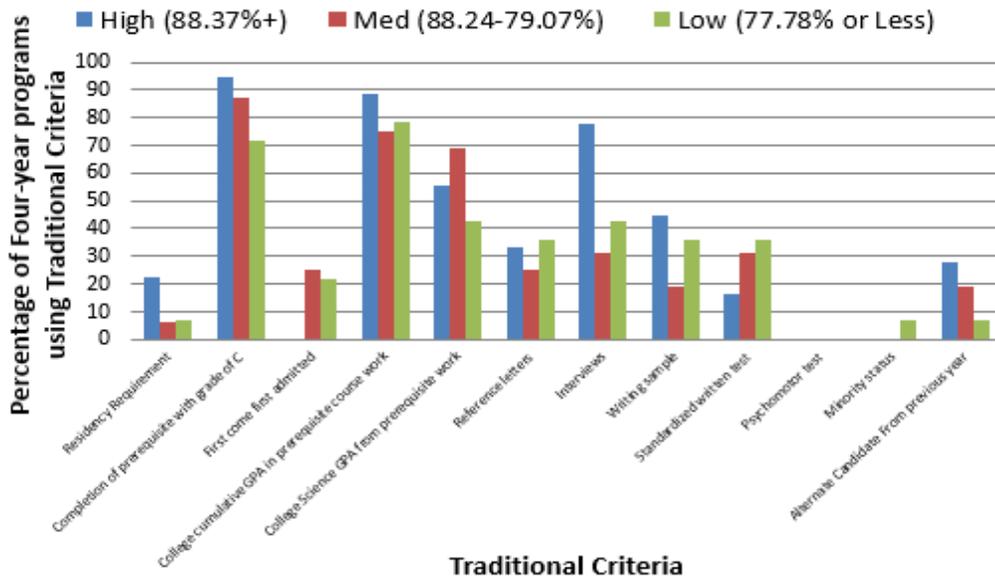


Figure 1b. Percentage of schools using traditional admissions criteria by graduation rate grouping four-year programs ($N = 49$).

RQ2: *No significant difference will be found in the number of specific GPAs selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.*

To address RQ2, a one-way ANOVA was performed. The results indicated a significant difference for only the two-year Radiography programs, $F(2,165) = 4.31$, $p = 0.0150$. Table 12 summarizes the results for RQ2.

For two-year programs, Tukey's Post Hoc test revealed that a significant difference existed between the high graduation and moderate graduation groups, as well as between the high and low graduation groups. The high group utilized significantly more traditional admissions criteria.

Table 12

Type of GPA used for Admission Criteria by Two- and Four-year Radiography Program Affiliated, by Graduation Rate

Program Type	Graduation Group	<i>N</i>	<i>M</i>	<i>SD</i>	Post Hoc Grouping
Two-year	Low (0-77%)	56	1.32	1.04	A
	Moderate (78-87%)	55	1.32	0.94	A
	High (88-100%)	57	1.82	1.13	B
Four-year	Low (0-79%)	16	2.0	1.21	n/a
	Moderate (80-89%)	16	2.0	0.81	n/a
	High (90-100%)	17	1.64	0.86	n/a

Note. For Post Hoc Grouping, means with the same letter within the same program type were not significantly different.

Figures 2a and 2b report the percentage of programs selecting specific GPAs utilized by their graduation rate grouping. As shown in Figure 2a, high graduating programs utilized math and science GPAs both in high school and college more often, whereas Figure 2b demonstrates that four-year programs utilized college math and science GPAs more often between programs with high graduation rates, moderate graduation rates, and low graduation rates.

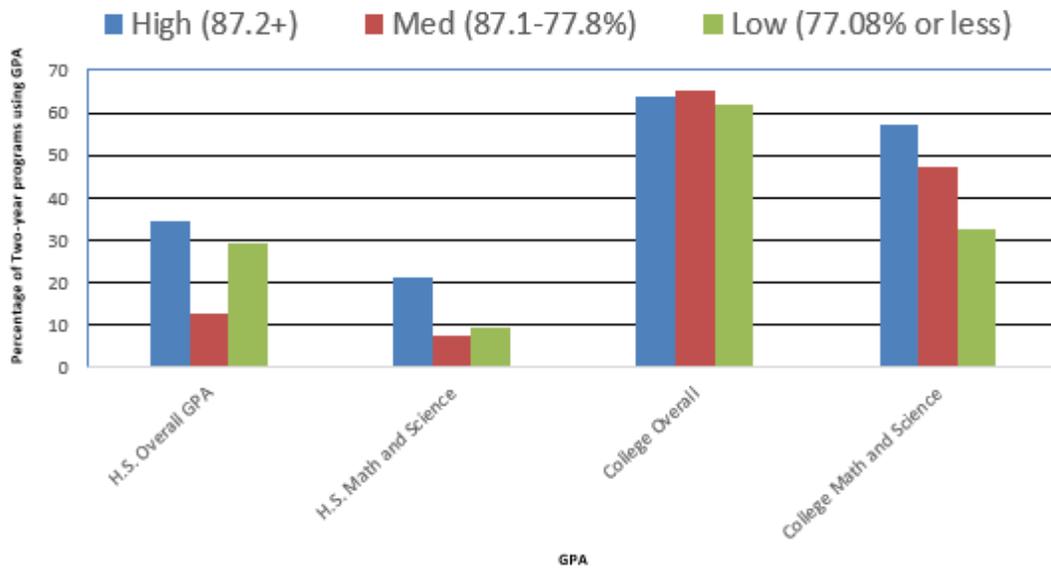


Figure 2a. GPA used for admission criteria by graduation groups by graduation rate grouping at two-year programs ($N = 49$).

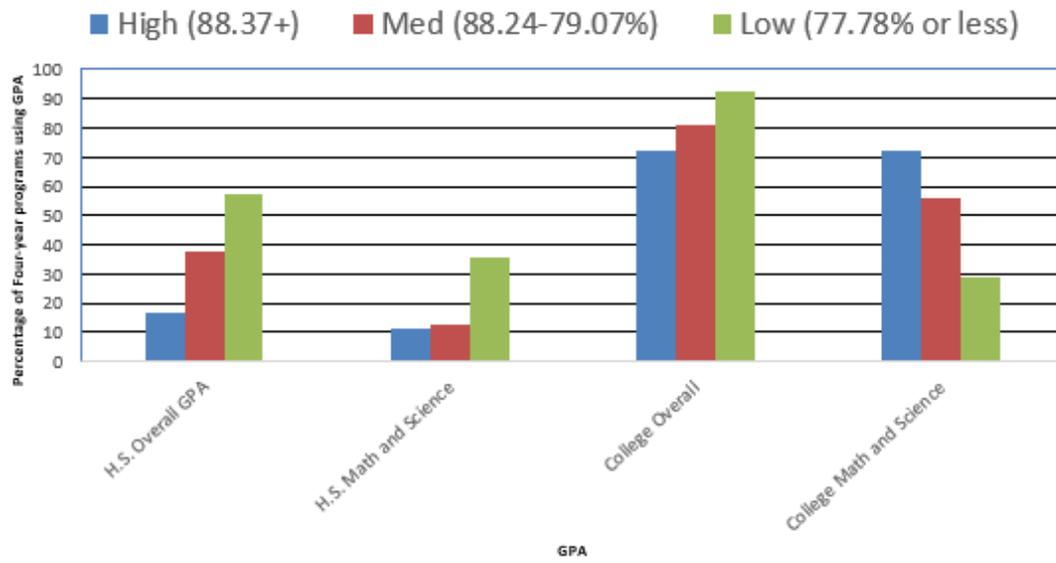


Figure 2b. GPA used for admission criteria by graduation groups by graduation rate grouping at four-year programs ($N = 49$).

To address RQ3, a one-way ANOVA was performed. The results indicated a significant difference for only the two-year Radiography programs, $F(2,165) = 13.13$, $p < .0001$. Table 13 summarizes the results for RQ3.

For two-year programs, Tukey's Post Hoc test revealed that a significant difference existed between the high graduation and moderate graduation groups, as well as between the high graduation and low graduation groups. The high group utilized significantly more reference letters.

Table 13

Type of Reference Letters used for Admissions criteria by Two- and Four-Year Radiography Programs Affiliated, by Graduation Rate

Program Type	Graduation Group	<i>N</i>	<i>M</i>	<i>SD</i>	Post Hoc Grouping
Two-year	Low (0-77%)	56	0.17	0.50	A
	Moderate (78-87%)	55	0.38	0.84	A
	High (88-100%)	57	1.01	1.21	B
Four-year	Low (0-79%)	16	0.56	1.09	n/a
	Moderate (80-89%)	16	0.25	0.68	n/a
	High (90-100%)	17	0.70	1.10	n/a

Note. For Post Hoc Grouping, means with the same letter within the same program type were not significantly different.

Figures 3a and 3b report the percentage of programs utilizing reference letters as part of their admissions criteria by their graduation rate grouping. As shown in Figure 3a, high graduating two-year programs utilized character, employment, and educational reference letters twice as often as moderate to low graduating programs. Figure 3b demonstrates that four-year programs with high graduation rates used the same type of reference letters as two-year programs.

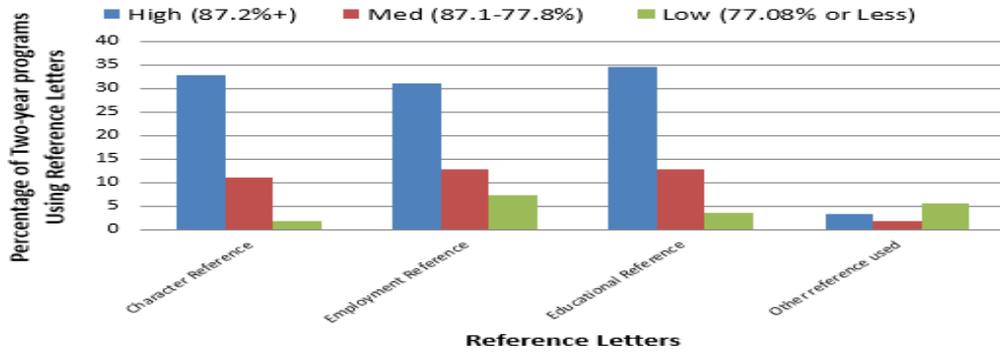


Figure 3a. Reference letters by graduation rate grouping two-year programs (N = 172).

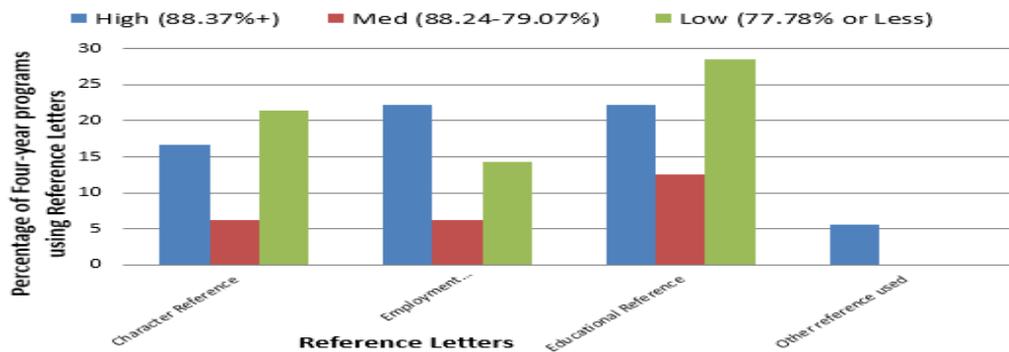


Figure 3b. Reference letters by graduation rate grouping four-year programs (N = 49).

RQ4: *No significant difference will be found in the number of interview criteria selected*

To address RQ4, a one-way ANOVA was performed. The results indicated a significant difference for two-year radiography programs, $F(2, 165) = 23.56, p < .0001$; and four-year programs $F(2, 46) = 4.00, p = 0.0251$. Table 14 summarizes the results for RQ4.

For two-year programs, Tukey's Post Hoc test revealed a significant difference between the high graduation and moderate graduation groups, as well as the high and low graduation groups. The high graduation group utilized interviews significantly more often.

For four-year programs, Tukey's Post Hoc test revealed a significant difference between the high graduation and moderate graduation groups. However, no difference

was noted between low and moderate and low and high graduation groups utilizing interviews significantly more.

Figures 4a and 4b report the percentage of programs utilizing interviews as part of their admissions process by graduation rate grouping. As shown in Figure 4a, high graduating two-year programs utilized all criteria in interviews. Figure 4b also demonstrated the same results for four-year programs with high graduation rates.

Table 14

Interviews Utilized by Two- and Four-year Radiography Programs Affiliated, by Graduation Rate

Program Type	Graduation Group	<i>N</i>	<i>M</i>	<i>SD</i>	Post Hoc Grouping
Two-year	Low (0-77%)	56	1.53	1.53	A
	Moderate (78-87%)	55	2.30	3.32	A
	High (88-100%)	57	5.31	3.18	B
Four-year	Low (0-79%)	16	2.31	3.43	AB
	Moderate (80-89%)	16	2.00	3.01	A
	High (90-100%)	17	4.88	3.21	B

Note. For Post Hoc Grouping, means with the same letter, within the same program type were not significantly different.

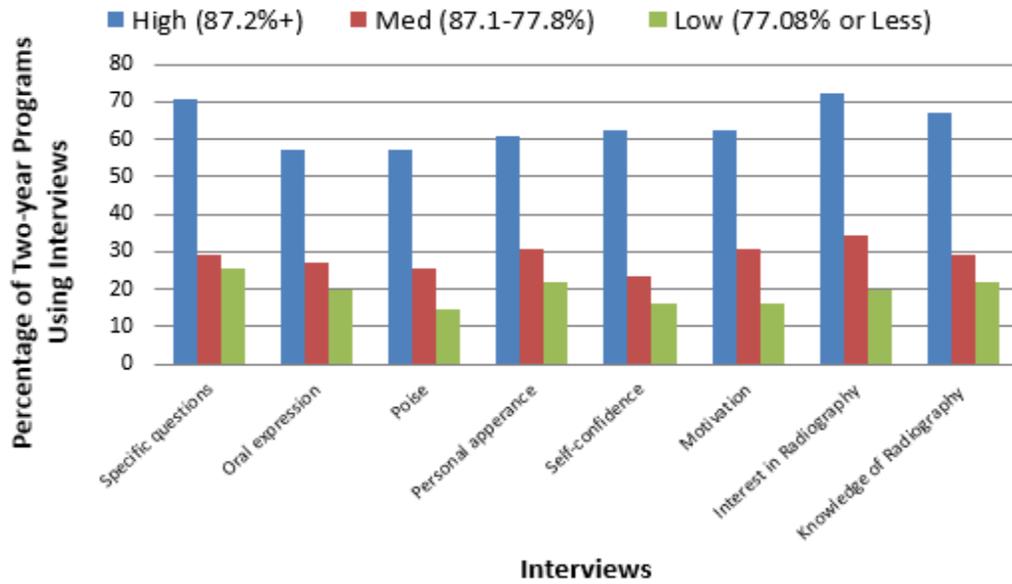


Figure 4a: Interview criteria by graduation rate grouping two-year programs ($N = 172$).

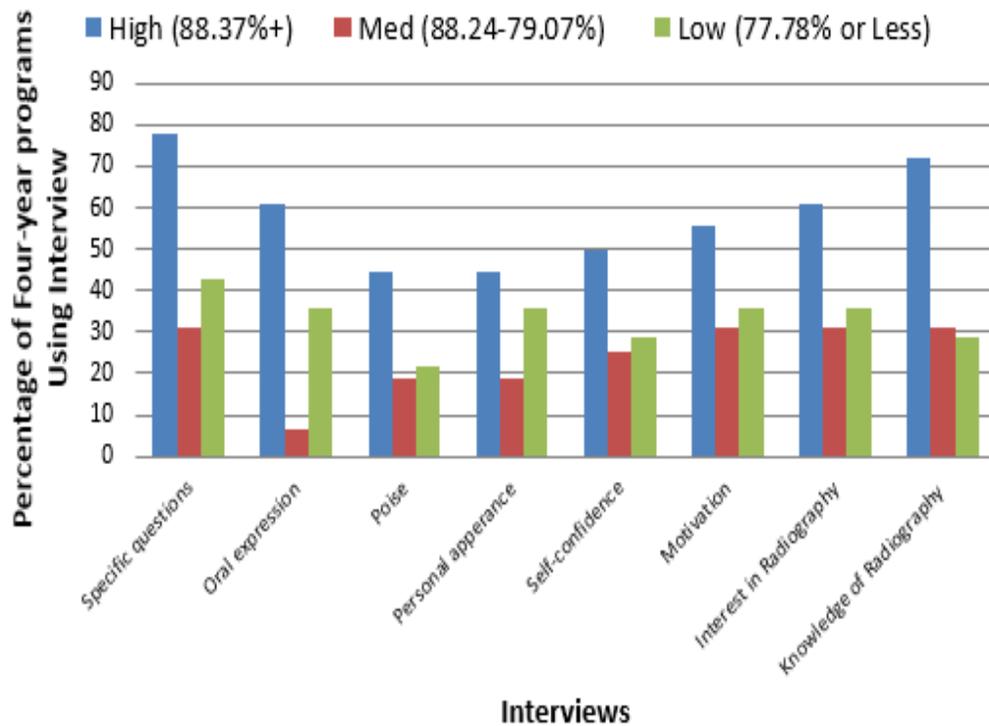


Figure 4b: Interview criteria by graduation rate grouping four-year programs ($N = 49$).

RQ5: *No significant difference will be found in the number of standardized written instruments selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.*

To address RQ5, a one-way ANOVA was performed. The results indicated no significant difference between two-year programs with high graduation rates and four-year programs with high graduation rates. Table 15 summarizes the results for RQ5.

Table 15

Standardized Tests Utilized by Two- and Four-year Radiography Programs Affiliated, by Graduation Rate

Program Type	Graduation Group	N	M	SD	Post Hoc Grouping
Two-year	Low (0-77%)	56	0.64	0.72	n/a
	Moderate (78-87%)	55	0.85	1.06	n/a
	High (88-100%)	57	0.75	0.98	n/a
Four-year	Low (0-79%)	16	0.81	0.91	n/a
	Moderate (80-89%)	16	0.56	0.89	n/a
	High (90-100%)	17	0.29	0.68	n/a

Note. For Post Hoc Grouping, means with the same letter, within the same program type were not significantly different.

Figures 5a and 5b report the standardized tests utilized by the percentage of programs by their graduation rate grouping. As shown in Figure 5a, two-year programs

in all three graduation rates utilized ACT tests more often, whereas Figure 5b shows that four-year programs with moderate graduation rates tended to use ACT and SAT tests more often.

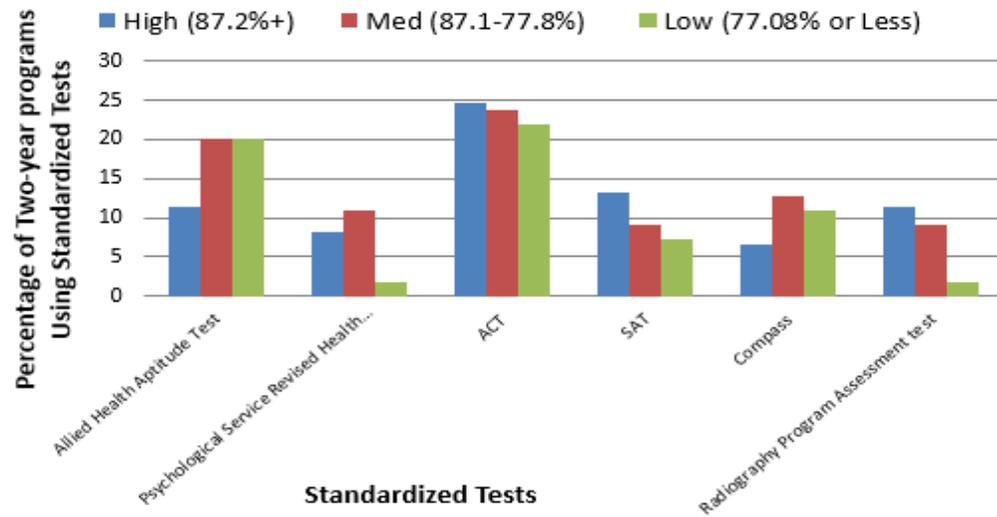


Figure 5a. Standardized tests by graduation rate grouping two-year programs ($N = 172$).

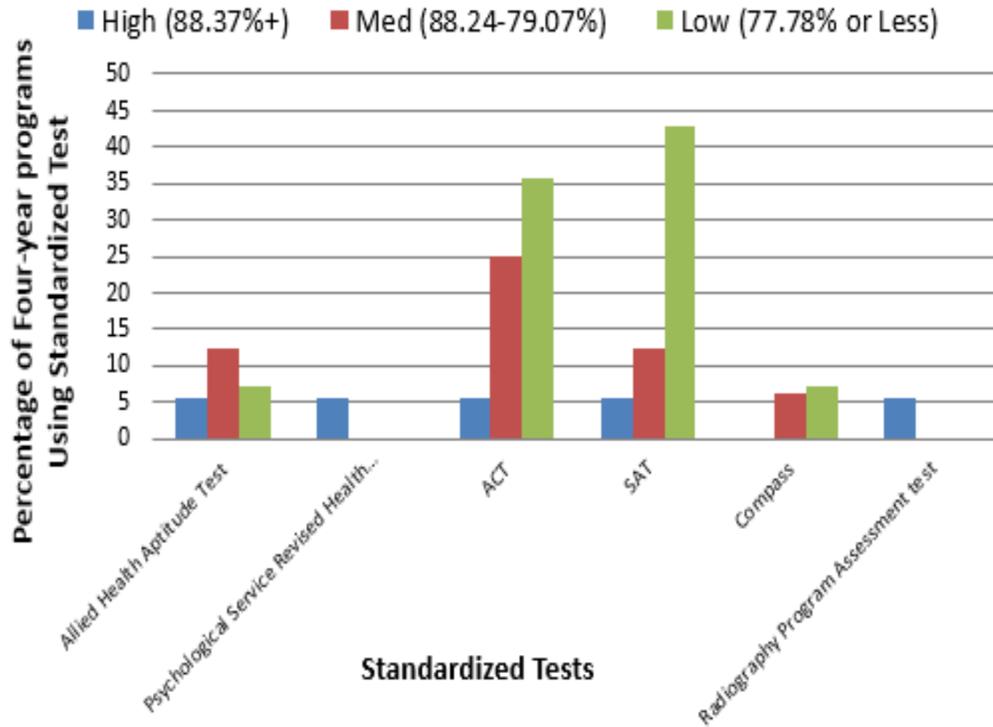


Figure 5b. Standardized tests by graduation rate grouping four-year programs ($N = 49$).

RQ6: *No significant difference will be found in the number of psychomotor tests selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.*

To address RQ6, a one-way ANOVA was performed. The results indicated no significant difference between two-year programs with high graduation rates and four-year programs with high graduation rates. Table 16 summarizes the results for RQ6.

Table 16

Psychomotor Tests Utilized by Two- and Four-year Radiography Programs Affiliated, by Graduation Rate

Program Type	Graduation Group	<i>N</i>	<i>M</i>	<i>SD</i>	Post Hoc Grouping
Two-year	Low (0-77%)	56	0.05	0.22	n/a
	Moderate (78-87%)	55	0.03	0.18	n/a
	High (88-100%)	57	0.05	0.22	n/a
Four-year	Low (0-79%)	16	0.00	0.00	n/a
	Moderate (80-89%)	16	0.06	0.25	n/a
	High (90-100%)	17	0.05	0.24	n/a

Note. For Post Hoc Grouping, means with the same letter, within the same program type were not significantly different.

Figures 6a and 6b report the psychomotor tests utilized by the percentage of programs by their graduation rate grouping. As shown in Figure 6a, two-year programs in all high graduation rates utilized spatial relations tests and/or aptitude tests, whereas Figure 6b shows that four-year programs with high graduation rates used the other category that consisted of the Hobet test, Technical Standard Test, and/or clinical skills with observation on the extent to which the student can perform specific tasks.

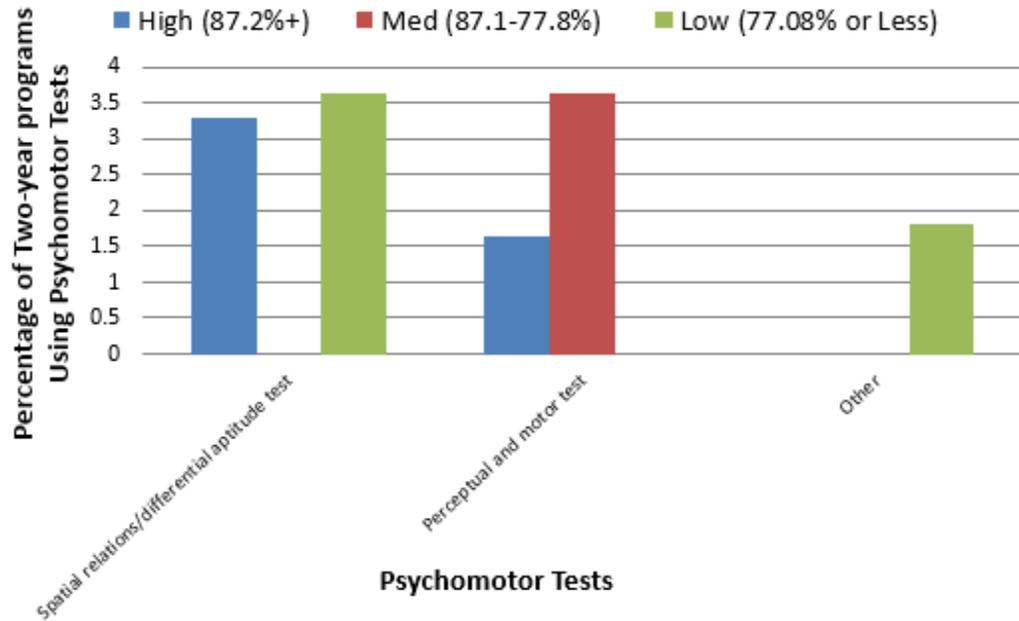


Figure 6a. Psychomotor tests by graduation rate grouping two-year programs ($N = 172$).

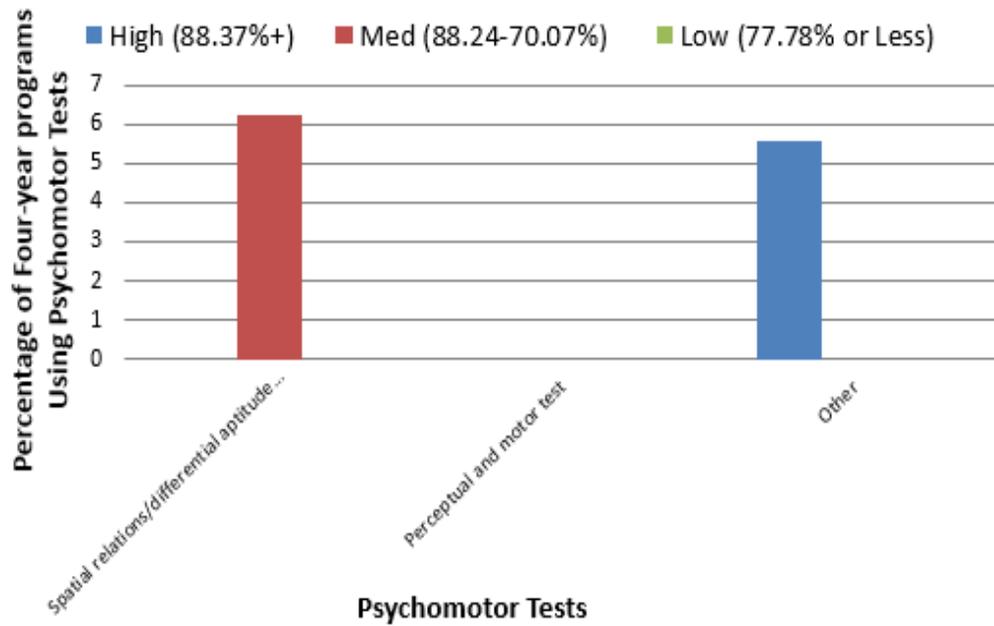


Figure 6b. Psychomotor tests by graduation rate grouping four-year programs ($N = 49$).

RQ7: *No significant difference will be found in the number of non-traditional admissions criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.*

To address RQ7, a one-way ANOVA was performed. The results indicated a significant difference for only the two-year Radiography programs, $F(2,165) = 3.95$, $p = 0.0212$. Table 17 summarizes the results for RQ7.

For two-year programs, Tukey’s Post Hoc test revealed a significant difference between the high and moderate graduation groups, as well as between the high and low graduation groups. The high group utilized significantly more non-traditional admissions criteria.

Table 17

Number of Non-traditional Admissions Criteria items Utilized by Two- and Four-Year Radiography Programs Affiliation, by Graduation Rate

Program Type	Graduation Group	<i>N</i>	<i>M</i>	<i>SD</i>	Post Hoc Grouping
Two-year	Low (0-77%)	56	0.73	1.19	A
	Moderate (78-87%)	55	1.10	1.21	A
	High (88-100%)	57	1.35	1.12	B
Four-year	Low (0-79%)	16	0.43	1.03	n/a
	Moderate (80-89%)	16	0.75	0.85	n/a
	High (90-100%)	17	1.05	1.19	n/a

Note. For Post Hoc Grouping, means with the same letter, within the same program type were not significantly different.

Figures 7a and 7b report the percentage of programs selecting specific non-traditional admissions criteria by their graduation rate grouping. As shown in Figure 7b, high graduating four-year programs utilized Radiography department observations nearly a third more often than moderate to low graduating programs.

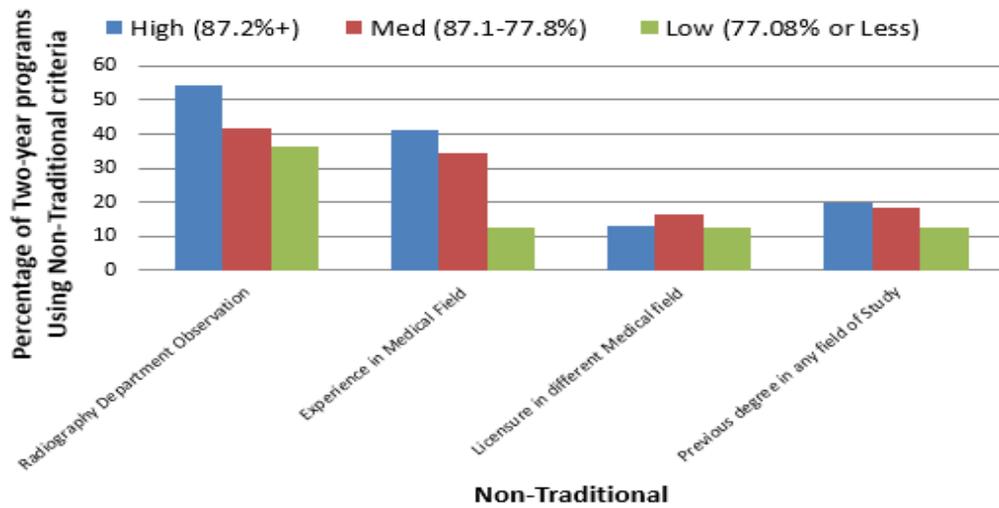


Figure 7a. Non-Traditional criteria by graduation rate grouping two-year programs (N = 172).

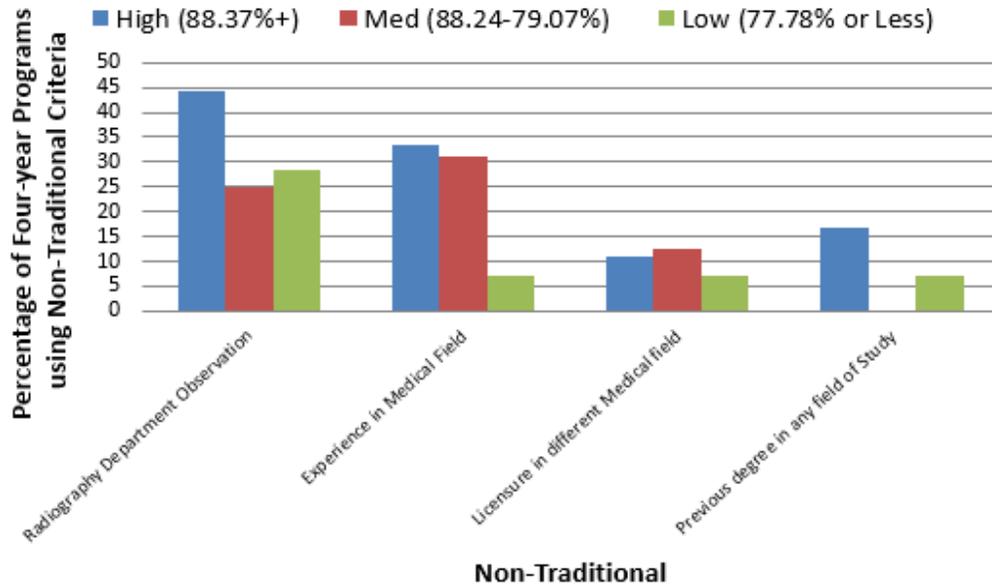


Figure 7b. Non-Traditional criteria by graduation rate grouping four-year programs ($N = 49$).

RQ8: *No significant difference will be found in the number of departmental observations criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.*

To address RQ8, a one-way ANOVA was performed. The results indicated no significant difference between two-year Radiography programs with high graduation rates and four-year Radiography programs with high graduation rates. Table 18 summarizes the results for RQ8.

Table 18

Radiography Department Observations Scoring Utilized By Two and Four-Year Radiography Programs Affiliation, by Graduation Rate

Program Type	Graduation Group	N	M	SD	Post Hoc Grouping
	Low (0-77%)	56	0.57	0.75	n/a
Two-year	Moderate (78-87%)	55	0.49	0.71	n/a
	High (88-100%)	57	0.70	0.86	n/a
	Low (0-79%)	16	0.43	0.72	n/a
Four-year	Moderate (80-89%)	16	0.37	0.61	n/a
	High (90-100%)	17	0.82	0.88	n/a

Note. For Post Hoc Grouping, means with the same letter within the same program type were not significantly different.

Figures 8a and 8b report that which is evaluated when students conduct department observations by the percentage of programs by their graduation rate grouping. As shown in both Figures, two-year and four-year programs with high graduation rates included the number of hours observed and Radiography personnel evaluations as part of their admissions criteria.

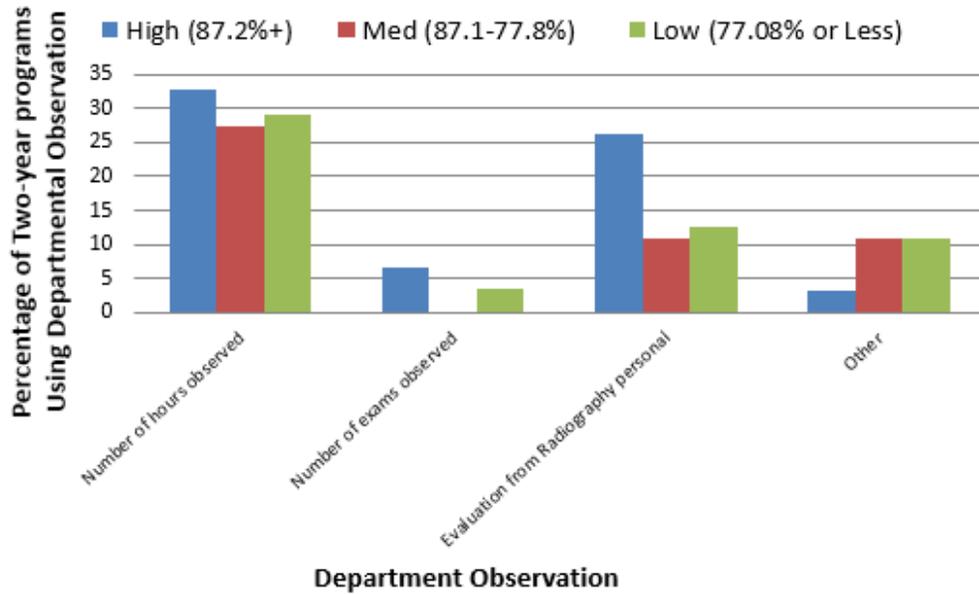


Figure 8a: Consideration for department observation by graduation rate grouping two-year programs ($N = 172$).

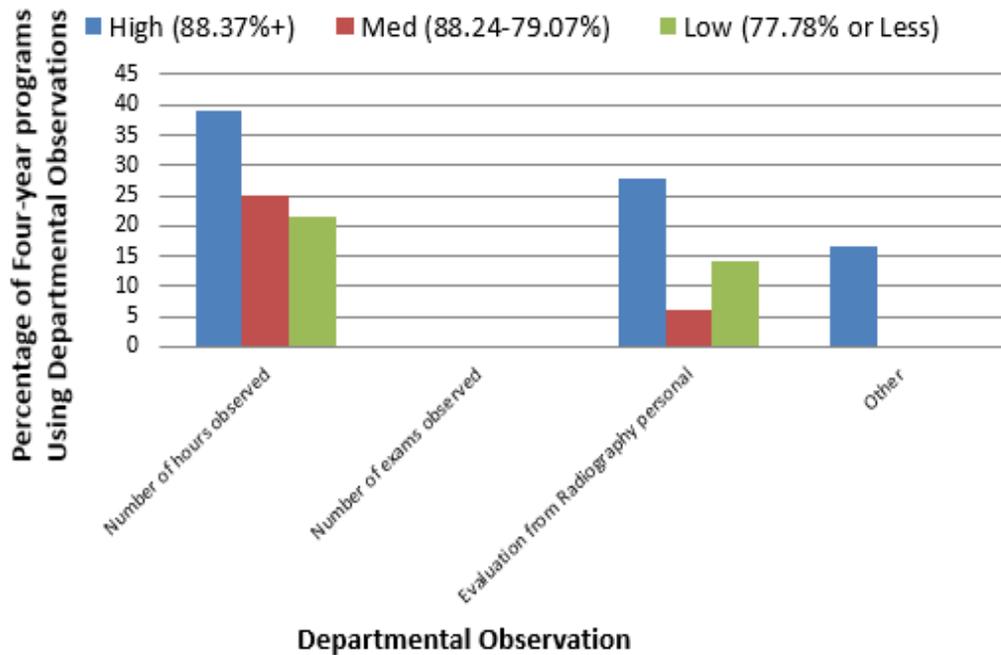


Figure 8b: Consideration for department observation by graduation rate grouping four-year programs ($N = 49$).

RQ9: *No significant difference will be found in the number of prerequisite classes required between programs with high graduation rates, moderate graduation rates, and low graduation rates.*

To address RQ9, a one-way ANOVA was performed. The results indicated a significant difference for two-year Radiography programs, $F(2, 165) = 3.79$, $p = 0.0246$; and four-year programs $F(2, 46) = 5.31$, $p = 0.0084$, with high graduation rates. Table 19 summarizes the results for RQ9.

For two-year programs, Tukey's Post Hoc test revealed a significant difference between the high and moderate graduation groups, as well as the high and low graduation groups, and also included moderate and low graduation groups. The moderate group utilized interviews significantly more often than low graduation groups. In addition, the high group utilized interviews significantly more often than moderate and low groups.

For four-year programs, Tukey's Post Hoc test revealed a significant difference between the high graduation and moderate graduation groups, as well as the high and low graduation groups, and also included moderate and low groups, with the moderate group utilizing interviews significantly more often than the low groups. In addition, the high graduation group utilized interviews significantly more often than the moderate and low groups.

Table 19

*Prerequisite Classes Required by Two and Four- Year Radiography Programs
Affiliation, by Graduation Rate*

Program Type	Graduation Group	N	M	SD	Post Hoc Grouping
	Low (0-77%)	56	3.62	2.82	A
Two-year	Moderate (78-87%)	55	4.27	2.57	BA
	High (88-100%)	57	5.08	3.06	B
	Low (0-79%)	16	2.50	3.65	A
Four-year	Moderate (80-89%)	16	3.87	3.32	BA
	High (90-100%)	17	6.35	4.15	B

Note. For Post Hoc Grouping, means with the same letter within the same program type were not significantly different.

Figures 9a and 9b report the percentage of programs by their graduation rate grouping. Both show that two- and four-year Radiography programs with high graduation rates utilized anatomy and physiology, college algebra, English, social/behavioral science, medical terminology, and communication classes as prerequisites.

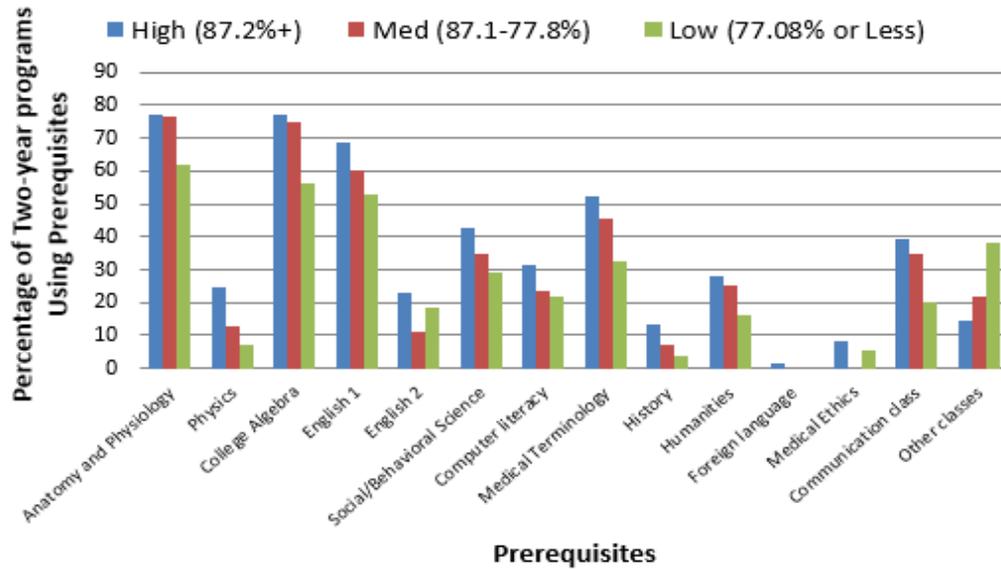


Figure 9a. Prerequisite courses used for admissions criteria by graduation rate Grouping two-year programs ($N = 172$).

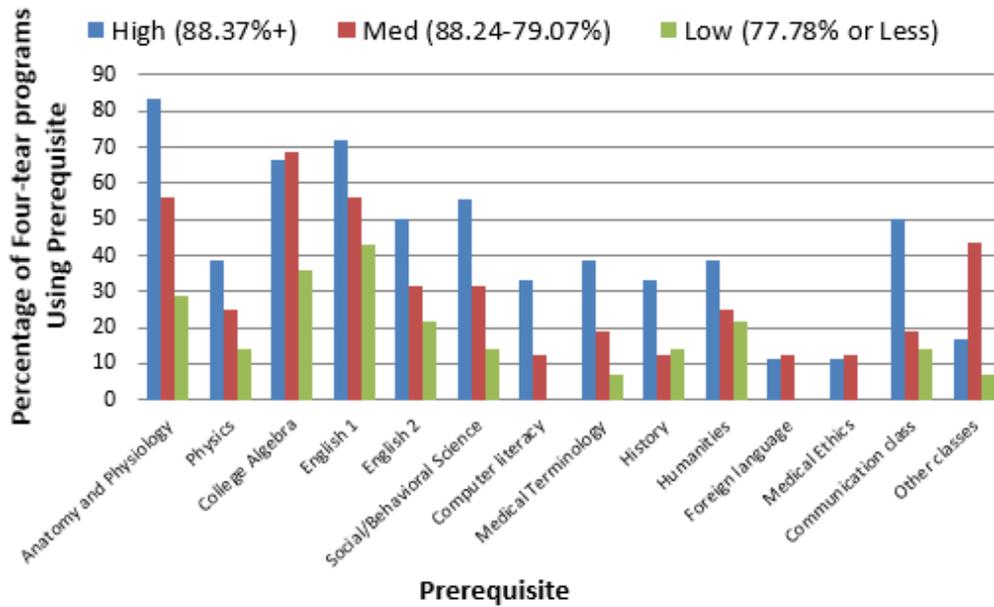


Figure 9b: Prerequisite courses used for admission criteria by graduation rate grouping four-year programs ($N = 49$).

Summary of Findings

The return rate surpassed the results normally obtained in surveys of allied health programs. Those who responded were eager for the completion of the study and the results. As higher education administrators and program directors overall were concerned with graduation rates and the variables, if any, that show a significant difference in their graduation rates when used for their selective admissions process.

From the analysis of the data, two-year programs that utilized more admissions criteria had higher graduation rates, as opposed to two-year programs with moderate to low rates. Thus, one could summarize that more variables used for admission would indeed provide better selection criteria to produce candidates more likely to complete the program.

Analysis of Variance (ANOVA) yielded a significant difference at the $p = .05$ level for two-year programs in traditional criteria, GPAs, reference letters, interviews, and non-traditional criteria. For both two-year and four-year programs, a significant difference was noted for both groups utilizing interviews and required prerequisites.

One half of all programs utilized anatomy/physiology, college algebra, and English 1 as prerequisite courses for admissions criteria. Over one third of the programs utilized English 2, social/behavioral science, and medical terminology as prerequisites. However, at least one third required students to take either a nurse aid class, patient care class, or introduction to the profession class prior to admittance into the program.

The GPA that was utilized as part of the admissions criteria showed that both two- and four-year programs utilized college overall GPA as part of their admissions criteria. This yielded a significant difference at the $p = .05$ level for two-year programs.

However, over half of the participants also used college math and science GPAs as part of their admissions criteria.

Reference letters also demonstrated a significant difference for two-year programs at the $p = .05$ level. Of the 172 participants from two-year programs, 27 selected character reference, 30 selected employment reference, and 30 selected educational reference letters as requirements for their admissions process. Four-year programs showed that they also relied on the same criteria for reference letters; however, no significant difference was found between high, moderate, and low graduation rates in four-year programs.

Of the two- and four-year programs that utilized interviews as part of their admissions process, a significant difference was seen at the $p = .05$ level for both program types. The study showed that the programs that utilized interviews used very structured criteria for this variable. All four-year programs used specific questions during the interview, whereas only 91.3% of two-year programs used specific questions. In addition, two-year programs placed more emphasis on poise and personal appearance than four-year programs.

Standardized written tests and psychomotor tests showed no significant difference between two- and four-year programs with high, moderate, or low graduation rates at the $p = .05$ level. However, the data revealed that a majority of participants relied on the ACT or SAT test as part of their admissions criteria.

Non-traditional criteria showed a significant difference for two-year programs with high graduation rates at the $p = .05$ level. Of the 172 participants in two-year programs, 78.4% chose departmental observations, and 52.6% selected experience in the

medical field as part of their admissions criteria. Four-year programs showed no significant difference; however, they selected the same criteria as two-year programs, with 72.7% choosing departmental observations and 54.5% selecting experience in the medical field. However, no significant difference was noted in the criteria utilized from the departmental observations.

The research analysis revealed a significant difference in both two-year and four-year programs with high graduation rates at the $p = .05$ level for required prerequisite classes. The majority of participants selected anatomy and physiology, college algebra, and English 1 as prerequisites required of the candidates applying to their programs, with less emphasis on medical ethics classes, foreign language classes, and history. A summary of the data, discussions concerning the data, and recommendations for further study are presented in Chapter V.

CHAPTER V: SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Introduction

Radiography educators must assure all applicants, consumers, and interested parties that their programs' admission practices are rational, valid, reliable, fair, and humane. In addition, they must show administrators of higher education that they can successfully predict the selected students who will be successful in the program and can be gainfully employed in their field. A competent entry level radiographer must possess excellent academic, verbal, reasonable judgment, and clinical skills in order to be successful in a career. The current study's focus was to add to the limited research available for Radiography program directors and to provide useful information in refining and strengthening current selective admissions practices. In addition, the study sought to provide criteria that admissions committees can utilize to enhance graduation rates within programs.

Summary

The rationale for this study arose from the need to improve graduation rates within the researcher's program. The lack of available research further solidified the need for more studies on this topic. This research was patterned after an independent study designed to investigate traditional and non-traditional criteria used to select cohorts of students into dental hygiene programs. The initial pilot study incited a great deal of interest from Radiography program directors, although little research was available to assist the directors and the admissions committees in determining criteria that could predict student success within the program once admitted. Prior to this study, the types

of traditional and non-traditional criteria being used were unknown, as well as the effectiveness of the criteria and the criteria being used in relation to high graduation rates.

A limited number of candidates is selected each year from a pool of several hopeful students wishing to complete their education and begin working in the field. However, no concrete data are available on determining the candidates more likely to be successful once accepted. This study was designed to add to the current deficiency of data available for use by Radiography program directors and their admissions committees. The information that was obtained through this research study can be used to guide and assist those involved in Radiography admissions in order to formulate criteria that will result in success once students are accepted into the program.

The primary focus of this study was to elicit information from program directors concerning their admissions practices and graduation rates to determine whether a relationship existed between admissions criteria and graduation rates. To accomplish this, a thorough review of the literature was conducted. Although the literature was limited concerning admissions practices for Radiography, literature of selective admissions in allied health programs offered useful information to guide this research.

The instrument utilized was modeled after a 1999 pilot study by Fehrenbach and later developed into a dissertation study by Semler (2001). The instrument consisted of 36 questions with several sub questions. Three were rearranged from the pilot study to enrich the data required to address the research questions. The instrument contained sections on demographics, admissions criteria, and institution characteristics.

The method employed allowed for certain interpretations to be determined. The first was a correlation between admissions criteria and graduation rates. However, it did

not query the experience level of the educator, which also could play an important role in the success of the student. Continued study of admissions criteria in selective admissions Radiography programs is indicated and should be pursued in order to add to the understanding and research available to program directors and admissions committees. The findings of this study may be useful to other researchers who seek to identify predictors of academic success in relation to admission criteria.

Several theories related to the attrition and retention of students, particularly in selective admissions processes. After a thorough review of several potential conceptual frameworks (see Chapter I), the researcher utilized the two most appropriate corresponding frameworks: Noel's 7 Themes of Attrition (1985) and Tinto's Design of Student Incorporation (1993).

Noel's (1985) model provided a clear and historical foundation for potential aspects of program attrition, with corresponding reasons for withdrawal to other allied health program research. The unrealistic expectations of coursework and demand of time were determined to be key variables in a student's persistence to graduation. Academic preparation also was shown to impact student success within the study, as the nature of the Radiography program required students to retain two years of information in order to pass a national board exam. Thus, the academic demands continue to impact student success, from the preparation of pre-major courses, to initial entrance into the program and, finally, the demands of the national board exam, which is the last stage.

In examining Noel's (1985) theory in relation to the admissions process, several variables provided data for making decisions on student academic ability and preparation. Programs that included the overall college GPA or the college math and science GPA

exhibited higher graduation rates than other programs. This also was revealed in the current study. Two-year programs that utilized overall college GPA and college math and science GPAs had a higher graduation rate than those that did not, at the $p = .05$ level. The importance of a strong math and science background was imperative in relation to the additional knowledge the student will learn in the program related to these two courses. Therefore, students without a strong background in these areas will struggle from the beginning and, therefore, give up on their academic career much earlier than a student with a strong knowledge base.

Tinto's (1993) framework referred to a different side of the retention problem facing allied health programs, particularly in the context of the community college. Students engaged in the community college campus were statistically more likely to be non-traditional, with increased demands outside of the classroom, including family obligations and work. The added pressure of the family and work responsibilities did not offer a sustainable level of support in multiple ways. Students may feel unsupported by other family members, as their time is shifted to the demands of the academic program; work hours may decrease or be eliminated, impacting the household income; and overall time with family and friends (a group that non-traditional students support more than others) is greatly diminished. Tinto addressed the need for students to be integrated into the college culture academically and socially; however, the community college student already is highly vested in life outside of the institution. Regardless of one's dedication to a career path, the question becomes: To what end are students capable of seeing the long-term impact of degree completion, with the demands of family and adult life standing in front of them daily?

Tinto (1993) provided a softer look at student success in addressing, not only the academic side of a student, but also the human connections that demonstrate proven academic success. However, the nature of the program limits a student's ability to engage in the campus socially due to academic demands. Yet, the admissions process must consider the students' abilities to engage within the confines of the program, with such characteristics as adapting to change, ability to interact with peers, and degree of understanding of the academic demands on the current lifestyle. These can be demonstrated through letters of recommendation and admissions interviews. The results of this study demonstrated that programs requiring reference letters and interviews had a significant higher graduation rate at the $p = .05$ level, as opposed to programs with moderate to low graduation rates. Those that demonstrated the highest graduation rates specifically requested recommendation letters from employers and past college faculty members, which validated the need for interviews and reference letters as part of the admissions process.

Quantitative Data Analysis

This research was conducted to expand knowledge of the extent to which traditional and non-traditional variables used during selective admissions impact graduation rates for two- and four-year Radiography programs. This chapter presents the results of the extent to which the independent variables can predict the dependent variables. The relationships were analyzed using descriptive statistics, followed by the analysis of variance (ANOVA) study of the correlations among the independent and dependent variables, and by Tukey Post Hoc Tests when a significant difference was found for the nine research questions.

Discussion

The primary purpose of this study was to determine the admissions criteria used by programs with high graduation rates, and to determine whether a relationship existed between admissions criteria and graduation rates in accredited Radiography programs in the United States and Puerto Rico. In order to accomplish this, the study was guided by nine research questions. The questions are discussed independently in the following sections. The programs were divided into two-year and four-year programs, and the results are discussed in relation to the program type.

Interpretation of Findings

The interpretation of findings represents an analysis of archival data from 221 accredited Radiography programs. The school years that were reviewed included 2012, 2013, and 2014 from both two-year and four-year programs. A discussion of the findings is organized by research question and is aligned with previous research related to Radiography programs.

Discussion of Research Question 1

***RQ1:** No significant difference will be found in the number of traditional admissions criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.*

For Research Question 1, the participants were asked to select all that applied from a list of traditional admissions criteria. Overall, the most utilized traditional admissions criteria for two- and four-year programs were the completion of prerequisite classes with a grade of “C” or higher (86.7%) and cumulative GPA in prerequisite classes

(77.1%). The least utilized traditional admissions criteria for four-year programs were psychomotor tests (0) and minority status (1.2%) for two-year programs.

Other categories that revealed significance in two-year programs were interviews (47.3%), and the same number of programs utilized standard written tests (45%) and college science GPA in prerequisite work (45%). Similar to two-year programs, four-year programs utilized college science GPA (55.1%) and interviews (51%); however, only 26.5% of programs utilized standard written tests. A correlation between two- and four-year programs showing the highest graduation rate utilized completion of prerequisites with a grade of “C” or higher and overall college cumulative GPA from prerequisite work, as well as interviews demonstrating the third highest criteria used with programs that had high graduation rates.

This study has shown that programs with high graduation rates utilized overall GPA in prerequisite classes and the completion of all prerequisite classes prior to entering the program. This research aligned with previous studies. In research conducted by Shehane (1994), the results indicated that academic rank was statistically significant, ($t = 1.28, p \leq .20$).

In a study by Kudlas (2006), results revealed that programs with competitive admissions practices showed a significant effect on graduation rates ($p = 0.013$), as opposed to those without a competitive admissions practice. Additionally, this study aligned with that of Ballinger (1976), in which a significant correlation was seen with graduation rates when candidates earned higher grades in English, mathematics, and natural science classes in high school or in college prerequisite classes.

For Research Question 1 this study aligned with previous studies to show that a competitive admissions process, in addition to the completion of prerequisite classes and GPAs in math and science classes, can be indicators of student completion of the program. Those that utilized more criteria to select their students into each cohort had a higher graduation rate in both two- and four-year programs. The dependent variable (DV) was traditional criteria, and the independent variable (IV) was graduation rate.

Discussion of Research Question 2

RQ2: No significant difference will be found in the number of specific GPAs selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.

In order to address Research Question 2, the participants were asked to select the GPA currently used for their admissions criteria when accepting a cohort of students. GPAs utilized for selective admissions demonstrated that both two-year (75.9%) and four-year Radiography programs (85.1%) used overall college GPA most often. College math and science GPA was the second highest GPA utilized with two-year (54.5%) and four-year programs (55.3%). Overall, high school and high school math and science GPAs were utilized the least among both groups. A significant difference was noted between two-year and four-year programs; two-year programs with higher graduation rates utilized college math and science GPAs more often; however, 41 participants selected “does not apply.”

The findings from the study regarding two-year programs aligned with previous research. In a study by Drees (2006), the difference in GPA, both overall and in science, and the number of course hours completed revealed a positive significant correlation in

whether a student would be successful in selective admissions allied health programs. Sparkman et al. (2012) stated that results of previous studies on college completion had indicated a correlation between high school GPA and graduation rates; thus, student GPAs have been used as predictors of success. In research by Gillis (2007), GPA and science class grades showed a significant difference in graduation rates of students with adjusted $R^2 = .88$ ($p = .0416$).

It is apparent from this study and previous research that a predictor of high graduation rates would relate to students who had successfully completed math and science classes. In addition to completing these classes, the higher grade in these particular classes indicated a greater chance of that student graduating from the Radiography program.

Discussion of Research Question 3

RQ3: No significant difference will be found in the number of reference letters selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.

For Research Question 3, participants were asked whether they utilized reference letters as part of their admissions criteria. The Analysis of Variance showed a significant difference between two- and four-year programs with high graduation rates. Two-year programs utilized character (45%), employment (50%), and education reference letters (50%) nearly three times more often than programs with moderate or low graduation rates.

No significant differences were noted with four-year programs when utilizing character (43.8%), employment (43.8%), and education reference letters (52.6%) for

admissions criteria. Participants were provided the opportunity to select “other” and asked to provide an explanation. The following list was provided: personal and professional; no friend or relatives; background checks; reference form from the program; job shadow comments; and two mandatory educational references, one being the choice of the candidate.

Although this study did not provide that which was scored when reference letters were used, it revealed a significant difference between programs with high graduation rates and those with moderate to low rates. These findings aligned with previous research, as demonstrated in a study by Kudlas (2006), who reported that programs utilizing reference letters showed a higher graduation rate than those that did not utilize reference letters. In another study by Espen et al. (2006), the authors reported that, although 44% of the programs surveyed required reference letters, 67% did not contact the references, as most students provided only positive references.

From this study and previous research, two-year programs that required reference letters appreciated higher graduation rates. However, as stated previously, prior studies have not delineated between two- and four-year programs. Therefore, one cannot assume from previous studies that reference letters would be similarly supported in four-year programs.

Discussion of Research Question 4

***RQ4:** No significant difference will be found in the number of interview criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.*

For Research Question 4, participants were asked whether they utilized interviews as part of their selective admissions practices and criteria that were used to score the interviewee. The choices provided in the survey included specific questions, oral expression, poise, personal appearance, self-confidence, motivation, interest in program, and knowledge of the Radiography field. Both two- and four-year programs showed a significant difference in graduation rates of those utilizing the interview process as part of their admissions criteria.

Two-year programs that utilized interviews had nearly double graduation rates than that of two-year programs not utilizing this as part of their admissions criteria. The two-year programs that scored the candidates on specific questions, interest in Radiography, and knowledge of the field had the highest difference in graduation rates. Four-year programs that utilized interviews as part of the admissions criteria showed the largest difference between programs that asked specific questions and inquired about the candidate's knowledge of the field of Radiography.

Previous research by Hughes (2013) revealed that interviews benefited female candidates more so than males. Hughes also stated that "interview ratings and previous relevant experience were more predictive than previous exam scores" (p. 44). Espen et al. (2006) also noted that interviews showed a strong correlation with higher graduation rates. In research conducted by Espen et al., only 59% of the programs required an interview, as compared to a study by Shehane (1996), in which 64% required an interview prior to admission.

From the findings of this study and prior studies, interviews were found to provide a value when selecting candidates for a two- or four-year Radiography program.

However, it must be noted that the manner in which the interview is conducted can have positive or negative implications on a program. Therefore, interviews should be well structured, consistent, and conducted by the same group of individuals who interview all candidates. In addition, the interview should be as objective as possible in order to show fairness to all candidates.

Discussion of Research Question 5

RQ5: No significant difference will be found in the number of standardized written instruments selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.

Research Question 5 asked participants to select the standardized written instruments that were used as part of their selective admissions process. The data showed no significant difference between two- and four-year programs by graduation rate when utilizing standardized written tests. However, two-year programs selected ACT (45.5%), and four-year programs selected ACT (62.5%), as well as SAT (56.3%). Therefore, both programs relied on ACT scores more often than other standardized written tests.

In order to measure student preparedness and to determine eligibility for college admission, many institutions have relied upon standardized preadmission screening tools such as the ACT and SAT (Geiser, 2008; Sparkman et al., 2012; Ramineni, 2012). Although these two predictive variables were reliable in determining student success in college, they may not be as reliable in predicting success in allied health programs (Mzumara & Shermis, 2001).

Sinha (2010) reported that, although ACT and SAT scores were useful in predicting student success in allied health programs, individuals were cautioned to also

utilize high school courses such as biology, chemistry, math, and physics. In the study, these variables also could be used as predictors for student success in selective admissions allied health programs.

Although ACT or SAT scores commonly are used as part of the selective admissions criteria, this study did not show any difference in graduation rates between two- and four-year programs that utilized this variable for admissions practices.

Discussion of Research Question 6

***RQ6:** No significant difference will be found in the number of psychomotor tests selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.*

Research Question 6 asked participants to select the psychomotor testing instruments used as part of their selective admissions process. The data showed no significant difference between two- and four-year programs by graduation rates when utilizing psychomotor tests. However, two-year programs with high graduation rates utilized spatial relations/differential aptitude tests 50% of the time. Space was provided for “other,” and half of the four-year program directors with high graduation rates selected this category. Participants were provided a place to fill in their choice, and the following items were added: the Hobet, Technical Standard Test, clinical skills, and the ability to perform specific tasks.

The research study did not show any significant difference in two- and four-year programs with high graduation rates; however, it is apparent from this and previous studies that most programs utilized the spatial relations/differential aptitude tests when using psychomotor tests as part of their admissions criteria.

Discussion of Research Question 7

RQ7: No significant difference will be found in the number of non-traditional admissions criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.

Non-traditional admissions criteria were listed as Radiography department observations, experience in the medical field, and licensure in a different medical field and previous degree in any field of study. This study verified that two-year programs with high graduation rates had a significant difference between two-year programs with moderate or low graduation rates when utilizing non-traditional criteria. Radiography department observations (78.4%) and experience in the medical field (52.6%) were the highest categories selected from the list. However, four-year programs with high graduation rates did not show a significant difference between moderate and low graduation rate programs. They utilized Radiography department observations (72.7%) and experience in the medical field (54.5%) more often than the other choices.

Two-year programs also demonstrated that high graduation rate programs utilized Radiography department observations approximately one third more often than moderate to low graduation rate programs. Four-year programs with high graduation rates utilized Radiography department observations nearly double that of moderate to low graduation rates programs. Previous studies have not indicated that this particular criteria has been researched. Therefore, it is unknown whether this research aligned with previous studies. However, it was noted that programs in both two- and four-year institutions with high graduation rates required the candidates to participate in a Radiography department observation prior to admission. These findings were expected, as many individuals both

in and out of the medical field have little understanding of the duties performed by a radiographers.

Discussion of Research Question 8

***RQ8:** No significant difference will be found in the number of departmental observations criteria selected between programs with high graduation rates, moderate graduation rates, and low graduation rates.*

Research Question 8 asked participants whether observations of a Radiography department were required, and the part of the observation that was utilized in their admissions practices. The choices included number of hours observed, number of exams observed, evaluation from the Radiography department personnel, or other. The hours for observation ranged from 2 to 24. Two-year programs selected other (19.2%), and four-year programs with high graduation rates also chose other (15.8%), which included an essay of their observation experience, a tour of the department, virtual shadowing link, and a question-and-answer sheet as part of the admissions criteria. This item revealed no significant difference between two- and four-year programs with high, moderate, and low graduation rates.

Aligned with a study by Kudlas (2006), no difference in graduation rates was noted between programs that required a departmental observation and those that did not require a departmental observation. Further research did not provide additional information on departmental observations. Therefore, as a result of this research and that of Kudlas (2006), departmental observations was determined to have no impact on graduation rates.

Discussion of Research Question 9

***RQ9:** No significant difference will be found in the number of prerequisite classes required between programs with high graduation rates, moderate graduation rates, and low graduation rates.*

Research Question 9 inquired about the number and variety of prerequisite classes required by programs that vary according to the individual institution. Question 9 inquired about classes that were required as prerequisites. From the list of choices, two-year and four-year programs selected anatomy and physiology (81.8%), college algebra (79.1%), and English 1 (71.1%). This study demonstrated a significant difference in two- and four-year programs with high graduation rates relative to the requirements that were considered to be prerequisites, in comparison to two- and four-year programs with moderate to low graduation rates. Two-year programs revealed a higher graduation rate when they required social/behavioral science classes and medical terminology. In addition, graduation rates increased when English II was required. Four-year programs showed approximately double graduation rates, as compared to moderate to low rates, when candidates were required to take social/behavioral science classes, computer literacy, medical terminology, history, and humanities. Remarkably, when communication classes were required, the high graduation programs doubled that of moderate to low programs.

The results of this study aligned with that of Kwan et al. (2009) that revealed undergraduate grades in mathematics ($r = 0.580$, $p < 0.01$) and undergraduate biology ($r = 0.423$, $p < 0.01$); undergraduate physics ($r = 0.344$, $p < 0.01$); and overall

undergraduate GPA ($r = 0.578$, $p < 0.01$) were significantly correlated with performance in the program and with graduation rates.

Graduation rates between two- and four-year programs revealed a significant difference in prerequisite classes required of the candidates that applied to their programs. This criteria has been previously studied, and this research aligned with those studies. However, other research did not specifically ask about classes that were required as prerequisites.

Summary of the Study and Findings

This research has revealed some surprising findings and appeared to be more in-depth than previous studies. Two-year programs with high graduation rates showed the most significant difference with scales 1, 2, 3, 4, 7, and 9. Four-year programs demonstrated only a significant difference in scales 4, 7, and 9. Thus, the conclusion can be drawn that four-year programs utilized more data for their selective admissions process than two-year programs. Overall, four-year programs had a higher graduation rate than two-year programs, with two-year programs showing the lowest rate at 33.90, and four-year programs demonstrating the lowest rate of 60.42 on a scale of 1 to 100.

Research Question 1 showed that, of the programs that responded, they either did not add extra points in to their admissions process for diversity or did not consider diversity within the selection process. From research by Sullivan (2006); Baldwin et al. (2006); and Donini-Lenhoff and Brotherton (2010), this issue is ongoing and one that should be addressed for the interest of the population of patients for whom the graduates will care throughout their career. This was surprising, as several thousand articles have been published on the need for a more diverse population of healthcare workers.

Findings regarding the use of reference letters revealed that programs utilizing reference letters showed higher graduation rates, as opposed to those that did not utilize reference letters, which fell in the moderate to low graduation rates. Although programs that required interviews revealed a significant difference between two- and four-year programs, the reliability and objectivity of interviews was a major concern for those that required them. In recent years, more programs have been moving away from interviews due to the subjectivity of this admissions criteria. However, it is imperative that the interviews be formatted in such a way to avoid bias and discrimination.

Additionally, the research disclosed that Radiography department observations provided a significant difference for two-year programs. Subsequent to the enactment of the Health Insurance Portability and Accountability Act (HIPAA) in 1996, medical facilities find it much more difficult to allow students to do observations. As noted in the research, some programs relied on virtual observations, video of the Radiography department, and/or a tour of the department. As stated previously, many do not understand the scope of practice of radiography on a daily basis, as with other medical healthcare fields.

The number of specific prerequisite classes required varied between programs. However, the difference in graduation rates related to the specific required classes was surprising. Four-year programs revealed that the requirement of communications classes showed a drastic difference in high, moderate, and low graduation rates. Two-year programs that required foreign language demonstrated a higher graduation rate, as opposed to those with moderate and low graduation rates, and did not require foreign language as a prerequisite.

Recommendations

In order to improve this study, future researchers should ask about the amount of classroom experience of each educator. This would help to determine whether the admissions criteria or the experience of the educator is a factor in low graduation rates.

Although the return rate of the survey was substantial, the usable data hindered the study. A total of 618 surveys were sent, with a return rate of 450; however, only 221 were completed and contained usable data. For future studies, it is recommended that participants complete the survey once they have begun with it.

Another recommendation would be to perform a longitudinal study. Very few have been conducted to examine only Radiography programs. Therefore, a study conducted over a period of 5 to 10 years would provide additional data.

It also would benefit this study to break out some of the questions that were asked. One such question would be the way in which admissions criteria is weighted. One program may place more weight on the interview, and a different program also may conduct interviews; however, they may weigh the interviews with far less emphasis.

Limitations

An initial limitation of the study was that data were requested for the past three graduating classes. In 2015, ARRT mandated that, in order for graduates to sit for their national board exam, they must graduate with an associate's degree. Programs in the past could be hospital-based, technical programs, or independent programs that did not require college classes prior to admittance into the program. This would impede the data on college GPAs, GPAs in prerequisite classes, and required prerequisite classes. Therefore,

a study on admissions criteria beginning in 2015 may show a difference in graduation rates and admissions criteria from the research obtained in this study.

An additional valid study could be performed within one's own institution. Several programs, as established earlier, place a great deal of weight on prior college GPAs, either in overall or prerequisite classes or both. However, all teachers have different standards for their individual classes, whether in prerequisite or program classes. Therefore, an "A" in one class by a particular faculty member may be a "C" in the same class by a different faculty member. Therefore, it would benefit this study, as well as Radiography program directors and admissions committees, to understand the criteria used to justify grades in anatomy and physiology, college algebra, and English. It also could be beneficial to examine the teachers that the unsuccessful students have had, as compared with the teachers that successful students have had in these subjects.

Recommendations on the Application of the Study Findings

The intent of this study was to evaluate admissions criteria utilized by program directors and to determine the admissions criteria that can be utilized to support higher graduation rates. Program directors can use this study to review admissions criteria, and other allied health programs can utilize this study to tailor their admissions criteria. With the lack of research available to Radiography program directors and admissions committees, these individuals often have had to rely on research available for other allied health programs, including nursing. However, Radiography is a unique field that mandates strong people skills, excellent communication, and the ability to think critically and adapt quickly to change. Radiographers must learn many aspects of patient care, possess a strong knowledge in the cutting edge of technology, in addition to adaptability

and a desire to be a lifelong learner. Although these skills may not be unique to radiographers alone, they are essential for a candidate who applies to a Radiography program, desiring to be accepted, to complete their education, and to have a successful career in the field.

Conclusion

This study began with the purpose of understanding the admissions criteria that influence high graduation rates. The findings by no means would dictate that program directors and admissions committees revamp their requirements. However, the researcher attempted through this study to generate insights that individuals may consider when establishing or evaluating their current admissions criteria. By reevaluating Radiography programs' current admissions criteria, program directors and admissions committees may be more selective when admitting students into their programs and offering admission to those with the greatest probability of success. In addition to accepting students, using more variables for their admissions process, and programs that admit students with less than strong backgrounds in math and science or overall GPA, administrators may implement support services for these students, allowing them a stronger opportunity to become successful in their career choice. The program director also would have a better opportunity to impact program completion and higher graduation rates.

Increasing graduation rates will, not only benefit the program and institution financially, it also will benefit the community and healthcare field. Theoretically, social change may be achieved through an increase in the number of credentialed radiographers

who can provide care and comfort, as well as aid in diagnosing and potentially curing some patients of diseases that the current aging population in the United States will face.

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APPENDIX A:
Accredited Radiography Programs
By Academic Level of Achievement

Academic level of Achievement	Number of Programs
Associate Degree	22
Associate Degree/Certificate	1
Associate in Applied Technology	1
Associate in Health Science	3
Associate in Occupational Science	2
Associate in Occupational Studies	5
Associate in Radiologic Science	4
Associate in Radiologic Technology	2
Associate of Applied Science	283
Associate of Radiography	1
Associate of Science	110
Associate of Science/Certificate	2
Bachelor of Health Science	2
Bachelor of Medical Science	1
Bachelor of Radiography & Imaging Sciences	1
Bachelor of Radiologic Science	5
Bachelor of Science	28
Bachelor of Science in Radiography	1
Bachelor of Science in Radiography/Certificate	1
Bachelor of Science/Associate of Science	1
Bachelor of Science/Certificate	2
Certificate	140
Occupational Associates Degree	1

APPENDIX B:

Permission from original author to use and make modifications to survey tool



Margaret J. Fehrenbach, RDH, MS Dental Hygiene Education

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Phone: 206-244-5359 margaret@dhed.net ☐☐

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December 24, 2014

Dear Joy Menser:

I grant permission to you to use my original survey research tool on retention with modification in your study. I understand there will be full acknowledgement as to its origin. Good luck with your future studies and work.

Sincerely,

A handwritten signature in black ink that reads "Margaret J. Fehrenbach, RDH, MS". The signature is written in a cursive style.

Margaret J. Fehrenbach, RDH, MS
Director, Dental Hygiene Education

APPENDIX C:
Survey Tool

Selective Admission Criteria and Retention

Thank you for participating in the Selective Admission Criteria and Retention survey, by completing the survey you are consenting to the terms and conditions of the survey.

Your information will be kept confidential. Thank you in advance for helping promote our profession.

Q2. Name of contact person and Institution of Higher Education associated with your Radiography program:

Q3. Title of the person responding to this questionnaire (Please choose the one that is the most appropriate):

- Institution Dean or Director of Health Services (1)
- Radiography Program Director (2)
- Institution Admission Program Director or Staff (3)
- Radiography Program Admission/Selection Committee member (4)
- Radiography Program Faculty member (5)

Q4. Which best describes the institution affiliated with your Radiography Program?

- Private 4 year institution (1)
- Private 2 year institution (2)
- Public 4 year state institution (3)
- Public 2 year state institution (4)

Q5. Which of the following best describes the setting of your Radiography program?

- Community College (1)
- Technical College (2)
- Allied Health Department in an University (3)
- Other (Please list below) (4) _____

Q6. Which best describes the entry-level curriculum of your Radiography program?

- Two-year Associate degree (1)
- Four-year Bachelor degree program (2)
- Do not have entry-level curriculum to program (3)
- Other (Please list below) (4) _____

Q7. How often is students admitted into your program?

- Once a year (1)
- Bi-annually (2)
- Open start date (3)
-

Q8. Approximately how many candidates apply for each cohort?

- _____ Class of 2014 (1)
- _____ Class of 2013 (2)
- _____ Class of 2012 (3)

Q9. How many students are selected into each cohort?

- _____ Class of 2014 (1)
- _____ Class of 2013 (2)
- _____ Class of 2012 (3)

Q10. Which of the following traditional admission criteria does your Radiography program use for admission of students in your entry-level curriculum? (Please select all that apply) NOTE: nontraditional criteria will be requested later in the survey.

	Yes (1)
Residency Requirements (1)	<input type="checkbox"/>
Completion of prerequisite course work with a grade of "C" or higher (2)	<input type="checkbox"/>
First come first admitted (3)	<input type="checkbox"/>
College cumulative GPA in prerequisite course work. (4)	<input type="checkbox"/>
College Science GPA from prerequisite work (5)	<input type="checkbox"/>
Reference letters (6)	<input type="checkbox"/>

Interviews (7)	<input type="checkbox"/>
Writing sample (8)	<input type="checkbox"/>
Standardized written test (9)	<input type="checkbox"/>
Psychomotor test (10)	<input type="checkbox"/>
Minority status (11)	<input type="checkbox"/>
Alternate Candidate From previous year (12)	<input type="checkbox"/>
Does not apply (13)	<input type="checkbox"/>

Q11. If GPA is used as admission criteria for your entry-level curriculum at your Radiography program, which of the following GPA's are used? (Please select all that apply)

	Yes (1)
High School overall (1)	<input type="checkbox"/>
High School math and science (2)	<input type="checkbox"/>
College overall (3)	<input type="checkbox"/>
College math and science (4)	<input type="checkbox"/>
Does not apply (5)	<input type="checkbox"/>

Q12. If GPA is used as admission criteria for your entry-level curriculum in your Radiography, which of the following specific levels are also considered?

	Yes (1)
"C" average at 2.0 (on a 4.0 scale) (1)	<input type="checkbox"/>
"C" average at 2.75 (on a 4.0 scale) (2)	<input type="checkbox"/>
"B" average at 3.0 (on a 4.0 scale) (3)	<input type="checkbox"/>

Q13. If reference letters are used for admission criteria for your entry-level curriculum Radiography program, what type of reference letter(s) are requested? (Please choose all that apply or fill in the blank for information that is used but not listed)

	Yes (1)
Character reference (1)	<input type="checkbox"/>
Employment reference (2)	<input type="checkbox"/>
Educational reference (3)	<input type="checkbox"/>
No specific reference is requested, candidate chooses reference source. (4)	<input type="checkbox"/>
Other reference type please specify (5)	<input type="checkbox"/>
Does not apply (6)	<input type="checkbox"/>

Q14. If interviews are used as part of the admission criteria for your entry-level curriculum in your Radiography program, which of the following may be used or noted by interviewers? (Please select all that apply, please add additional information if it is not listed)

	Yes (1)
Specific questions (1)	<input type="checkbox"/>
No specific questions (2)	<input type="checkbox"/>
Oral expression (3)	<input type="checkbox"/>
Poise (4)	<input type="checkbox"/>
Personal appearance (5)	<input type="checkbox"/>
Self-confidence (6)	<input type="checkbox"/>
Motivation (7)	<input type="checkbox"/>
Interest in Radiography Program (8)	<input type="checkbox"/>
Knowledge of the Radiography Field (9)	<input type="checkbox"/>
Does no apply (10)	<input type="checkbox"/>

Q15. If standardized written instrument(s) are used as admission criteria in your entry-level curriculum Radiography program, which of the following would best describe the instrument that your program accepts? Please choose all that apply.

	Yes (1)
Allied Health Aptitude Test (1)	<input type="checkbox"/>
Psychological Service Revised Health Occupational Test (2)	<input type="checkbox"/>
ACT (3)	<input type="checkbox"/>
SAT (4)	<input type="checkbox"/>
COMPASS (5)	<input type="checkbox"/>
Your Radiography program assessment test (6)	<input type="checkbox"/>
Does not apply (7)	<input type="checkbox"/>
Additional information (8)	<input type="checkbox"/>

Q16. If you use ACT or SAT what is the maximum age of test scores that you will accept?

Q17. If you use Compass, what is the maximum age of test scores that you will accept?

Q18. If psychomotor test(s) are used as admission criteria for your entry-level curriculum in your Radiography program, which of the following can be used to best describe the test(s)? Please choose all that apply

	Yes (1)
Spatial relations test or differential aptitude test (1)	<input type="checkbox"/>
Paper and pencil perceptual and motor test (2)	<input type="checkbox"/>
Other (3)	<input type="checkbox"/>
Does not apply (4)	<input type="checkbox"/>

Q19. If any nontraditional admission criteria is used for your entry-level Radiography curriculum, which of the following? (Please choose all that apply).

	Yes (1)
Radiography department observation (1)	<input type="checkbox"/>
Experience in the Medical field (2)	<input type="checkbox"/>
Licensure in a different medical field (3)	<input type="checkbox"/>
Previous degree in any field of study (4)	<input type="checkbox"/>
Does not apply (5)	<input type="checkbox"/>

Q20. Do you require observation in a Radiography department prior to admission into your entry level curriculum program?

- Yes (1)
 No (2)

If No Is Selected, Then Skip to If prerequisite courses are used as p...

Q21. For the observation in a Radiography department which one of the following is considered?

	Yes (1)
Number of hours observed (1)	<input type="checkbox"/>
Number of exams observed (2)	<input type="checkbox"/>
Evaluation from Radiography department personal (3)	<input type="checkbox"/>
Other, please explain (4)	<input type="checkbox"/>

Q22. If observation is required as admission criteria for your entry-level Radiography curriculum are there specific exams that must be observed?

- Yes (1)
 No (2)

If No Is Selected, Then Skip to If prerequisite courses are used as p...

Q23. Please provide a list of exams that must be observed.

Q24. If prerequisite courses are used as part of the admission criteria for your entry-level curriculum Radiography program, which of the following classes are required?

	Yes (1)
Anatomy and Physiology (1)	<input type="checkbox"/>
Physics (2)	<input type="checkbox"/>
College Algebra (3)	<input type="checkbox"/>
English 1 (4)	<input type="checkbox"/>
English 2 (5)	<input type="checkbox"/>
Social/ behavioral science (6)	<input type="checkbox"/>
Computer literacy class (7)	<input type="checkbox"/>
Medical Terminology (8)	<input type="checkbox"/>
History (9)	<input type="checkbox"/>
Humanities (10)	<input type="checkbox"/>
Foreign Language (11)	<input type="checkbox"/>
Medical Ethics (12)	<input type="checkbox"/>
Communication class (13)	<input type="checkbox"/>
If there are other courses please list: (14)	<input type="checkbox"/>
Does not apply to my program (15)	<input type="checkbox"/>

Q25. As part of the admission criteria used for your entry-level Radiography curriculum how many prerequisite credit hours are required?

_____ Prerequisite hours required (1)

Q26. As part of the admission criteria used for your entry-level Radiography curriculum program how many prerequisite credit hours must be completed prior to the start of the program?

- All required prerequisite credit hours (1)
- All science related prerequisite credit hours (2)
- None, students take prerequisite credit hours during the program (3)
- At least half of the prerequisite credit hours must be completed (4)
- None of these apply (5)

Q27. Do you weight the admission criteria to rank the applicants?

- Yes (1)
- No (2)

If No Is Selected, Then Skip to Describe the status of your admission...

Q28. If you answered yes to the above question please provide a list of criteria with the weighted percentage listed by each criteria utilized.

Q29. Describe the status of your admission criteria and procedure for your entry level curriculum Radiography program.

- Has not changed for the last 5 years (1)
- Has been revised within the last 5 years (2)
- Change is currently being proposed, but has not been implemented (3)
- Other situation (4) _____

Q30. Do you or your admission committee annually review your admission criteria to determine if or how it relates to student success?

- Yes (1)
- No (2)

Answer If Do you or your admission committee annually review your admission criteria to determine if or how it relates to student success? Yes Is Selected

Q31. Please describe what your review process consists of if you annually review your admission process.

Q32. How effective is your current selection criteria for admissions related to your retention rate in each cohort?

- Very Ineffective (1)
- Ineffective (2)
- Somewhat Ineffective (3)
- Neither Effective nor Ineffective (4)
- Somewhat Effective (5)
- Effective (6)
- Very Effective (7)

Q33. How many people currently serve on your admission committee?

Q34. Which of the following people serve on your entry-level Radiography curriculum admission committee: Please select all that apply.

	Yes (1)
Department Dean (1)	<input type="checkbox"/>
Program Director (2)	<input type="checkbox"/>
Registrar (3)	<input type="checkbox"/>
Counselor (4)	<input type="checkbox"/>
Program Faculty (5)	<input type="checkbox"/>
Clinical Instructor(s) (6)	<input type="checkbox"/>
General Education Faculty (7)	<input type="checkbox"/>
Student representative (Class President) (8)	<input type="checkbox"/>
Other (Please list) (9)	<input type="checkbox"/>

Q35. How many students took the ARRT National Board Exam for the first time and how many passed for the following years?

- _____ 2014 took the ARRT National Board Exam first attempt (1)
- _____ 2014 passed on the first attempt (2)
- _____ 2013 took the ARRT National Board Exam first attempt (3)
- _____ 2013 passed on the first attempt (4)
- _____ 2012 took the ARRT National Board Exam first attempt (5)
- _____ 2012 passed on the first attempt. (6)

Q36. How many students re-took the ARRT National Board Exam for the second time and how many passed?

- _____ 2014 re-took the ARRT National Board Exam second attempt (1)
- _____ 2014 passed the ARRT National Board Exam second attempt (2)
- _____ 2013 re-took the ARRT National Board Exam second attempt (3)
- _____ 2013 passed the ARRT National Board Exam second attempt (4)
- _____ 2012 re-took the ARRT National Board Exam second attempt (5)
- _____ 2012 passed the ARRT National Board Exam second attempt (6)

Q37. This study seeks to investigate how many students started in each cohort and how many graduated from the same cohort. For the following question please provide the number of student that started in the cohort and how many of those students graduated at the end of that cohort:

_____ Graduating class of 2014: number of students enrolled in first class of program (1)

_____ Graduating class of 2014: number of students that graduated in 2014 (2)

_____ Graduating class of 2013: number of students that were enrolled in first class of program (3)

_____ Graduating class of 2013: number of students that graduated in 2013? (4)

_____ Graduating class of 2012: number of students enrolled in first programmatic class? (5)

_____ Graduating class of 2012: number of students that graduated in 2013? (6)

Q38. This is an anonymous survey. However if you would like to be entered into a drawing for a \$50.00 amazon gift card please enter your email address below.

Q39. If you would like a copy of the results of the survey please supply your email address below.

APPENDIX D:
Kentucky Community and Technical College System
IRB Approval

500 North Main Street
Versailles, KY 40383
Telephone: 859-256-3100
Website: kctcs.edu

10/20/2014
10/16/2014

Ms. Nadine Joy Menser
Owensboro Community & Technical College
4800 New Hartford Rd.
Owensboro, KY 42303

RE: The Perfect Formula: What Tools Best Predict Retention in Selective Admission Programs?

Dear Ms. Menser:

After careful consideration of your application to the KCTCS Human Subjects Review Board, I have determined that you are eligible for exemption from federal regulations regarding the protection of human subjects based on your research using a procedure that meets the exempt review criteria section 7 (2).

Thank you for your cooperation in meeting the federal requirements for conducting research that utilizes human subjects. We appreciate your notification to this board and we will keep your information on file.

Sincerely,



Jay K. Box, Ed.D.
Chancellor
Chair, KCTCS Human Subjects Review Board

cc: Christina Whitfield, Ph.D.
System Director of Research and Policy Analysis



APPENDIX E:
Western Kentucky University IRB Approval



*INSTITUTIONAL REVIEW BOARD
OFFICE OF RESEARCH INTEGRITY*

DATE: October 2, 2014

TO: Joy Menser, MSM
FROM: Western Kentucky University (WKU) IRB

PROJECT TITLE: [664689-1] The Perfect Formula: What tools best predict retention in selective admission programs?
REFERENCE #: IRB 15-090
SUBMISSION TYPE: New Project

ACTION: APPROVED
APPROVAL DATE: October 2, 2014

REVIEW TYPE: Exempt from Full Board Review

Thank you for your submission of New Project materials for this project. The Western Kentucky University (WKU) IRB has APPROVED your submission. This approval is based on an appropriate risk/benefit ratio and a project design wherein the risks have been minimized. All research must be conducted in accordance with this approved submission.

This submission has received Exempt from Full Board Review based on the applicable federal regulation.

Please remember that informed consent is a process beginning with a description of the project and insurance of participant understanding followed by an *implied* consent form. Informed consent must continue throughout the project via a dialogue between the researcher and research participant. Federal regulations require each participant receive a copy of the consent document.

Please note that any revision to previously approved materials must be approved by this office prior to initiation. Please use the appropriate revision forms for this procedure.

All UNANTICIPATED PROBLEMS involving risks to subjects or others and SERIOUS and UNEXPECTED adverse events must be reported promptly to this office. Please use the appropriate reporting forms for this procedure. All FDA and sponsor reporting requirements should also be followed.

All NON-COMPLIANCE issues or COMPLAINTS regarding this project must be reported promptly to this office.

This project has been determined to be a Minimal Risk project.

Please note that all research records must be retained for a minimum of three years after the completion of the project.

If you have any questions, please contact Paul Mooney at (270) 745-2129 or irb@wku.edu. Please include your project title and reference number in all correspondence with this committee.

This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Western Kentucky University (WKU) IRB's records.

WESTERN KENTUCKY UNIVERSITY

Institutional Review Board
Continuing Review Report

Name of Project: The Perfect Formula: What benchmarks best predict retention in selective admission programs?

Name of Researcher: Joy Menser

Department: Educational Leadership Doctoral Program_

How many total subjects have participated in the study since its inception? # 10__

How many subjects have participated in the project since the last review? #60__

Is your data collection with human subjects complete? Yes No

1. Has there been any change in the level of risks to human subjects? (If "Yes", please explain changes on a separate sheet). Yes No
2. Have informed consent procedures changed so as to put subjects above minimal risk? (If "Yes", please describe on a separate sheet). Yes No
3. Have any subjects withdrawn from the research due to adverse events or any unanticipated risks/problems? (If "Yes", please describe on a separate sheet). Yes No
4. Have there been any changes to the source(s) of subjects and the Selection criteria? (If "Yes", please describe on a separate sheet). Yes No
5. Have there been any changes to your research design that were not specified in your application, including the frequency, duration and location of each procedure. (If "Yes", please describe on a separate sheet). Yes No
6. Has there been any change to the way in which confidentiality of the Data is maintained? (If "Yes", please describe on a separate sheet). Yes No
7. Is there desire to extend the time line of the project? Yes No
On what date do you anticipate data collection with human subjects to be completed? _____

Revised Research tool attached to [664689-2]



APPENDIX F:
Letter of Survey Explanation

Dear Program Directors,

My name is Joy Menser, and I am a Doctoral Student at Western Kentucky University. In approximately 3 days I will be sending you an email with a link to a survey. Your participation would be greatly appreciated. The topic that I have chosen for my research is “The Perfect Formula: What benchmarks best predict retention in selective admission programs?” The reason I chose this topic is, like most of you I struggle every year selecting a cohort of students that the admission committee deems acceptable, willing to complete the program, and be successful on their National Board Exam.

Although the survey is rather lengthy, the benefit that your program could gain from the results will outweigh the time it will take you to participate in the survey. While there is a plethora of information available for allied health selective admission programs there is very little research available that directly relates to our programs.

The benefit to your program and the profession would be well worth the time it will take you to complete the survey tool. If you are interested in the results of the research at the end of the survey there will be a place for you to supply your email address. Once the survey is completed I will email the results of the survey to the individuals that has requested the information.

Thank you in advance for your dedication to our profession and time for participating in the survey.

Sincerely

Joy Menser, MSM, RT (R) (T)

Doctoral Candidate at Western Kentucky University

APPENDIX G:
Letter of Invitation to Participate In Survey

Dear Program Director:

As a student at Western Kentucky University completing an education doctorate (EdD), I am requesting your participation in a research study entitled "The Perfect Formula: What Tools Best Predict Retention in Selective Admission Programs?" The purpose of the research study is to determine the relationship between current admission criteria and academic progression for students in selective admission Radiography Programs.

Although there is no benefit to you personally, the benefit to the radiography profession is that study data will assist radiography educators and accrediting bodies in refining criteria for selection into radiography programs. Additionally, the study will assist in obviating the concern of attrition for all radiography programs. Lowering attrition will assist in decreasing the shortage of radiographers. Your confidentiality will be maintained. There is no risk to you for participating in this study. Your participation will involve providing anonymous student academic information including preadmission selection criteria. You may choose not to participate or withdraw from the study at any time. There is no penalty for withdrawal.

I appreciate your participation in the research study. By accessing the weblink provided, you will be implying your consent in participating in this study. All data collected will be kept secure and every program's identity will remain secure. Please feel free to contact me if you have any questions or concerns related to this study or the collection of data. My email address is joy.menser@kctcs.edu and in the subject line please put "research".

Thank you sincerely for your participation.

Respectfully,

A handwritten signature in black ink that reads "Joy Menser". The signature is written in a cursive, flowing style.

Joy Menser, MSM RT (R) (T)

Doctoral Candidate for Western Kentucky University