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A Comparative Study of the Entry-Level Credentialing Examination Scores of the Respiratory Therapy Distance Education Students of J. Sargeant Reynolds Community College

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A Comparative Study of the Entry-Level Credentialling Examination Scores of the Respiratory Therapy Distance Education Students of J. Sargeant Reynolds Community College.

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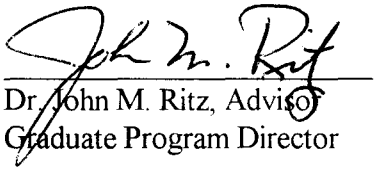

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CHAPTER I

INTRODUCTION

In 1993, the Virginia General Assembly awarded a grant to J. Sargeant Reynolds Community College (JSRCC) to develop a distance learning project. Of the many health technology programs at JSRCC, Respiratory Therapy was selected as the distance learning project model. The career path flexibility exhibited by this profession, the completely outcome-based accreditation and the overlapping of concepts with other health-care programs would allow the opportunity to expand the model to other programs. (Etkin, 1995, p. 1) Additionally, Respiratory Therapy was identified as a high personnel need area in Virginia with a 41% growth rate forecasted for this field in the next decade. (Author, 1990, p. 10)

With the elimination of many hospital-based and community college health technology programs throughout the Virginia Commonwealth due to funding and low enrollment, the hospitals and other healthcare providing agencies have suffered from an extremely small employment pool. This is especially true for geographically remote or medical underserved areas; and correspondence courses have not proven to be the most effective method of delivering education to many students. (Harkins, 1997, p. 164)

The goal of this project was to provide students in these designated areas with the opportunity to access an education in respiratory therapy at their local community colleges and hospitals eliminating the need to relocate to other areas to attend school. It has been the experience of the researcher that students

who leave their home areas for an education rarely return to work. With the success of this pilot project, other health care programs would be encouraged to offer their programs by this distance education technology.

STATEMENT OF THE PROBLEM

The problem of this study was to compare the National Board for Respiratory Care entry-level credentialling examination scores of the J. Sargeant Reynolds Community College class of 1997 distance education respiratory therapy students with the J. Sargeant Reynolds Community College class of 1997 traditional respiratory therapy students' scores.

HYPOTHESIS

The following hypothesis was used to evaluate the effectiveness of the distance education program.

H_0: Students who study respiratory therapy at J. Sargeant Reynolds Community College through distance education will score equally to those who study through traditional methods when taking the entry-level credentialling examination.

BACKGROUND AND SIGNIFICANCE

A study conducted by the Virginia Hospital Association of the needs in healthcare manpower in Virginia resulted in a large disparity between supply and demand. This disparity is expected to widen. Respiratory Therapy was identified as a high manpower need area in Virginia with a 41% growth rate forecasted well

into the next decade. (Author, 1990, p. 10) Factors impacting the need of respiratory therapy manpower include the increase in air pollution and the large number of aging population. Together with this needs forecast and the definable modularized components of this profession, Respiratory Therapy was selected as the pilot distance learning program for JSRCC. The areas selected to receive the associate degree program in respiratory therapy were Southside Virginia Community College (SSVCC), Danville Community College (DCC), Piedmont Virginia Community College (PVCC), and Rappahannock Community College (RCC). The project director was Sally Etkin, Ed. D., a faculty member of JSRCC.

The objective of the program was to increase the number of respiratory therapy practitioners in these designated areas by providing access to a high quality education program using distance learning instructional technology in the most cost effective manner. The technical resource staff members of the Virginia Community College System (VCCS) office, the JSRCC distance learning department and the respiratory therapy curriculum committee provided the expertise in the selection of the distance learning hardware and software for the project.

The distance learning technology selected was Optel Audiographics System with two-way telephones that are connected by a bridge provided by the VCCS Department of Technology. This technology only required POTs lines and computers to be installed at the receive sites, so the installation costs were minimal. Members of the curriculum committee, comprised of respiratory therapy educators from Virginia, were asked to develop instructional modules using Microsoft PowerPoint. These included cardiopulmonary anatomy and physiology,

microbiology, applied chemistry and physics, pharmacology, basic theory and procedures, cardiopulmonary assessment, pathophysiology, advanced theory and procedures, pulmonary rehabilitation, hemodynamic monitoring, critical care monitoring, neonatology, and cardiopulmonary diagnostics. These modules were integrated into courses established by JSRCC's Respiratory Therapy Program.

In the fall semester of 1995, a program coordinator was hired and the JSRCC distance learning respiratory therapy advanced practice pilot program began. Enrolled were ten students who already held the Certified Respiratory Therapy Techhnician (CRTT) credential and who would receive, upon completion, the advance practice certificate. It was determined that starting with the advance practice program would eliminate the need for some of the initial resources that the entry-level program would require, since these students had a proven background in respiratory therapy. In 1996, the first entry-level class was admitted with five students at RCC, two students at DCC, one student at PVCC and two students at SSVCC.

This is the first study to compare the student outcomes between the traditional students and the distance education students of the JSRCC program. The information obtained from this study will be used to determine the need to continue the distance education program. If the distance education respiratory therapy program can educate students to be comparable in competencies and theory to the students of traditional respiratory therapy programs, this will be a desirable educational option for people living in remote areas of Virginia.

Therefore we should concentrate on using the technology to address these issues.

(Lane, 1998)

LIMITATIONS

This study was limited to students who matriculated in the entry-level traditional and the distance learning respiratory therapy program at J. Sargeant Reynolds Community College in Richmond, Virginia, during the 1996 and 1997 academic years. Some of the students entering the program had previous on-the-job experience in respiratory therapy which impacted the comparison of the NBRC examination scores with students who had no previous experience in respiratory therapy. The courses were not taught simultaneously, however, the course contents were consistent in both programs. The instructors for both of the programs were not always the same which also may impact the results of the study.

ASSUMPTIONS

In this study, it was assumed that:

1. The students had the same program entrance qualifications.

2. The course content received by both groups of students were consistent with the NBRC matrix.

3. The distance lab and clinical experience objectives and activities were consistent with those of the traditional program.

4. The NBRC credentialling exams were equal in difficulty among the students taking them during the time of this study.

5. The students GPAs were at least 2.0.

PROCEDURES

Student rosters were acquired from the directors of both the traditional and the distance learning respiratory therapy programs. The student files were reviewed to determine verification of the entrance requirements of the students, the lab and clinical competency skills completed, the students' GPAs achieved, and the NBRC examination score results. Data were analyzed utilizing the t-test, the two groups were compared, and further recommendations were made.

DEFINITION OF TERMS

The following terms were used throughout this study:

1. NBRC--The National Board for Respiratory Care is the credential awarding agency for respiratory care practitioners.

2. Entry-Level--The beginning level of practice recognized by the NBRC and the practice of respiratory therapy. The entry-level practitioner has earned an associate degree in applied science in respiratory therapy and has successfully completed the NBRC examination receiving the Certified Respiratory Therapy Credential (CRT).

3. GPA--Grade point average calculated over the duration of enrollment in program of study awarding academic credit.

4. Medically underserved areas--Areas where medical facilities and providers of health care are limited.

5. Outcome-based accreditation--Program approval, based on

satisfactorily documented student outcomes, deemed by a recognized accrediting agency.

SUMMARY AND OVERVIEW OF CHAPTERS

Chapter I explained the purpose and need to implement a distance education program in respiratory therapy to facilitate the education and training of healthcare practitioners in medically underserved areas of Virginia. Described in this chapter were the events that led up to the implementation of the program and the specific areas designated as receive sites for the distance education respiratory therapy program.

Chapter II will provide information on previous, related studies on distance education respiratory therapy and the opinions of experts on this topic. Chapter III will consist of a detailed description of the assessments, surveys and score reports used in the testing methods from which conclusions were drawn. Chapter IV discusses the findings of the testing methods. Chapter V will summarize the study and make recommendations for further research.

CHAPTER II

REVIEW OF LITERATURE

The problem of this study was to compare the National Board for Respiratory Care entry-level credentialling examination scores of the J. Sargeant Reynolds Community College class of 1997 distance education respiratory therapy students with the J. Sargeant Reynolds Community College class of 1997 traditional respiratory therapy students' scores. Since the implementation of distance education, especially in respiratory therapy, is relatively new, little information on the specific topic was found. However, information was found on several topics relating to distance education, both in philosophy and in instructional technology.

This chapter will discuss: 1) the philosophy of the distance education respiratory therapy program, 2) the community of interest and need for the program, 3) the implementation of the program, and 4) the student outcomes.

THE PHILOSOPHY OF THE PROGRAM

There is much excitement and, sadly, much skepticism, about distance education. For those involved in distance education, every day lends itself to new discoveries, new challenges, and, of course, frustration. For those refusing to be involved in distance education there is short-sightedness. The term distance education represents a variety of educational models that have in common the physical separation of the faculty member and some or all of the students. As with all types of education, the various distance education models are built around the

central components of the instructional process: presentation of content; interaction with faculty, peers and resources; practical application; and assessment. (UMD, 1997, p.1)

THE COMMUNITY OF INTEREST AND NEED

Respiratory care leaders met at the 1993 American Association for Respiratory Care National Consensus Conference on Respiratory Care Education and developed a report entitled "Year 2001: Delineating the Educational Direction for the Future Respiratory Care Practitioner". The report states, "different types of nontraditional instruction will exist, among them, distance learning through teleconferencing. Education will become more flexible to meet adult learning needs". (Green, 1994, p. 107)

In campus-based undergraduate courses, technology has proven to be capable of providing a means for a rich and collaborative learning environment, thus exceeding the traditional classroom in its ability to connect students and course materials at anytime. (Alrajeh, et al, 1998) With adult students enrolled to redirect their careers, women starting their careers after their children have grown, and students unable to relocate to receive an education in their chosen field, distance education addresses their needs with more options than campus-based courses.

Some faculty are not receptive to becoming involved in distance education delivery. The general barriers to the use of educational technology include: 1) lack of information about technology, 2) length of time for widespread use, and 3) inappropriate match between technology and service. There is also an opinion that

a general panacea approach with a technological solution which leads to machine mysticism based on a misperception that technical advance leads to progress and the myth that a cultural lag occurs everywhere as we try to keep up with progressive technology. (Cassidy, et al, 1996)

To help alleviate these feeling, institutions should establish some faculty incentives that recognize additional time faculty may spend in training and in planning an effective distance education course. Stand-up trainers are skilled at developing and presenting their curriculum "live," but most do not have backgrounds in developing curriculum for computer-based delivery (instructional design and flowcharting) or in computer programming. (Phillips, 1998) The recruitment and selection of good distance education faculty is critical to the success of the program. Faculty who volunteer to participate in new modes of delivery are usually more successful and experience greater satisfaction than those who are assigned to participate. However, there are not always volunteers willing to teach the needed subjects. Using experienced and successful distance education faculty to recruit others is generally effective. (UMD, 1997)

All of these approaches are becoming more and more visible because the National Information Infrastructure is evolving, as is educational reform. (Cassidy, et al, 1996) Being a champion for progressive educational philosophies and educational reforms has been an agenda for the respiratory therapy accrediting agency for several years. By its nature, respiratory therapy lends itself well to the distance education technology and pedagogy.

An example of this is shown by computer technology in medical education including all the activities that are involved in instruction and evaluation, administration of medical education programs, retrieval and storage of clinical information, and integration of computer technology into the medical curriculum. (Alrajeh, et al, 1998) Further, ventilators and many other types of equipment used specifically by respiratory therapists are driven by computer technology.

As the word gets out about the capabilities of educational technologies and with the increasing number of people desiring to reap the benefits that this technology affords, the use of cutting edge technologies must be sped up to increase the productivity of education. (Harlacher, 1988, p. 7) While academic programs have improved the quality of respiratory care education, the elimination of hospital based programs has resulted in a shortage of qualified/licensed respiratory care practitioners in geographically remote and medically underserved areas. (Harkins, et al, 1997, p. 165) Further, small community hospitals are one of the major employers in remote areas and many citizens desire to qualify themselves for employment there. However, it is difficult for many to relocate to receive an education. Non-traditional programs have assisted in improving the availability and accessibility of respiratory care education to isolated areas. (Harkins, et al, 1997, p. 165)

Recently, the passage of the respiratory therapy licensure bill by the Virginia General Assembly has brought on a new challenge of mandatory continuing education requirements to maintain eligibility to practice. The educational technology can be instrumental in answering this new pattern of

problems by providing a means to receive continuing education courses on site or within a reasonable driving distance. (Lane, 1998) Such things as a lack of funding necessary for attending state and national meetings, low staff commitment for traveling very far to receive continuing education, and the ever-changing field make it difficult to comply. The advantages of educational technology include cost efficiency, access to programming, enrichment, and new methods of instruction that reach all learning styles. (Lane, 1998)

PROGRAM IMPLEMENTATION

The goal of the JSRCC distance education respiratory program was to deliver affordable distance education to remote and the medically underserved areas of Virginia. The technology selected to deliver the instruction was the Optel Audiographics System. Course slides were prepared using Microsoft PowerPoint that were loaded onto computers at all of the receive sites. Writing tablets, used to project free-hand drawings and illustrations on the computer screen, and two-way voice were transmitted through modems connected by a teleconferencing bridge. All of the sites were connected at one time for synchronous classes of four to five students per site.

The major disadvantage to this system of audiographics is that the teacher and remote learner cannot see each other, thus only minimal student-teacher interaction is possible. (Harkins, 1997, p.164) Asking students to participate in conferencing is a priority and writing on the tablet helps to engage them in their learning. Interaction by students may account for up to forty percent of the grade.

With the requirement for meaningful interaction, students seldom fail to participate. Once they begin to interact, it becomes a pattern for them. (Lane, 1998) They begin to own the class and take responsibility for the quality of the discussions and learning. If students know in advance that an instructor will review and grade answers presented during a session, they will have added incentive to be ready for an instructor's questions. (Hodson, 1998) In the face-to-face classroom, up to sixty to eighty percent of the verbal exchange during class time comes from the instructor. This pattern is the opposite in computer and audio conferencing. (Lane, 1998)

Most learning styles can be accommodated by interaction through mixed media. Distance education also includes a component which enables students to become self-directed learners and reduce their sense of isolation. (Lane, 1998) Audio conferencing can be used more to dispel the student's sense of isolation from the instructor and peers. Formal audio conferences should be scheduled well in advance, an agenda should be set by the instructor, and students should have hard copies in their study guide or text of visuals. Additional visual materials are mailed or faxed to students, or students may download materials from the Internet. (Lane, 1998)

Voice mail for faculty and students will extend the bounds of instructor accessibility for students. Complete interactions can take place synchronously. Because this can be done from any phone in the world, instructors can be accessible to students at all times. Faculty are able to provide significant one-to-one instruction to students when they need it. (Lane, 1998)

To bring a different element into the course, guest experts in the content field are asked to present lectures or participate in question and answer periods though audio conferences. Interactive technology can provide the mechanism where medical expertise can be shared across geographic barriers. (Harkins, 1997, p. 167) Between Charlottesville, where University of Virginia is located, and Richmond, where Medical College of Virginia is located, the students have as instructors some of the nation's leading experts.

One of the most challenging aspects of distance education is to provide students who are not on campus with experiences that are equivalent to those of other students in fully equipped laboratories. Students who are not at the origination location should not be disadvantaged. (UMD, 1998) Students are sometimes required to travel to a central location with laboratory facilities to complete intensive lab modules. Similarly, they might travel to decentralized locations to do lab assignments. (UMD, 1998) In distance education, it is essential that faculty and administrators work together to think creatively about how to accomplish the educational objectives when students may not have ready access to all the campus-based resources. (UMD, 1998)

Bigger buildings have never made better scholars. The quality of education in tomorrow's universities will depend, as always, not on the physical edifice, but on the quality of thought and heart that goes into designing and delivering the overall educational experience. (Phillips, 1998) Dietz outlines the basic instructor/student interactions in the traditional learning process which include pre-, post- and in-class materials, instructor and student questions, gauging student

reactions and evaluating student comprehension. These interactions should occur in a distance learning environment as well as in the traditional classroom. (Dietz, 1998) Technology does not teach, people do. (Phillips, 1998)

JSRCC hires laboratory instructors, who are qualified employees at the local hospitals, where the laboratory and clinical experiences are provided. To reinforce procedures taught in the laboratory, video tapes are used for content that must be presented utilizing visuals. Off-the-shelf computer simulations are increasingly available and students may work in groups or alone at the campus computers loaded with the programs for laboratory. (UMD, 1998) Coupled with audio conferencing and computer conferencing technologies, an entirely new group of resources becomes available. Interaction can be carried on through more cost efficient methods which can be available to students in synchronous or asynchronous as the content or the instructor requires. The asynchronous mode allows all students to be productive when it is convenient for them. (Lane, 1997)

Because the mix of media and multimedia appeal to a variety of learning styles, students will learn more effectively than they would from only one medium. Each of the domains of Bloom's taxonomy of intellectual behavior, cognitive, psychomotor, and affective, can be utilized through the interaction of media. The act of formulating and verbalizing one's own ideas as well as responding to ideas by others are important cognitive skills. Collaboration contributes to higher order learning through cognitive restructuring or conflict resolution. (Lane, 1998)

Study or work groups of three and four students are able to accomplish tremendous amount of productive and innovative work. (Lane, 1998) Since

many of the distance students are working adults with families, laboratory times must be flexible according to the schedules of the students and instructors at each location.

STUDENT OUTCOMES

The JSRCC distance education respiratory therapy program faculty measures each of the domains of Bloom's taxonomy of intellectual behavior, 1) cognitive, 2) psychomotor, and 3) affective, through several evaluation tools. The cognitive domain is measured through objective tests that may be faculty or computer generated. Also, standardized self-assessment examinations, written by the NBRC, are administered to the students just prior to graduation. Students must achieve a passing score on the examination as a graduation requirement.

With the many clinical instructors at various sites, it is the practice of the JSRCC program to assess the psychomotor domain in clinical competency by having one on-campus faculty member conduct a clinical practical examination of each student on skills taught for each semester. The tool used is a commer-cially prepared competency-based tool of nationally accepted clinical practice guidelines. The affective domain is evaluated by the local instructor through the use of a subjective tool developed by the researcher. After graduation, the student writes the NBRC credentialling examination. Upon receiving a passing score, the graduate will become a Certified Respiratory Therapist (CRT).

Since the implementation of the JSRCC distance education program four years ago, more than fifty students have graduated and most are employed in their

community hospitals. The future of this technology depends on overcoming difficulties related to the increased workload for faculty members in medical education. It will be necessary to provide training for faculty members on how to utilize collaborative learning approaches. (Alrajeh, et al, 1998)

SUMMARY

The review of literature discussed various studies, articles and experts opinions on the comparison the student outcomes of the distance learning respiratory therapy program to the traditional respiratory therapy program at J. Sargeant Reynolds Community College. While research was not strong in this specific category, distance education is a comparable alternative to the traditional classroom setting for delivering respiratory therapy education.

Research showed that distance education is a more compatible learning situation for the working adult than the traditional program and reached students who would otherwise not be able to have the opportunity to pursue this career. It also showed that distance education facilitates critical thinking, student responsibility, and diversity of learning types. It has been concluded that in many ways, the JSRCC Distance Education Respiratory Therapy Program has had an impact on remote areas and the medically underserved areas of Virginia.

CHAPTER III

METHODS AND PROCEDURES

The problem of this study was to compare the National Board for Respiratory Care entry-level credentialling examination scores of the J. Sargeant Reynolds Community College class of 1997 distance education respiratory therapy students with the J. Sargeant Reynolds Community College class of 1997 traditional respiratory therapy students' scores. In order to determine this, a population was selected, data were collected and compiled, and statistical analyses were performed. This chapter will discuss each of these areas, in addition to the research method used in the study.

The methods of research used in this study were finding and analyzing existing data from surveys and purchased examinations of both the traditional and distance students. Also new data were collected from surveys sent to the graduates and their employers. Next, the cumulative grade point averages from school records were examined. Finally, data were collected, recorded on a master list, and analyzed to search for a difference. This was an experimental study.

POPULATION

The population in this study was the student body of the class of 1997 of J. Sargeant Reynolds Community College Respiratory Therapy Programs in Richmond, Virginia. From this population, two main sample lists of students were generated for the purpose of comparing them to each other. Included in these lists

were a stratified sample of students with two or more year of on-the-job training in respiratory therapy prior to enrolling in the programs.

The first list was comprised of the in-house students enrolled in the respiratory therapy program at JSRCC. It was compiled by obtaining the class rosters for the class beginning Fall Semester, 1996. Twenty-six students were on this list.

The second list was comprised of the students enrolled in the distance education respiratory therapy program at JSRCC. It was compiled by obtaining the class rosters for the class beginning Fall Semester, 1996. Thirteen students were on this list.

The next lists of students were a stratified sample population of three in-house students with two or more years of previous experience in respiratory therapy and three distance education students with two or more years of experience in respiratory therapy.

Data Collection

In order to collect the data needed, each student's record was reviewed and its contents were recorded. First, permission for access to records was granted by the program head of respiratory therapy. Second, from interviews with the clinical coordinators, students with at least two years of previous experience in respiratory therapy prior to enrollment were identified. Third, graduate exit data and graduate scores from the National Board of Respiratory Therapy (NBRC) credentialling examination score were collected. Once the data were collected from students'

records, they were compiled and counted in preparation for analysis. There were four sets of data which were collected in order to perform the necessary calculations. These were:

1. The NBRC entry-level credentialling exam scores.
2. The grade point averages at the completion of the programs.
3. The Program Exit Rating Survey forms received from students upon graduation.
4. The Post-Graduate Rating Survey forms received by graduates one-year after graduation.

Statistical Analysis

Once the data collection and compilation were completed, statistical analyses were performed. The t-test was selected for its ability to determine if there is a significant difference between two sets of numbers. The purpose of the first t-test was to determine if there were significant differences in the students' scores on the NBRC entry-level credentialling exam between the in-house and the distance education respiratory therapy students. The purpose of the second t-test was to compare GPAs of the traditional and distance education students.

Summary

This chapter has discussed the methods and procedures which were followed in order to accomplish the stated research goals. A population was defined and data were collected, compiled and analyzed. The findings, conclusions

and recommendations which were drawn from this research will be presented and discussed in Chapters IV.

CHAPTER IV

FINDINGS

This study was conducted to compare the National Board for Respiratory Care entry-level credentialling examination scores of the J. Sargeant Reynolds Community College class of 1997 distance education respiratory therapy students with the J. Sargeant Reynolds Community College class of 1997 traditional respiratory therapy students' scores. This chapter will present the findings of the research conducted.

PRESENTATION OF DATA

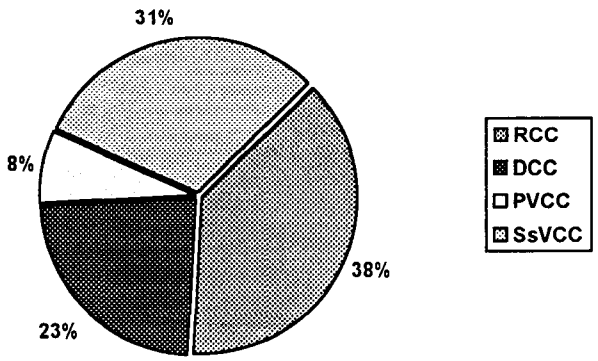
There were two population groups compared in this study. One group of 13 students was enrolled in the distance education respiratory therapy program. The other group of 26 was enrolled in the in-house respiratory therapy program, both during the 1996-98 academic years. Figure 1 shows the following comparisons:

Geographical locations of the 13 students who matriculated in the distance education program were: Rappahannock Community College, Glenns Campus, five or 38% of the students; Danville Community College, three or 23%; Piedmont Virginia Community College, one or 8%; and Southside Virginia Community College, Christianna Campus, four or 31%. Of the 13 students matriculating in the distance program, eleven or 85% graduated. This calculates to a two student or 15% attrition rate. The in-house program graduated 18 out of 26 students enrolled, or 70%, with eight students or a 30%

attrition rate. Students entering these programs are required to complete 22 credits of general education consisting of human anatomy and physiology, college English, social sciences and physical education. It has been demonstrated that students matriculating having completed these courses have been adequately prepared to be successful.

Figure 1

Geographical Comparison of Distance Student Population



There appears to be a noticeable difference in the reasons the distance students and the in-house students attrit. These differences are shown in Table 1 as follows:

- The comparison of students who graduate versus the attrition rate between the distance and in-house programs.
- The causes of attrition from the distance program were failure to complete laboratory assignments (50%) and withdrawal due to personal problems (50%).

- The causes of attrition from the in-house program were failure to complete laboratory assignments (10%), failure to maintain passing scores (80%) and withdrawal due to personal problems (10%).

Table 1

Comparison of Percentages of Graduates and Causes for Attrition Between Distance and In-House Students

Program	% Graduates	% Attrits	Grades	Laboratory	Personal
Distance	85%	15%	5%	45%	50%
In-House	70%	30%	80%	10%	10%

The distance and in-house students completed program exit surveys just prior to graduation. (See Appendix A) These surveyed the students' opinions on how well they were prepared in areas of cognitive and clinical competencies. One-year after graduation, program satisfaction surveys were mailed to the distance and in-house graduates. (See Appendix B) These surveyed the graduates' opinions on how well they were prepared for their jobs. Six months after the students graduated, employer surveys were mailed to rate the distance and in-house graduate's performance. (See Appendix C) Figure 2 will show the results of the surveys as follows:

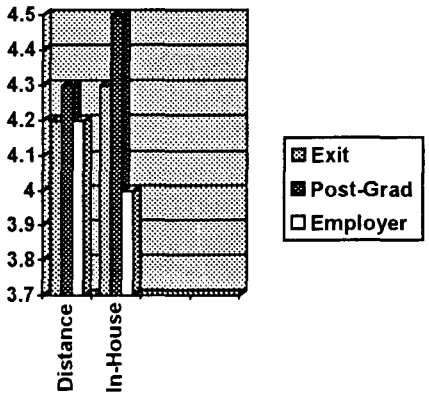
- The students rated their overall preparation to practice respiratory care as 4.2 and 4.3, respectively, agree, on a Likert scale of 1-5 with 5 being "Excellent". One hundred percent of the surveys were returned.

- The graduates rated their preparation for their job as 4.3 and 4.5, respectively, agree and strongly agree, on a Likert scale of 1-5, with 5 being "Excellent". Thirty-five percent of the surveys were returned.

- Employers rated the job performance of the distance and in-house graduates as 4.2 and 4.0, respectively, agree, on a Likert scale of 1-5, with 5 being "Excellent". Seventy-five percent of the surveys were returned.

Figure 2

Results of Surveys



Comparison of Groups

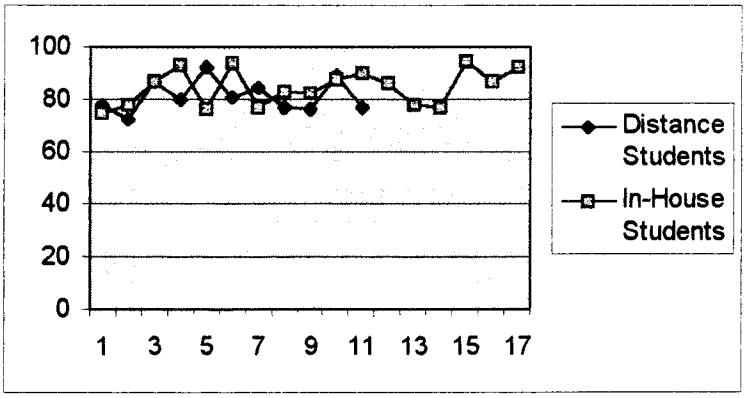
Two t-tests were performed using the findings of this research. The results were as follows:

The results of test 1 (See Appendix D), was used to compare the National Board for Respiratory Care entry-level credentialling exam scores of the distance to the in-house students, had a $t = 1.498$. From a two-tailed test at the .05 level of significance, a P value of < 2.056 was shown. This indicates

there is no difference between the two groups. Figure 3 demonstrates this comparison.

Figure 3

Comparison of NBRC Scores



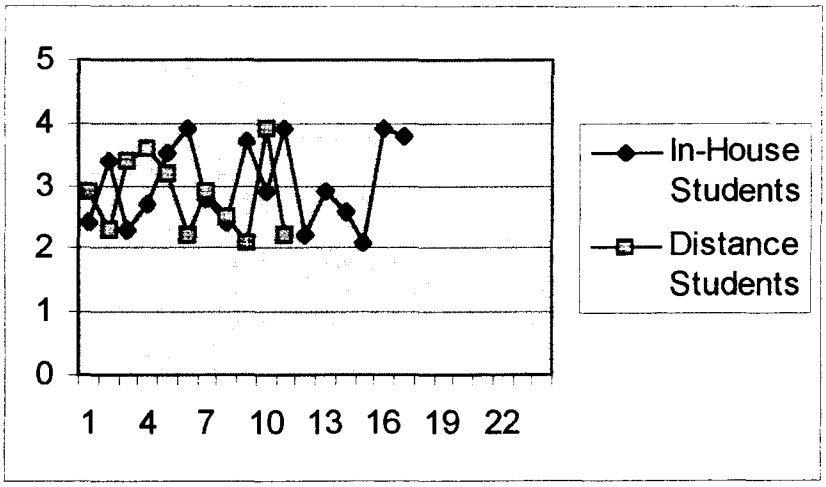
The results of test 2 (See Appendix E), was used to compare the GPAs of the distance students to the in-house students, had a t = .780. From a two-tailed test at the .05 level of significance, a P value of <2.056 was shown. This indicates there is no difference between the two groups. Figure 4 demonstrates this comparison.

Summary

This chapter has reported the results of a comparison of the NBRC entry-level credentialling scores and GPAs of the distance education respiratory therapy

Figure 4

Comparison of GPAs



students to the in-house respiratory therapy students. Chapter V will analyze these finding as well as provide conclusions and recommendations.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

The purpose of this chapter is to summarize previous chapters, to draw conclusions based on the data presented, to make recommendations, and to suggest ideas for further study.

Summary

This research was conducted after the implementation of the pilot distance education program established at J. Sargeant Reynolds Community College to serve as a model for future distance education programs in the Virginia Community College System. A review of literature showed that students can receive an education through a non-traditional means of delivery that is comparable to the education students receive in a traditional classroom setting. Thus, the purpose of this research was to compare the performance of the distance education respiratory therapy students to the traditional respiratory therapy students at J. Sargeant Reynolds Community College.

The problem of this study was to compare the National Board for Respiratory Care entry-level credentialling examination scores of the J. Sargeant Reynolds Community College class of 1997 distance education respiratory therapy students with the J. Sargeant Reynolds Community College class of 1997 traditional respiratory therapy students' scores.

The population of this study was limited to the 1997 graduating class of the J. Sargeant Reyolds Community College Respiratory Therapy Program. From this population, two samples, traditional and distance students, were drawn. An additional limitation was that the student body was small.

This research was conducted by reviewing the school files of twenty-eight students. Eleven of these students were graduates of the distance education program and seventeen were graduates of the tradtional program in December, 1997. The GPAs and the NBRC entry-level credentialling examination scores were recorded for each of the graduates who took the examination. These results were reported in Chapter IV. When the research was complete, t-tests were performed to determine if there was a significant difference in the performance of the students between the two groups.

Conclusions

The hypothesis in this study was: H_0: students who study respiratory therapy at J. Sargeant Reynolds Community College through distance education will score equally to those who study through traditional methods when taking the entry-level credentialling examination. Based on calculated results, this hypothesis was accepted and it was concluded that students receiving an education in respiratory therapy technology from non-traditional means of educational delivery is comparable to the education received by the students in the traditional classroom setting. Specifically, scores on credentialling examinations and GPAs were comparable.

Recommendations

Based on the results and conclusions of this study, the following recommendations were made:

1. J. Sargeant Reynolds Community College should continue the distance education respiratory therapy program.

2. This study should be repeated when the distance education program has been in existance for at least five years to access a larger population of graduates.

3. Further study should include a comparison of the audiographics mode of educational delivery with an asynchronous mode of delivery.

4. A study should be conducted comparing the advance practice distance education program in Respiratory Therapy with the in-house advance practice program at J. Sargeant Reynolds Community College.

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Appendix A
Program Exit Rating Survey

Respiratory Therapy Program
J. Sargeant Reynolds Community College
PO Box 85622
Richmond, VA 23285-5622

EXIT SURVEY

Name: _____

Home Address: _____

_____

	Do Not Do	Poor	Fair	Avg	Very Good	Exec
What is your overall rating of how well prepared you are for your job?	0	1	2	3	4	5
How would you evaluate your overall knowledge of respiratory care?	0	1	2	3	4	5

How well were you prepared by the program to perform the following procedures?

A. <u>Data Collection</u>

1. Review existing data in patient record (history, physical, lab, etc.)	0	1	2	3	4	5
2. Recommend procedures to get more data (PFT, ABG, Oximetry)	0	1	2	3	4	5
3. Assess patient's respiratory status by inspection, palpation, auscultation and percussion.	0	1	2	3	4	5
4. Interview patient to determine current status(level of consciousness, ability to cooperate)	0	1	2	3	4	5
5. Perform bedside procedures (oximetry, weaning parameters, etc.)	0	1	2	3	4	5
6. Interpret results of bedside procedure (No.5)	0	1	2	3	4	5
7. Review planned therapy to establish therapeutic goals	0	1	2	3	4	5
8. Determine appropriateness of prescribed therapy and recommend needed change	0	1	2	3	4	5

B. **Equipment Management:**	Do Not Do	Poor	Fair	Avg	Very Good	Exec
9. Select and obtain appropriate equipment for respiratory care plan:						
a. oxygen administering devices, humidifiers and aerosol devices	0	1	2	3	4	5
b. ventilators and related equipment	0	1	2	3	4	5
c. regulators, flowmeters, and concentrators	0	1	2	3	4	5
10. Assemble, check for function and identify malfunctions of equipment:						
a. regulators, flowmeters, concentrators and administering devices	0	1	2	3	4	5
b. humidifiers and aerosol devices	0	1	2	3	4	5
c. ventilators and patient circuits	0	1	2	3	4	5
d. manual resuscitators, intubation equipment and artificial airways	0	1	2	3	4	5
e. oximeters, oxygen and blood gas analyzers	0	1	2	3	4	5
11. Take action to correct malfunctions of the equipment:						
a. oxygen administering devices	0	1	2	3	4	5
b. humidifiers and aerosol devices	0	1	2	3	4	5
c. manual resuscitation devices	0	1	2	3	4	5
d. ventilators and patient circuits	0	1	2	3	4	5
e. ntubation equipment and tracheostomy tubes	0	1	2	3	4	5
C. Clinical Practice :						
12.Explain therapy and goals to patient	0	1	2	3	4	5
13.Note, interpret and record patient response to therapy	0	1	2	3	4	5
14.Protect patient from nosocomial infection by adherence to infection control policy	0	1	2	3	4	5
15.Maintain proper cuff inflation and position of ET and Trach tubes	0	1	2	3	4	5
16.Perform arterial puncture	0	1	2	3	4	5

Conduct therapeutic procedures to achieve removal of bronchopulmonary secretions including:

	Do Not Do	Poor	Fair	Avg	Very Good	Exec
17 Instruct and encourage proper cough technique	0	1	2	3	4	5
18.Perform postural drainage, percussion and vibration	0	1	2	3	4	5
19.Administer aerosol therapy (e.g. bronchodilators, saline, and mucolytics)	0	1	2	3	4	5

Conduct therapeutic procedures to achieve adequate spontaneous and artificial ventilation including:

20.Instruct patient in proper breathing techniques,incentive spirometry, etc.	0	1	2	3	4	5
21.Initiate and adjust continuous mechanical ventilation (e.g. Mode, volume, rate)	0	1	2	3	4	5
22.Institute and modify weaning procedures	0	1	2	3	4	5

Conduct therapeutic procedures to achieve arterial and tissue oxygenation including:

23.Administer oxygen to minimize hypoxemia (e.g. on and off ventilation, before & after suctioning)	0	1	2	3	4	5
24.Initiate and adjust CPAP, PEEP and combinations of IMV/SIMV and pressure support	0	1	2	3	4	5

Evaluate and monitor patient's responses:

25.To respiratory care including vital signs, cardiac rhythm, sputum production and susculation	0	1	2	3	4	5
26.To mechanical ventilation including FO liter flow volume, rate peak pressure, I:E ratio, MIP (NIF), flow and alarm systems	0	1	2	3	4	5

Make necessary modifications in therapeutic procedures including:

27.Terminate treatment based on patient's adverse reaction	0	1	2	3	4	5
28.Modify duration and/or technique of chest physiotherapy based on patient response	0	1	2	3	4	5

Recommend modifications in respiratory care based on patient response including:

	Do Not Do	Poor	Fair	Avg	Very Good	Exec
29.Discontinuation of, or change in duration of therapy	0	1	2	3	4	5
30.Change in oxygen therapy	0	1	2	3	4	5
31.Change in aerosol drug dosage or concentration	0	1	2	3	4	5
32.Change in weaning procedure	0	1	2	3	4	5
33.Change in mechanical ventilator settings	0	1	2	3	4	5
Initiate and conduct the following:						
34.CPR techniques in an emergency setting	0	1	2	3	4	5
35.Pulmonary rehabilitation/home care within the prescription (e.g. Modify procedure for use in the home, instruct patient's family, monitor equipment	0	1	2	3	4	5

Appendix B
Post-Graduate Rating Survey

J. SARGEANT
REYNOLDS
COMMUNITY
COLLEGE

POST OFFICE BOX 85622 • RICHMOND, VIRGINIA 23285-5622

September 23, 1999

Dear :

I would appreciate your completing a survey to evaluate your progress in the workforce as a 1997 J. Sargeant Reynolds Community College Respiratory Therapy graduate. This is an effort to improve instructional delivery and better prepare graduates for the workplace. You are our best resource for this information.

Enclosed you will find the survey. You are to rate the items addressed from 0-5 of how you believe they apply to you. Please return the completed survey to me in the self-addressed, stamped envelope by October 15, 1999.

Thanking you in advance for your cooperation, I am

Sincerely yours,

Gaynel Olsen, BS, RRT
Assistant Professor of Respiratory Therapy

Respiratory Therapy Program
J. Sargeant Reynolds Community College
PO Box 85622
Richmond, VA 23285-5622

POST GRADUATE SURVEY

Name: _____

Home Address: _____

_____

Respiratory Employer: _____

Position Title: _____

	Do Not Do	Poor	Fair	Avg	Very Good	Exec
What is your overall rating of how well the program prepared youfor your job?	0	1	2	3	4	5
How would you evaluate your overall knowledge of respiratory care?	0	1	2	3	4	5

How well were you prepared by the program to perform the following procedures?

A. <u>Data Collection</u>

1. Review existing data in patient record (history, physical, lab, etc.)	0	1	2	3	4	5
2. Recommend procedures to get more data (PFT, ABG, Oximetry)	0	1	2	3	4	5
3. Assess patient's respiratory status by inspection palpation, auscultation and percussion.	0	1	2	3	4	5
4. Interview patient to determine current status(level of consciousness, ability to cooperate)	0	1	2	3	4	5
5. Perform bedside procedures (oximetry, weaning parameters, etc.)	0	1	2	3	4	5
6. Interpret results of bedside procedure	0	1	2	3	4	5
7. Review planned therapy to establish goals therapeutic	0	1	2	3	4	5
8. Determine appropriateness of prescribed therapy and recommend need for change	0	1	2	3	4	5

B. Equipment Management:

	Do Not Do	Poor	Fair	Avg	Very Good	Exec
9. Select and obtain appropriate equipment for respiratory care plan:						
a. oxygen administering devices, humidifers and aerosol devices	0	1	2	3	4	5
b. ventilators and related equipment	0	1	2	3	4	5
c. regulators, flowmeters, and concentrators	0	1	2	3	4	5
10. Assemble, check for function and identify malfunctions of equipment:						
a. regulators, flowmeters, concentrators and administering devices	0	1	2	3	4	5
b. humidifiers and aerosol devices	0	1	2	3	4	5
c. ventilators and patient circuits	0	1	2	3	4	5
d. manual resuscitators, intubation equipment and artificial airways	0	1	2	3	4	5
e. oximeters, oxygen and blood gas analyzers	0	1	2	3	4	5
11. Take action to correct malfunctions of the equipment:						
a. oxygen administering devices	0	1	2	3	4	5
b. humidifiers and aerosol devices	0	1	2	3	4	5
c. manual resuscitation devices	0	1	2	3	4	5
d. ventilators and patient circuits	0	1	2	3	4	5
e intubation equipment & concentrators	0	1	2	3	4	5
C. Clinical Practice :						
12. Explain therapy and goals to patient	0	1	2	3	4	5
13. Note, interpret and record patient response to therapy	0	1	2	3	4	5
14. Protect patient from nosocomial infection by adherence to infection control policy	0	1	2	3	4	5
15. Maintain proper cuff inflation and position of ET and Trach tubes	0	1	2	3	4	5
16. Perform arterial puncture	0	1	2	3	4	5
Conduct therapeutic procedures to achieve removal of bronchopulmonary secretions including:						
17. Instruct and encourage proper cough technique	0	1	2	3	4	5

	Do Not Do	Poor	Fair	Avg	Very Good	Exce
18. Perform postural drainage, percussion and vibration	0	1	2	3	4	5
19. Administer aerosol therapy, (e.g. bronchodilators saline, and mucolytics)	0	1	2	3	4	5

Conduct therapeutic procedures to achieve adequate spontaneous and artificial ventilation including:

20. Instruct patient in proper breathing techniques, incentive spirometry, etc.	0	1	2	3	4	5
21. Initiate and adjust continuous mechanical ventilation (e.g. Mode, volume, rate)	0	1	2	3	4	5
22. Institute and modify weaning procedures	0	1	2	3	4	5

Conduct therapeutic procedures to achieve arterial and tissue oxygenation including:

23. Administer oxygen to minimize hypoxemia (eg.,on and off ventilation, before & after suctioning)	0	1	2	3	4	5
24. Initiate and adjust CPAP, PEEP and combinations of IMV/SIMV and pressure support	0	1	2	3	4	5

Evaluate and monitor patient's responses:

25. To respiratory care including vital signs, cardiac rhythm, sputum production and ausculation	0	1	2	3	4	5
26. To mechanical ventilation including liter flow volume, rate peak pressure, I:E ratio, MIP (NIF), flow and alarm systems	0	1	2	3	4	5

Make necessary modifications in therapeutic procedures including:

27. Terminate treatment based on patient's adverse reaction	0	1	2	3	4	5
28. Modify duration and/or technique of chest physiotherapy based on patient response	0	1	2	3	4	5

Recommend modifications in respiratory care based on patient response including:

29. Discontinuation of, or change in duration of therapy	0	1	2	3	4	5
30. Change in oxygen therapy	0	1	2	3	4	5
31. Change in aerosol drug dosage or concentration	0	1	2	3	4	5
32. Change in weaning procedure	0	1	2	3	4	5

	Do Not Do	Poor	Fair	Avg	Very Good	Exce
33. Change in mechanical ventilator settings	0	1	2	3	4	5
Initiate and conduct the following:						
34. CPR techniques in an emergency setting	0	1	2	3	4	5
35. Pulmonary rehabilitation/home care within the prescription (e.g. Modify procedure for use in the home, instruct patient's family, monitor equipment	0	1	2	3	4	5

General Information:

Length of employment at time of rating: _____

Based on your work experience, what are the program's major are of strength?:

_____

Besides the duties rated above, what other tasks or procedures were you expected to perform?: _____

_____

To help the program better prepare graduates, I offer the following comments and suggestions: _____

_____

_____

Appendix C
Employer Rating Survey

J. SARGEANT
REYNOLDS
COMMUNITY
COLLEGE

POST OFFICE BOX 85622 • RICHMOND, VIRGINIA 23285-5622

September 23, 1999

Dear :

I would appreciate your taking a few minutes of your time to complete a survey evaluating the 1997 J. Sargeant Reynolds Community College Respiratory Therapy graduates you have hired. This is an effort to better serve your employment needs and follow up on our graduates.

You will find enclosed a survey for each of the 1997 graduates who are, or have been, employed by your hospital. Please return the competed survey to me in the self-addressed, stamped envelope by October 15, 1999.

Thanking you in advance for your cooperation, I am

Sincerely yours,

Gaynel Olsen, BS, RRT
Coordinator, Distance Education Respiratory Therapy

Employer Rating of
J. Sargeant Reynolds Community College
Respiratory Therapist Program

Please give this form to the supervisor who has the most direct job contact with the graduate.

Graduate: _____

Directions:

Please use the scale provided for scoring. We require responses on the Short Form only unless a category is scored less that average, in which case we request you refer to that category on the long form for more detailed evaluation. We will combine the data for you. A score of "zero" is appropriate if your employee does not routinely perform that task.

	Do Not Do	Poor	Fair	Avg	Very Good	Exec
What is your overall rating of this graduate?	0	1	2	3	4	5
How would you evaluate this graduate's general knowlege of respiratory care?	0	1	2	3	4	5
How would you evaluate this graduate's effectiveness in communicating with physicians?	0	1	2	3	4	5

How well was this therapist prepared by the program to perform the following:

	Do Not Do	Poor	Fair	Avg	Very Good	Exec
A. Professionalism and Job Performance (e.g., attendance, punctuality, appearance dependability, etc.)	0	1	2	3	4	5
B. Data Collection (e.g., patient record review, ABG/PFT/ Oximetry, assessment, interpretation, Recommendation of therapy changes)	0	1	2	3	4	5
C. Equipment Management (e.g., selects appropriately uses and corrects malfunctions of O_2 devices, humidifiers aerosols, ventilators, cylinders, intubation, equipment, etc.)	0	1	2	3	4	5

		Do Not Do	Poor	Fair	Very Avg	Good	Exec
		0	1	2	3	4	5
D.	**Performance of Clinical Practice** (e.g., explains therapy, performs and records therapy, maintains infection control, performs ABG, etc.)						
E.	**Airway Clearance Techniques** (e.g., suction, assisted cough, CPT, aerosol therapy, etc.)	0	1	2	3	4	5
F.	**Hyperinflation/Ventilation Procedures** (e.g., incentive spirometry, IPPB, can institute basic ventilation, weaning parameters, etc.)	0	1	2	3	4	5
G.	**Arterial and Tissue Oxygenation Procedures** (e.g., initiate/adjust, CPAP, PEEP, SIMV, pressure support, vital signs, ventilator adjustments)	0	1	2	3	4	5
H.	**Modify Therapy** (e.g., terminate if adverse reaction, modify CPT based on patient response, etc.)	0	1	2	3	4	5
I.	**Recommends Modification of Therapy** (e.g. d/c or change duration, modify O_2, change aerosol drug, modification to vent settings, etc.)	0	1	2	3	4	5
J.	**Can Initiate and Perform** (CPR, design rehab or home care program, patient/family instruction)	0	1	2	3	4	5

General Information:

Length of employment of graduate at time of rating: _____

What are this graduate's strengths as a respiratory therapy practitioner? _____

_____

What are this graduate's weaknesses as a respiratory therapy practitioner? _

_____

_____ _____

Employer Signature Date

Appendix D
Results of NBRC score t-tests

NBRC TEST RESULTS

Difference Between Two Independent Means

Number of Respondents in Group One	Number of Respondents in Group Two
11	17
Mean or Average For Group One	Mean of Average For Group Two
81	85
Estimated Standard Deviation For Group One	Estimated Standard Deviation For Group Two
6.9	6.9
Confidence Level	t-value
85.39%	1.498141

Appendix E
Results of GPA t-tests

GPA

Difference Between Two Independent Means

Number of Respondents in Group One	Number of Respondents in Group Two
11	17
Mean or Average For Group One	Mean of Average For Group Two
283	303
Estimated Standard Deviation For Group One	Estimated Standard Deviation For Group Two
65	67
Confidence Level	t-value
55.77%	.7803063