

# **A Comparative Study of the National Board for Respiratory Care Entry-Level Credentialing Examination Scores of the J. Sargeant Reynolds Community College**

**by Gay Olsen**

from *Inquiry*, Volume 5, Number 2, Fall 2000

© Copyright 2000 Virginia Community College System

---

## **Abstract**

This study compared the National Board for Respiratory Care entry-level credentialing 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 and found no significant differences.

## **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 reduced 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 medically 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 those areas 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 credentialing 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<sub>0</sub>: 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 credentialing examination.

## **BACKGROUND AND SIGNIFICANCE**

A study conducted by the Virginia Hospital Association of the needs in healthcare manpower in Virginia revealed 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 members of the 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 Technician (CRTT) credential and who would receive, upon completion, the advanced practice certificate. It was determined that starting with the advanced 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).

## **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 commercially 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 credentialing 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).

## **METHODS AND PROCEDURES**

The focus of this study was to compare the National Board for Respiratory Care entry-level credentialing 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.

The methods of research used in this study included 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 was a stratified sample of students with two or more years 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) credentialing 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 credentialing 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 credentialing 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.

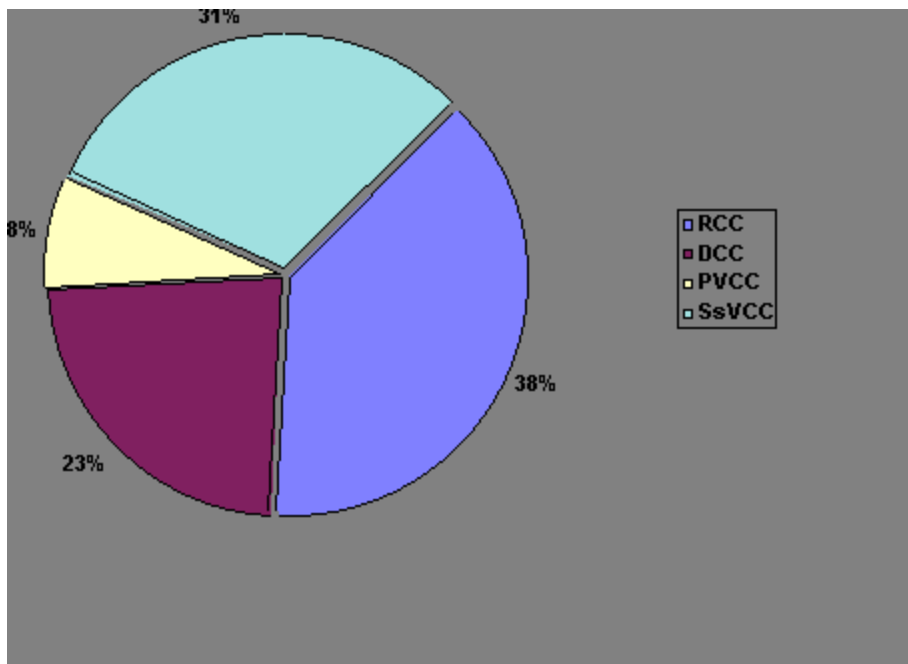
**PRESENTATION OF DATA**

There were two population groups compared in this study. One group of thirteen 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: Rappahannock Community College, Glens 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%.

**Figure 1**

<b>Geographical Comparison of Distance Student Population</b>	



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.

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

**Table 1**

<b>Comparison of Percentages of Graduates and Causes for Attrition Between Distance and In-House Students</b>					
Program	%Graduates	% Attrits	Attrit Due to Grades	Lab Skills	Personal
Distance	85%	15%	0%	50%	50%
In-House	70%	30%	80%	10%	10%

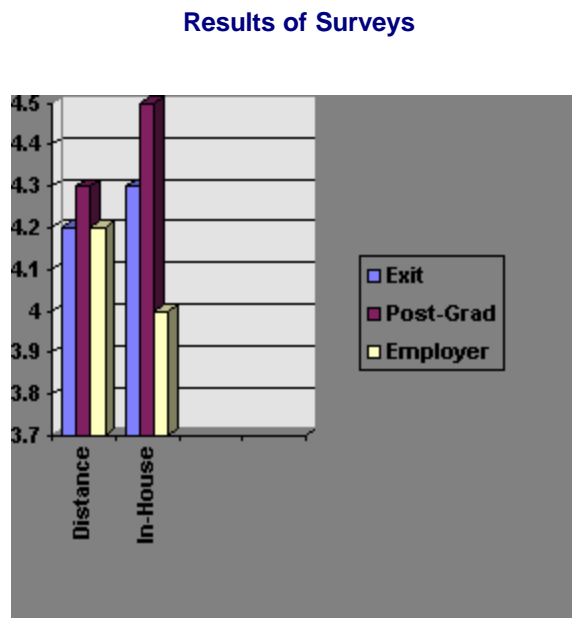
The table demonstrates the comparison of students who graduate versus the attrition rate between the distance and in-house

programs.

1. The causes of attrition from the distance program were failure to complete laboratory assignments (50%) and withdrawal due to personal problems (50%).
2. 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%).

The distance and in-house students completed program exit surveys just prior to graduation. 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. 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 graduates' performance. Figure 2 will show the results of the surveys as follows:

**Figure 2**



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

2. The graduates rated their preparation for their job as 4.3 and 4.5, respectively, on a Likert scale of 1-5, with 5 being “Excellent.” Thirty-five percent of the surveys were returned.
3. Employers rated the job performance of the distance and in-house graduates as 4.2 and 4.0, respectively, on a Likert scale of 1-5, with 5 being “Excellent.” Seventy-five percent of the surveys were returned.

## COMPARISON OF GROUPS

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

The results of test 1, used to compare the National Board for Respiratory Care entry-level credentialing 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.

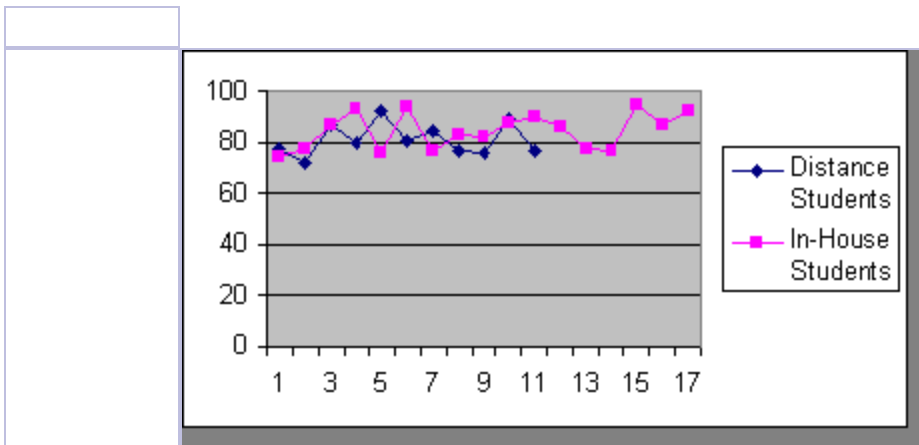


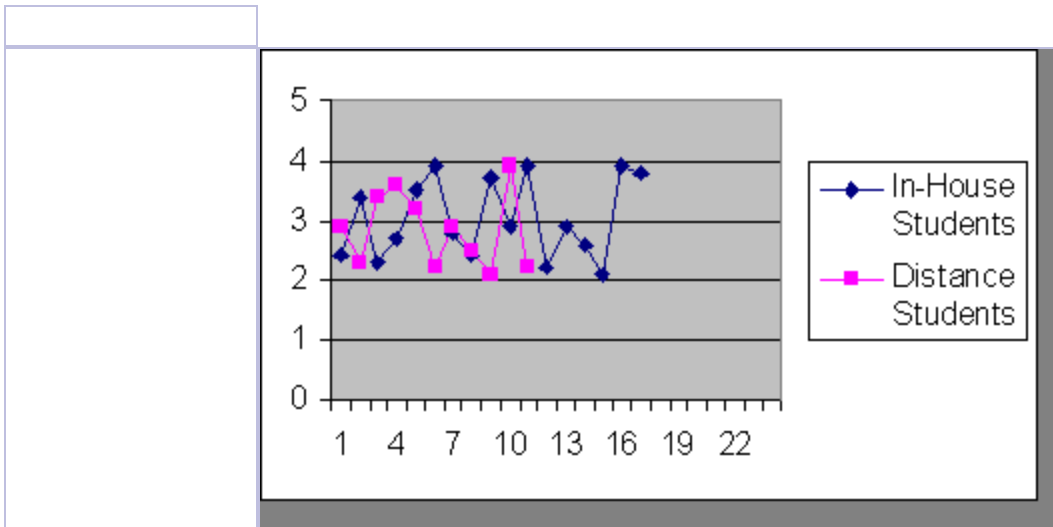
Figure 3

### Comparison of NBRC Scores

The results of test 2, 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.

Figure 4

Comparison of GPAs



## 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 credentialing examination. Based on calculated results, this hypothesis was accepted and it was concluded that students receive an education in respiratory therapy technology from non-traditional means of educational delivery comparable to the education received by the students in the traditional classroom setting. Specifically, scores on credentialing 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 existence 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.

#### BIBLIOGRAPHY

Alrajeh, Nabil and Janco, Bob MD. (1998) [A Model For Asynchronous](#)

[Learning Networks in Medical Education](#). Tennessee: ALN Magazine.

Author. (1998) [Models of Distance Education: A Conceptual Planning Tool Developed by University of Maryland University College for the University System of Maryland Institute for Distance Education](#). Found at the Web Site <http://www.umuc.edu/ide/modlmenu.html>.

Beck, Beverly. (1994) [PROPOSAL: An Alternative Form of Curricular](#)

[Delivery For Virginia Allied Health Education Programs](#). Unpublished.

Cassidy, Sheila and Lane, Carla, Ed. D. (1996) [Planned Change and the](#)

[Adoption of Distance Learning](#). California: Found at

<http://www.wested.ite/dlrn/dl.html>.

Dietz, Gary. (1998) [Distance Learning is Not just Videoconferencing](#). New

Hampshire: [WhitePineSoftware](#). Found at Web Site

<http://www.wpineccom/products/ClassPoint/cp-whitepaper>.

Etkin, Sally, Ph.D. (1997) Allied Health Distance Learning Project Report and Evaluation. Virginia: J. Sargeant Reynolds Community College Center for Distance Education and Instructional Technology.

Green, L. G.(1994)Different schools of thought. Texas: Respiratory Care Journal.

Lane, Carla, Ed.D. (1988) Strategic Planning: Providing Interaction Through Mixed Media in University Distance Learning Programs. California: Found at the Web Site: [http:// www.wested.org/tie/dlrn/strategic.html](http://www.wested.org/tie/dlrn/strategic.html).

Harkins, Lynda T. and Harkins, Cade J., III. (1997) Respiratory Care Education Goes the Distance. Illinois: Journal of Allied Health.

Harlacher, Ervin L.(1988) Cutting Edge Technologies in Community Colleges. Colorado: American Association of Community and Junior Colleges.

Hodson,Robert F., Ph.D. (1998) Merging Asynchronous and Synchronous Learning Networks with Web 4-M. Tennessee: ALN Magazine.

Phillips, Vicky. (1998) Selecting an Online Course Authoring System: Corporate Markets. Minnesota: Training Magazine.

---

**Gay Olsen, MS, RRT**, started the respiratory therapy program at Central Virginia Community College in 1972 and was program head until 1995. She started the distance education respiratory therapy program at JSRCC in 1995. Currently, the program delivers respiratory therapy training to six community colleges throughout the state using audiographics and web-based instruction. She would like to extend a note of thanks to Valerie Bredy, Health Technology Division Secretary, for her computer expertise in formatting the document and John Ritz, Ph.D., ODU, for his guidance in research methods.

