Respiratory Care Education Annual

The American Association for Respiratory Care

Volume 10 Spring 2001

Original Research

Evaluation of an Educational Method

Editorial Staff

Respiratory Care Education Annual is a publication of the American Association for Respiratory Care, 11030 Ables Lane, Dallas, TX 75229-4593. *Respiratory Care Education Annual* is a refereed journal committed to the dissemination of research and theory in respiratory care education. The editors seek reports of research, philosophical analyses, theoretical formulations, interpretive reviews of the literature, and point-of-view essays. Manuscripts should be submitted in three copies. The title page should contain (a) the title of the manuscript; (b) full names, institutional affiliations, and positions of the authors; and (c) acknowledgments of formal contributions to the work by others, including support of the research, if any. The first page of the article should repeat the title of the article and include an abstract of *no more than 120 words*. The name(s) of the author(s) should not appear on this or any subsequent page of the text. For rules governing references and style, consult the fourth edition of the *Publication Manual of the American Psychological Association*. Manuscripts that do not conform to these standards will be returned for revision. Send all submissions and editorial correspondence to the following address:

Education Department
American Association for Respiratory Care, 11030 Ables Lane, Dallas, TX 75229-4593

Respiratory Care Education Annual

Volume 10 Spring 2001

Original Research

Evaluation of an Educational Method

Respiratory Care Education Annual
Volume 10, Spring 2001, 3-13

Respiratory Therapists and the World Wide Web: Going Online to Satisfy Continuing Professional Education Requirements

Lynda Thomas Goodfellow
Georgia State University

Kathy J. Perdue
Atlanta, Georgia

Thomas Valentine
University of Georgia

Abstract

Most respiratory therapists (RTs) in the United States are required to complete continuing professional education (CPE). Although World Wide Web (Web)-based CPE is available, the number of RTs participating in this form of education is minimal. This study examined the perceptions of RTs in Georgia concerning their reasons for participating or not participating in Web-based CPE. Sixteen items with the capacity to motivate or deter participation were ranked. The top motivation items related to time, convenience, and the elimination of travel. The deterrence items encompassed concerns about credibility and accuracy of content, and loss of personal interaction. Dissemination of this information to stakeholders in the continuing education process will allow for successful development of Web-based CPE in the future.

Respiratory Therapists and the World Wide Web: Going Online to Satisfy Continuing Professional Education Requirements

The invariable and ever-quickening pace of change in the world today dictates that practicing professionals engage in the practice of lifelong learning. As various researchers (Nowlen, 1988; Queeney & English, 1994) have determined, the factors contributing to this demand include the changing nature of information and knowledge, increasing organizational complexity with the drive to maintain excellence and to remain competitive, the public's demand for professional accountability, the threat of malpractice litigation, the rapid development of new technologies, and shifts in governmental regulatory patterns. All of these factors are combining to place a growing demand on respiratory therapists (RTs), as members of the healthcare team, to be involved in meaningful lifelong learning.

Confronting this vision is the reality that RTs' usefulness to their patients' well-being is threatened by obsolescence due to the phenomenal growth rate of new knowledge and information relevant to the field of medicine. As a way of protecting the public from the consequences of RTs who do not remain current or "up-to-date," 35 of 45 state licensing agencies currently mandate continuing professional education (CPE) for RTs (American Association for Respiratory Care [AARC], 2000). State law and rules govern the number of CPE hours required by state licensing agencies; this includes the District of Columbia. RTs are currently required to complete a mean of 10 hours of CPE per year. A summary of the state licensure CPE requirements for RTs in the United States is presented in Table 1.

RTs in Georgia, like those in many other states, are faced with CPE requirements by government entities. State law requires that an individual engaged in the practice of respiratory care in Georgia must be licensed to use the RCP (respiratory care professional) designation. In order to maintain this license in Georgia, RTs must complete 30 hours of CPE preceding each biennial permit renewal. CPE offerings from a variety of sources are acceptable, i.e., offerings approved by the AARC, the American Thoracic Society (ATS), the American College of Chest Physicians (ACCP), the American Heart Association (AHA), the American Society of Anesthesiology (ASA), and the American Medical Association (AMA); offerings related to cardiopulmonary topics approved by the Georgia Nurses Association (GNA); and self-assessment and re-credentialing exams from the National Board for Respiratory Care (NBRC; K. Mason, personal communication, March 1999).

Program planners believe there are many reasons why professionals do not participate in continuing education (Cervero & Wilson, 1994). Queeney (1995) tells us that the greatest barrier to pursuing mandatory or additional CPE is professional adult learners' lack of time for educational activities. Yet, very little empirical evidence exists to support this global statement. Several independent study options have come to be seen as attractive alternatives to traditional classroom-bound training (Verduin & Clark, 1991). These include correspondence courses, satellite, teleconferencing, compressed video, cable television, interactive computer, and other distance learning modes. Because of this, there is a need to study how World Wide Web (Web)-based notions of continuing and/or distance education affect lifelong learning in the respiratory therapist and other adult professionals.

Table 1
State Licensure CPE Requirements for RTs in the United States

State	Hours/year
Arkansas	6/1
Arizona	20/2
California	15/2
Connecticut	pending
Delaware	20/2
District of Columbia	16/2
Florida	24/2
Georgia	30/2
Idaho	12/1
Illinois	24/2
Indiana	15/2
Iowa	30/2
Kansas	12/1
Kentucky	24/2
Louisiana	10/1
Maine	30/2
Maryland	16/2
Massachusetts	15/2
Minnesota	24/2
Mississippi	20/2
Missouri	24/2
Montana	24/2
Nebraska	20/2
New Hampshire	10/1
New Mexico	20/2
New York	30/3
North Dakota	10/1
Ohio	12/2
Oklahoma	12/2
Oregon	15/2
South Carolina	15/2
South Dakota	20/2
Tennessee	10/1
Texas	12/1
West Virginia	20/2

Note. CPE = continuing professional education; RTs = respiratory therapists. Six states do not regulate the practice of respiratory care; 10 others do not require CPE for licensure.

The Web has proven to be a valuable tool for augmenting traditional education and even an alternative means to traditional education. The Web is capable of connecting learners to an enormous fund of information and multimedia learning materials (Simoff & Maher, 1997). As a result, the option of utilizing Web-based training — that is, taking advantage of multimedia and computer networking to mediate and support instruction when teachers and learners are separated in place and/or time — as a means of accommodating mandatory continuing education requirements has caught the interest of many adult professionals, according to Simoff and Maher.

One of the primary benefits of this type of training is obvious: Participants have the option of completing their CPE requirements without having to take valuable time away from work. Web-based training gives control of scheduling and pacing of learning to the consumer and eliminates travel time. This allows RTs to better accommodate continuing education into their professional schedule. It is probable that RTs are still in the process of deciding if this innovation is a desirable alternative for CPE.

Because a variety of organizations, including state and national professional associations, public education institutions, and private educational organizations, are beginning to investigate developing and offering Web-based courses for professionals (Khan, 1997), the need to fill this gap in the literature is a timely one. If Web-based education is to fulfill its true potential, program planners and other interested constituencies, such as state regulatory boards, need to know the motivators and deterrents that RTs have for participating and for not participating in this form of distance learning.

Purpose

The purpose of this study was to identify the deterrents and motivators to participation in Web-based CPE for RTs. The following research question guided this study: What is the relative importance of specific reasons that either motivate or deter participation in Web-based CPE by RTs?

Methodology

Instrumentation

A research tool in the form of a survey instrument was developed to address the research question in this study. The instrument used in this study was a mailed self-completion survey designed to gather information about motivators and deterrents to participation in Web-based CPE. The motivation section of the survey was developed through a systematic process based on Kahn's (1997) Web-based instructional features. After review and elimination of redundancies, 16 motivation items were included on a study survey instrument. The deterrent items of this instrument were based on factors previously identified in a similar study of certified public accountants (Perdue & Valentine, 1998). The final instrument consisted of 16 motivational items, 16 deterrent items, and 8 personal and professional variables. Reliability scale analysis revealed a coefficient alpha of 0.934 for the motivation scale and a coefficient alpha of 0.905 for the deterrence scale.

Sampling and Data Collection

Approximately 4,000 RTs are licensed in Georgia. A sample of 300 RTs was randomly selected from the biennial year 2000 RCP state licensure list maintained by the Georgia Composite State Board of Medical Examiners. In August 2000, the 300 RTs were mailed a copy of the survey. After two follow-ups, 110 returned usable surveys, resulting in a final response rate of 37%.

Description of Respondents

The 110 respondents ranged in age from 24 to 67, with a mean age of 40.1 years. The number of CPE hours completed during the last reporting period ranged from zero to 150 hours, with a mean of 31.8 hours. A majority (65.4%) of respondents were female. With respect to educational attainment, 9.3% of respondents indicated they held no college degree, 43.0% held an associate's degree, 34.6% held a bachelor's degree, 6.5% held a master's degree, and 0.9% held a doctorate. The majority (66.4%) had used the Web to purchase goods or services. Even though the survey instrument did not ask specifically as to the availability of computers or the Web, only one respondent indicated that he or she did not have access to the Web. A summary of personal and professional characteristics of RTs completing the study survey instrument is provided in Table 2.

Data Analysis

Responses were analyzed using SPSS for Windows. To address the research question, item means were tabulated and ranked in order to compare RTs' ratings of the deterring and motivating survey items.

Table 2
Personal and Professional Characteristics of Study Respondents (N = 110)

Characteristic	*M* (*SD*) or percent
Age (in years)	40.1 (8.77)
Hours of CPE completed during last reporting cycle	31.8 (19.7)
Hours of Web-based CPE completed during last reporting cycle	2.4 (6.5)
Gender	
Female	65.4%
Male	34.6%
Degree level	
Associate	43.0%
Bachelor	34.6%
Master	6.5%
Doctorate	0.9%
Other	9.3%
Purchased goods or services on the Web	66.4%
Purchased no goods or services on the Web	33.6%

Note. CPE = continuing professional education.

Table 3
Rank Order Listing of Motivators to Participating in Web-based CPE

Motivator	*M* (*SD*)
1. Web-based CPE courses fit into my busy schedule better than regularly scheduled classes.	5.25 (1.00)
2. Web-based CPE courses let me learn at any hour of the day or night.	5.22 (1.11)
3. Web-based CPE courses eliminate the need for travel.	5.09 (1.19)
4. With Web-based CPE courses I can start a course on the specific date that I find most convenient.	5.06 (1.10)
5. Web-based CPE courses let me learn at the location I find most convenient.	5.04 (1.09)
6. Web-based courses save me time.	4.99 (1.15)
7. Web-based courses make it possible to locate course topics not available in my area.	4.99 (1.12)
8. Web-based courses save me money.	4.95 (1.25)
9. Web-based CPE courses let me learn at my own pace.	4.93 (1.14)
10. Web-based CPE courses let me focus on the course content that I think is most important.	4.90 (1.13)
11. Web-based courses let me learn from experts who do not teach in my area.	4.85 (1.19)
12. With Web-based courses, I can print only those documents I find useful.	4.58 (1.17)
13. Web-based courses let me learn as I see fit without relying on other people.	4.36 (1.24)
14. With Web-based CPE, I can skip content I don't need.	4.13 (1.37)
15. Web-based courses let me remain comfortably anonymous.	3.84 (1.62)
16. Web-based courses let me interact with learners from other areas.	3.73 (1.36)

Note. CPE = continuing professional education.

Results

The survey contained 32 items that attempted to assess respondents' degree of motivation and deterrence to using Web-based CPE. At present, only 24% are using the Web for CPE, while 71% indicate they plan to use the Web for CPE in the future. Means for the motivating items ranged from 3.73 to 5.25 on a 6-point Likert scale (from 1 = *strongly disagree* to 6 = *strongly agree*). For the deterring items, means ranged from 2.05 to 3.60. Only one item on the deterrence portion of the survey established a mean at or above the 3.5 theoretical half point.

Table 4
Rank Order Listing of Deterrents to Participating in Web-based CPE

Deterrent	*M* (*SD*)
1. I am concerned about the way professional and credentialing agencies view the credibility of Web-based CPE courses.	3.60 (1.69)
2. The relevancy of course content in Web-based CPE courses concerns me.	3.14 (1.53)
3. The overall quality of Web-based CPE courses concerns me.	3.14 (1.54)
4. I would rather interact with people than sit and stare at a computer screen.	3.10 (1.43)
5. The accuracy of course content in Web-based CPE courses concerns me.	3.08 (1.49)
6. The lack of opportunities for professional networking in Web-based CPE courses concerns me.	2.92 (1.49)
7. The lack of face-to-face interaction with other learners in Web-based CPE courses concerns me.	2.62 (1.36)
8. The lack of face-to-face interaction with instructors in Web-based CPE courses concerns me.	2.57 (1.48)
9. I lack the computer skills necessary to participate in Web-based CPE courses.	2.53 (1.71)
10. I lack the computer hardware necessary to participate in Web-based CPE courses.	2.49 (1.69)
11. I am not sure my computer is good enough for participation in Web-based CPE.	2.43 (1.67)
12. I lack the time necessary to learn how to participate in Web-based CPE courses.	2.32 (1.33)
13. I lack the reliable Internet access necessary to participate in Web-based CPE courses.	2.30 (1.59)
14. I do not have the computer expertise necessary for participation in Web-based CPE courses.	2.16 (1.34)
15. I am not confident enough with computers to participate in Web-based CPE courses.	2.12 (1.39)
16. I do not have the patience to learn how to participate in Web-based CPE courses.	2.05 (1.23)

Note. CPE = continuing professional education.

The researchers believe that the top eight items in each category provide the greatest information regarding motivation and deterrence to respondents' participation in Web-based CPE. A rank order listing of the motivator and deterrent questions used in the survey instrument are depicted in Tables 3 and 4, respectively. Of the top eight items for motivation, five involve time constraints, scheduling, and access, while three address the need to travel and cost savings. The top eight deterrence items encompass course quality concerns and concerns about interpersonal interaction and electronic communication.

Only a few of the background or personal variables were significant in explaining participation in Web-based CPE. From Spearman's rho correlations, four tests were significant. The higher the educational degree, the less deterred RTs were by the equipment needed for Web-based CPE ($p = 0.01$) or by the level of skill needed to perform Web-based CPE ($p = 0.01$). Age was found to have a relationship to deterrence for obtaining the skills needed to perform Web-based CPE ($p = 0.03$), and if RTs had purchased goods from the Web in the past, then they indicated less deterrence for participating in Web-based CPE than those who had never shopped on-line ($p = 0.04$). Independent sample t tests were performed, and ethnicity and gender were found not to be a predictor to participation in Web-based CPE ($t = 1.014$ and $p = .313$, and $t = 0.55$ and $p = .581$, respectively).

Discussion/Implications

Web-based education is increasingly important to people in many settings, including those seeking to fulfill mandatory continuing education. The highest-ranking items of motivation for these RTs relate to time, schedules, access, and resources. These items involve the need for customization and convenience. From these results, the term *motivation* may appear to really mean features that facilitate participation, not its more conventional educational use related to expectancy of improvement or reward as the result of participating. Self-directed learners may prefer this form of CPE by tailor-making their course format into what is important to them.

In contrast, the deterrents to participating in Web-based CPE appear to address quality and electronic communication concerns and be attitudinal in nature, which tends to demonstrate a desire for protection of how RTs have always completed their CPE requirements. Quality issues are related to relevancy, accuracy, and the use of no written materials. This supports Hawkins' (1997) contention that the biggest obstacle to Web-based CPE is course content and richness of offerings. Concerns of course quality to others include the value placed on Web-based CPE courses relative to other forms of CPE, and concerns about documentation of CPE and acceptance of these courses by state licensing agencies.

The top-rated deterrent is real concern by RTs practicing in states that have not addressed Web-based CPE. In Georgia, this issue was resolved by accepting Web-based CPE only if one of the approved granting CPE agencies had given its approval, i.e., the AARC, ATS, ACCP, AHA, ASA, AMA, GNA, and NBRC (K. Mason, personal communication, March 1999). However, the results of this study indicate that many RTs in Georgia are still not aware of this ruling.

Four of the eight deterrent items deal directly with concerns about the specifics of

course quality. RTs' preference for traditional classroom education in general (lectures and printed materials) supports the literature indicating a resistance to change (Rogers, 1995). Also, their concern about the interaction with instructors and interaction with peers supports the literature stating that interaction is a primary stumbling block for electronic education (Eastmond, 1995; McCormack & Jones, 1998; Moore & Kearsley, 1996; Nguyen, Tan, & Kezunovic, 1996; Webb & Street, 1997; Wiesenberg & Hutton, 1995).

The other four deterrent items are communication-related quality concerns, i.e., relevancy, credibility, personal interaction, and accuracy of content. No interaction with instructors or other peers, and missed networking opportunities support the premise of resistance to change and perceived problems with electronic communication.

Although the means of individual deterrent items tend to be low, we believe that the results work synergistically to dissuade people from participating in education, thus the concept of a deterrent, not a barrier, which implies no participation. Perhaps the question for further study is to answer why, with such little deterring influence, is Web-based CPE so underutilized?

The top motivators for using Web-based CPE would allow professionals to schedule CPE on their own time, not during a rigid schedule or out-of-town conference. The research can assert that RTs are motivated to participate in Web-based CPE and have the confidence, knowledge, and skill capacity to do so. Also, having the authority to participate is not much of a problem. Again, the difference is partially explainable by the contextual arena of the study. As professionals, RTs have moved to include the use of technology in their professional practice. Utilization of the technology, combined with their educational and training achievements, may serve to enhance their knowledge and skills to interact with Web-based CPE and build their confidence in doing so.

The study provides practical contributions to the field of continuing education for professionals. The Web is increasingly being used as a valuable augment or alternative to traditional lecture CPE. The identification of perceived motivators and deterrents that influence the extent to which RTs participate in CPE via Web-based courses will help education providers better prepare to facilitate participation in this increasingly important adjunct form of education. This may result in the development of more responsive programming.

The results of the study identified the most important motivators and deterrents to participation in Web-based CPE. These individual items may be used by CPE providers as a list of prioritized crucial elements that should be addressed in the planning of future programs and in communicating about those programs. Communication of this information to the various stakeholders involved in the continuing education process, i.e., state licensing agencies, professional organizations, education providers, and the RTs themselves, would allow for greater understanding of what it will take to successfully develop Web-based education as an augment or alternative to traditional continuing professional education for respiratory therapists.

References

American Association for Respiratory Care. (2000). *Licensure matrix* [On-line]. Available: www.aarc.org/advocacy/state/2000_licensure_matrix.html#matrix

Cervero, R. M., & Wilson, A. L. (1994). *Planning responsibly for adult education.* San Francisco: Jossey-Bass.

Eastmond, D. V. (1995). *Alone but together: Adult distance study through computer conferencing*. Cresskill, NJ: Hampton Press.

Gantz, J. (1997, July 9). Web-based training can help IT organizations. *Computerworld*, 37.

Hawkins, D. T. (1997, May/June). Web-based training for online retrieval: An idea whose time is coming. *Online*, 68-69.

Khan, B. H. (1997). *Web-based instruction*. Englewood Cliffs, NJ: Educational Technology Publications.

McCormack, C., & Jones, D. (1998). Building a Web-based education system. *Wiley Computer Pub., xvii,* 446.

Moore, M. G., & Kearsley, G. (1996). *Distance education : A systems view*. Belmont, CA: Wadsworth.

Nguyen, A. T. A., Tan, W., & Kezunovic, L. (1996, July). *Interactive multimedia on the world wide web: Implementation and implications for the tertiary education sector.* Paper presented at the Second Annual Australian World Wide Web Conference, Goldcoast, Australia.

Nowlen, P. M. (1988). *A new approach to continuing education for business and the professions: The performance model, American Council on Education/Macmillan series in higher education*. New York: Macmillan.

Perdue, K. J., & Valentine, T. (1998). Beliefs of certified public accountants toward distance education: A statewide Georgia survey. *The American Journal of Distance Education, 12*(3), 29-41.

Queeney, D. S. (1995). *Assessing needs in continuing education*. San Francisco: Jossey-Bass.

Queeney, D. S., & English, J. K. (1994). *Mandatory continuing education: A status report.* Columbus, OH: ERIC Clearinghouse on Adult, Career, and Vocational Education.

Rogers, E. M. (1995). *Diffusion of innovations* (4th ed.). New York: Free Press.

Simoff, S. J., & Maher, M. L. (1997, July). *Web-mediated courses: The revolution in on-line design education.* Paper presented at the Third Annual Australian World Wide Web Conference, Lismore, New South Wales, Australia.

Verduin, J. R., Jr., & Clark, T. A. (1991). *Distance education: The foundations of effective practice*. San Francisco: Jossey-Bass.

Webb, G., & Street, M. A. (1997, July). *A theoretical framework for internet-based training at Sydney Institute of Technology.* Paper presented at the Third Annual Australian World Wide Web Conference, Lismore, New South Wales, Australia.

Wiesenberg, F., & Hutton, S. (1995, November). *Teaching a graduate program using computer mediated conferencing software.* Paper presented at the annual meeting of the American Association for Adult and Continuing Education, Kansas City, MO.

Author Note

Lynda Thomas Goodfellow, EdD, RRT, Director of Clinical Education and Assistant Professor, Department of Cardiopulmonary Care Sciences; Kathy J. Perdue, PhD, Certified Public Accountant; Thomas Valentine, PhD, Associate Professor, Adult Education.

The authors thank the Georgia Society for Respiratory Care for its financial support of this study.

Correspondence concerning this article should be addressed to Lynda Thomas Goodfellow, Department of Cardiopulmonary Care Sciences, Georgia State University, University Plaza, Atlanta, Georgia 30303. Electronic mail may be sent to Lynda Thomas Goodfellow at resltg@panther.gsu.edu.

Respiratory Care Education Annual
Volume 10, Spring 2001, 15-32

The Extent to Which Factors Relevant to Program Function Influence Effectiveness of Respiratory Care Education

Patrick L. Johnson, Jr.
Florida A&M University

Abstract

This study was designed to examine whether a variance in student and faculty credentials and fiscal expenditures were associated with program performance on the 1997 Certification for Respiratory Therapy Technician Examination (CRTTE). Of 234 accredited college-based respiratory therapist programs surveyed, 100 (42.7%) returned usable questionnaires. Results obtained from bivariate and stepwise regression analyses of respondent data revealed that grade point average of graduates; faculty credentials; and expenditures for travel, lab supplies, instructional aids, and electronic media were the strongest predictors found significantly related (p = .05) to program effectiveness. Based on overall pass rates and threshold level of success criteria, educational effectiveness was marginal because only 76% (n = 179) of the population exhibited a pass rate of 80% or higher. Student and faculty credentials and program financial expenditures of respondents accounted for 56% of the variation in the CRTTE criterion measure. Awareness of the degree and interrelatedness between program components (student, faculty, curriculum, and resource) and outcomes contributes to quality program effectiveness.

The Extent to Which Factors Relevant to Program Function Influence Effectiveness of Respiratory Care Education

More and better assessment is presumably one way to make institutions more accountable for the success or failure of their educational programs. Pressure to improve assessment of educational programs has manifested itself at every level and aspect of higher education, including health care programs (Astin, 1993; Banta, 1993; Gordon, 1988; National Commission on the Cost of Higher Education, 1998; Pew Health Professions Commission, 1993).

Professional accreditation has been a major catalyst driving assessment in respiratory care (RC) education (Cisneros-Blagg, 1984; Cisneros-Blagg & Scanlan, 1986; von der Heydt & Grossman, 1991). In 1986, RC became the first allied health group to shift its programmatic accreditation from a prescriptive, process approach to a system that is outcome oriented (Joint Review Committee for Respiratory Therapy Education [JRCRTE], 1986; von der Heydt & Grossman, 1991; Ward & Helmholz, 1997).

While the outcome-oriented assessment system has been in place for more than a decade, the validity of this approach has yet to be assessed in RC education (Douce, 1993). This paper examines empirical literature related to effectiveness of RC education. It also provides a conceptual framework and model designed to assess educational effectiveness and whether student, faculty, curriculum, and financial resource variables are related to the success of RC education.

Empirical Perspective

The literature was reviewed to learn what procedures and instruments proved useful in predicting educational outcomes in RC. Related literature was also reviewed to determine types of variables and the extent they have played in predicting effectiveness of RC education.

The majority of the literature in health-related professions has involved program performance based on cognitive criteria (Agho, Mosley, & Williams, 1999). Studies in RC education have been conducted for the purpose of validating cognitive and noncognitive criteria used in the selection of students. These studies were conducted to assess the utility of admission criteria, i.e., students' age, gender, achievement test and standardized college entrance examination scores, grade point average (GPA), interview ratings from selection process, number of college credit hours, and class size in predicting student success (Douce & Coates, 1984; Flanigan, 1985; Op't Holt & Dunlevy, 1992; Shaw & Prewitt, 1995; Smith, 1992).

The criterion measure for these studies consisted primarily of results obtained by the Certification for Respiratory Therapy Technician Examination (CRTTE) or parallel forms of this examination. Beginning in July 1999, the CRTTE examination was changed and replaced by the Certification for Respiratory Therapist (CRT) examination (National Board for Respiratory Care [NBRC], 1998).

The literature also consists of predictive studies conducted to determine whether decisions on professional accreditation status and curriculum requirements were related to

program pass rates on the CRTTE (Cisneros-Blagg, 1984; Cisneros-Blagg & Scanlan, 1986; O'Daniel, 1987). Cisneros-Blagg and Scanlan reported association between programs' accreditation status under the 1977 JRCRTE standards and CRTTE pass rates. O'Daniel reported a relationship between program CRTTE performance and number of instructional hours. When CRTTE pass rates were compared by program types and length of curriculum, O'Daniel found significant differences in pass rates between respiratory therapy technician and respiratory therapist programs.

One half of the studies in the literature documented samples drawn from a single institution (Douce & Coates, 1984; Flanigan, 1985; O'pt Holt & Dunlevy, 1992; Shaw & Prewitt, 1995). Four studies were conducted involving samples drawn from multiple institutions. In these studies, Johnson (1999) and O'Daniel (1987) used the survey method, whereas Cisneros-Blagg and Scanlan (1986) and Cisneros-Blagg (1984) reported data obtained from existing records. Samples drawn consisted of vocational and technical schools with respiratory therapy technician and respiratory therapist programs, and associate and baccalaureate degree (AD and BD) programs within 2- and 4-year colleges and universities, respectively. Sample sizes were adequate for the most part, though a sample of 59 drawn by O'Daniel may not have offered sufficient statistical power to detect statistical differences between groups.

Pearson product-moment and multiple regression procedures were predominantly used as means of data analysis. The CRTTE or a parallel form of the examination was consistently used as an indicator of program success across studies (Cisneros-Blagg, 1984; Cisneros-Blagg & Scanlan, 1986; Johnson, 1999; O'Daniel, 1987).

Within the context of this study, the methods and measures were comparable. In a classical sense, generalization beyond the samples and findings was not advised. The lack of sufficient literature to support the assumption that relationships exist between program inputs and outcomes is evidence that further study is needed.

Purpose

Upon investigating effectiveness of educational programs, three important questions emerged:

1. What factors are related to and/or predict effectiveness of educational programs?
2. What degree of confidence can be drawn about the extent of relationships between program inputs and outcomes? and
3. Does theory contribute to explanation of program effectiveness?

From the aforementioned, the following research questions were derived:

1. Is there a difference in the 1997 CRTTE performance between private, proprietary, state, and 2- and 4-year colleges and universities? Is there a difference in the 1997 CRTTE performance between AD and BD institutions?
2. Are student, faculty, curriculum, and resource factors of respiratory therapist programs related to CRTTE performance, and if so, to what quantitative extent?
3. To what extent can student, faculty, curriculum, and resource factors individually and collectively predict program performance on the CRTTE?

Conceptual Framework

The ultimate goal of RC education is to produce competent respiratory therapists. Effectiveness within a system is defined by its capacity to fulfill its ultimate goal (Cameron, 1978; Etzioni, 1964; Georgopolous & Mann, 1962; Georgopolous & Tannenbaum, 1957; Hall, 1978; Miller, 1991; Price, 1968, 1972).

According to Astin (1993), the degree of effectiveness depends primarily on having lots of resources: the more we have, the more excellent the institution and programs. The resources that are supposed to make us excellent are of three types: money, high-quality faculty, and high-quality students. In order to effectively produce competent respiratory therapists, institutions and their programs must have adequate resources to carry out the various functions.

Assumptions and Limitations

The basic underlying assumption of this study was that RC education possesses certain functional components: students, faculty, curriculum, and financial resources. The attributes of students and faculty and extent of curricula transactions and financial resources affect the educational process and subsequent effectiveness in goal achievement (DeLapp, 1979; Wholey, 1989). Thus, the relationship between functional component parts and goal achievement can be expressed in the following form:

1. If program resource inputs are available, then qualified faculty will be recruited and retained to provide the necessary curricula instruction and activities.
2. Given the appropriate faculty to develop, teach, and provide the appropriate curricula and activities, then students will be provided an opportunity to develop the required knowledge, skills, and attributes appropriate to entry-level practice as respiratory therapists.
3. If an appropriate curriculum is undertaken, then graduates of the program will exhibit the desired outcomes (knowledge and skills) expected at the entry level into practice as respiratory therapists.
4. If these activities and outcomes occur, then progress will be made toward graduates attaining professional competence, passing the CRTTE, and entering into practice.

A major limitation of the research design was the reliance on a single criterion measure and the ignoring of environmental factors that influence student outcomes. Professional competency is but one of many potentially important educational outcomes. Admittedly, the quality of an educational system is a complex multidimensional construct in both origin and meaning (Astin, 1993; DeLapp, 1979; Tuckman, 1979). The environment, physical resources, and perceptions of faculty, graduates, and employers are dimensions that were excluded by design of this study.

A criticism of this study might be that there was no control for the effect of class size, which in effect may have created surrogate measures (Cisneros-Blagg & Scanlan, 1986). The investigator believed that the stepwise multiple regression procedure used in this study was justified because it permitted controlling for potentially bias characteristics of component variables (Astin, 1993). According to Cisneros-Blagg and Scanlan, class size holds some predictive power in the population.

Methods

Given the research objectives of this study, a combined correlational and multiple regression methodology was employed. Although this methodology does not provide a firm inference about cause and effect, the multiple regression model does provide opportunity to draw generalizations about association and prediction of educational effectiveness (Astin, 1993; Pedhazur, 1982).

Instrument

Because the information needed to conduct this study was not accessible, the survey method was selected. An RC education questionnaire (RCEQ) was constructed to obtain factual information consistent with the objectives of this study. The RCEQ consisted of five sections requesting information relative to the 1997 fiscal year. The first section was concerned with determining demographic information, type of institution (private, proprietary, state, and 2- and 4-year college and university), and type of program (AD or BD).

The second section requested student data: enrollment and high school and/or college GPA on admission and upon completion of the program. The third section requested data characteristic of program faculty: total number of program faculty, highest academic degree earned, number of years of clinical experience and teaching, and number of publications (textbooks and articles in professional journals).

The fourth section requested data pertinent to program curriculum: total number of clinical clock hours and general education and professional course credit hours required to be admitted to the program and to graduate. The fifth and final section requested outcomes data whereby program directors were asked to report the total number of graduates taking and passing the CRTTE, program pass rate, and averages of raw and scaled score results of their 1997 class.

The RCEQ was first reviewed by allied health educators for clarity, ambiguity, and consistency with the research objectives. Further development of the RCEQ entailed conducting a pilot test where 30 respiratory therapist programs directors, considered to be experts in the field of RC education, were asked to participate in a pilot test.

The pilot test consisted of a test-retest procedure (McMillan & Schumacher, 1989; Oosterhof, 1990). A coefficient of stability was determined by obtaining correlation scores based on administering the questionnaire on two different occasions. The second administration (retest) of the same questionnaire occurred one month after the first mailing.

The investigator assumed that the characteristics measured remained constant over a period of time (McMillan & Schumacher, 1989). Responses from 27 of 30 (90%) program directors were consistent, as indicated by a high correlation coefficient. Between the initial and second round of questionnaires, respondents were consistent ($r = 0.88$) in reporting identical factual data. The RCEQ was revised based on feedback from participants in the pilot study. Afterward, questionnaires and pre-addressed envelopes were coded for mailing to programs listed in the directory of accredited programs.

Subjects

The unit of study of this investigation was college-based respiratory therapist education programs accredited by the Commission on Accreditation of Allied Health Education Programs, formerly the Committee on Allied Health Education Accreditation, in collaboration with the Committee on Accreditation for Respiratory Care (CoARC), formerly JRCRTE. Questionnaire packets were mailed to a total of 234 program directors listed in the directory of accredited education programs (JRCRTE, 1997). The programs were sorted, grouped, and coded categorically by type of sponsorship (2- and 4-year college or university) and type of degree (AD or BD) awarded.

Considering the fact that response rates to the initial survey were low (25.6 %), a follow-up survey was sent to nonrespondents one month after the initial mailing. A second follow-up to nonrespondents was conducted by telephone within 14 days of the second mailing, thereby increasing the response rate to 42.7 % (N = 100).

Criterion Measure

Because the pass rate on the CRTTE represented a measure of program proficiency and met standards demonstrable of acceptable validity and reliability in measurement of professional competence in RC, it was selected as the criterion measure for program effectiveness (Cisneros-Blagg & Scanlan, 1986; NBRC, 1997; *Uniform guidelines*, 1973). In determining the usefulness of the CRTTE as a criterion measure, it was important to examine its consistency and reliability (Ary, Jacobs, & Razavieh, 1985; Banta & Pike, 1989; Parks, 1981).

The reliability of CRTTE results for March, July, and November 1997 was relatively stable as exhibited in Table 1 (S. Bryant, personal communication, October 6, 1998). These data are similar in nature to the statistics obtained from March 1990 through November 1996 test administrations. As a result, the 1997 CRTTE data were accepted based on acceptable test development procedures (NBRC job analysis, content specification, and validity), high reliability coefficients over an 8-year period, and low standard error of measurement as evidence of sufficient test reliability (Ary et al., 1985; NBRC, 1997).

In defining the degree of proficiency representative of program effectiveness, the CRTTE threshold of success level for program pass rates established by CoARC (2000)

Table 1
Results of Descriptive Statistics for 1997 CRTTE

Date	Raw passing score	*M* (*SD*)	*n*	K-R 20	*SEM*
March	93	100.7 (15.84)	1,253	.91	4.75
July	90	100.97 (15.54)	3,131	.91	4.66
November	96	101.63 (13.72)	1,538	.88	4.75

Note. CRTTE = Certification for Respiratory Therapy Technician Examination; K-R 20 = Kuder-Richardson formula. Data provided by the National Board for Respiratory Care.

Table 2
1997 CRTTE Results for Population of Respiratory Therapist Programs (n = 234)

Variable	*M* (*SD*)	Minimum	Maximum	Sum
Percent pass rate	85.70 (16.39)	25.00	100.0	
Graduates passing exam	11.68 (5.72)	1.00	46.0	2,708
Graduates taking exam	13.51 (6.45)	1.00	52.0	3,144
Total raw score	104.10 (9.95)	43.27	119.7	
Total scaled score	80.82 (4.57)	62.25	89.25	

Note. CRTTE = Certification for Respiratory Therapy Technician Examination. Maximum raw score = 140; maximum scaled score = 99. Data provided by the National Board for Respiratory Care.

was used. The CoARC threshold of success level was 80%. The results of the 1997 CRTTE for the population of respiratory therapist programs are presented in Table 2.

Analysis

Four series of analyses were conducted focusing on representativeness of the sample, comparisons between program types, comparisons between respondents based on 80% CRTTE pass rate threshold, relationships between program components and CRTTE measures, and prediction of program performance. First, the representativeness of the sample was examined to determine whether there were differences between the respondents and nonrespondents. Second, descriptive statistics were applied in screening for characteristics of programs at, above, and below the 80% CRTTE pass rate threshold. Then, *t* test, Pearson product-moment, and multiple regression procedures were conducted in analysis of the data and confirmation of the null hypotheses.

Because GPAs of graduates, years of teaching experience, number of faculty holding a doctorate of education or philosophy (EdD or PhD), and financial expenditures for travel, lab supplies, instructional aids, and electronic media exhibited predictive power, these variables were compared between respondents with 80% and higher pass rates to that of programs below the 80% threshold. Results of one-sample *t* tests comparing respondents by predictor variables are presented in Table 8.

Representativeness of the Sample

Program CRTTE pass rate was examined to determine whether the performance of the respondents was representative to that of the nonrespondents. Program pass rate was selected as the criterion to assess program effectiveness because professional certification is a measurable outcome and directly related to the educational goal of RC programs. Results of descriptive statistics for the 1997 CRTTE are presented in Table 1.

While the overall program pass rate of the population was a mean of 85.7%, the mean for pass rate of respondents was 88.5%, and 82.9% for nonrespondent programs. Independent two-tailed *t* tests were conducted to compare CRTTE pass rates of

Table 3
Results of One-Sample t Tests Comparing 1997 CRTTE Pass Rates of Nonrespondent (n = 134) and Respondent (N = 100) Programs

Variable	*M (SD)*	*t*	*df*	*p*
Percent pass rate		-3.14	133	0.002**
Nonrespondents	82.93 (20.38)			
Respondents	88.46 (12.39)			
Number passing		-2.85	133	0.006**
Nonrespondents	10.93 (6.07)			
Respondents	12.43 (5.38)			
Raw score		-1.28	133	0.202
Nonrespondents	103.65 (8.07)			
Respondents	104.55 (11.83)			
Scaled score		-2.00	133	0.048*
Nonrespondents	80.39 (4.94)			
Respondents	81.25 (4.19)			

Note. CRTTE = Certification for Respiratory Therapy Technician Examination. Maximum raw score = 140; maximum scaled score = 99. Nonrespondent data provided by the National Board for Respiratory Care. *p* is two-tailed.
*$p < 0.05$. **$p < 0.01$.

respondent and nonrespondent programs. Results presented in Table 3 indicate that the respondents had significantly higher CRTTE pass rates and average scores. Nonrespondent data were obtained from the NBRC (1997).

Demographics of Respondents

The majority (78%) of respondent programs ($N = 100$) were sponsored by AD-granting institutions. For types of ADs granted, 43 institutions granted the associate of applied science degree, 31 granted the associate of science degree, and 3 granted an associate in applied technology degree.

Two types of BDs were granted by respondents: 1 bachelor of health science (BHS) degree and 21 bachelor of science (BS) degrees. Together, the BHS and BS degree-granting institutions consisted of 22 of the 100 respondents.

Characteristics of Program Components

Student component variables. The mean for number of graduates in the 1997 class was 15.19 ($SD = 6.59$); total number of graduates for all programs was 1,519 ($N = 100$); the mean for the 1997 class college GPA on admission into respiratory therapist programs was 2.89 ($SD = 0.312$), with a 2.00 minimum and 3.72 maximum ($n = 72$); and the mean GPA of 1997 graduates on exiting programs was 3.14 ($SD = 0.24$). There were no significant differences between AD and BD programs for any of the student component variables.

Table 4
One-Sample t Tests Comparing CRTTE Pass Rates of Program Respondents (N = 100)

Variable	*n*	*M (SD)*	*t*	*df*	*p*
Pass rate			43.2	80	0.00**
80% or higher	81	93.1 (6.8)			
Less than 80%	9	60.7 (8.2)			
Grade point average			-.821	12	0.428
80% or higher	64	3.15 (.246)			
Less than 80%	13	3.10 (.219)			
EdD/PhD degree			-5.65	17	0.008**
80% or higher	79	.439 (.824)			
Less than 80%	18	.166 (.383)			
Expenditures			2.38	62	0.02*
80% or higher	63	$7,958.62 ($10,197.26)			
Less than 80%	8	$4,906 ($4,469.81)			

Note. CRTTE = Certification for Respiratory Therapy Technician Examination; EdD = doctor of education; PhD = doctor of philosophy. Expenditures were for travel, lab supplies, instructional aids, and electronic media. *p* is two-tailed.
*$p < 0.05$. **$p < 0.01$.

Faculty component variables. The total number of faculty reported was 285.98 full-time ($M = 2.90$) and 368 part-time ($M = 3.24$). The two-tailed independent *t* test indicated a significant difference between AD and BD programs for the total number of part-time faculty utilized ($t = 2.04$, $df = 51.05$, $p \leq 0.05$). For number of part-time faculty at AD programs, the mean was 4.25 ($SD = 4.27$), while the mean for number of part-time faculty at BD programs was 2.77 ($SD = 2.23$). Results of one-sample *t* tests indicated a significant difference between AD and BD programs for faculty holding doctorates ($t = -4.131$, $df = 18.89$, $p = 0.001$). Approximately 13% ($n = 37$) of the total number of faculty held an EdD or PhD. The majority (65%) of faculty holding doctorates taught in BD programs.

Table 5
Summary of Analysis for Research Questions 1a and 1b

Question	*t*	*df*	*p*
1a. Is there a difference in the 1997 CRTTE performance between private, proprietary, state, and 2- and 4-year colleges and universities?	--	--	--
1b. Is there a difference in 1997 CRTTE performance between associate and baccalaureate degree-granting institutions?	-2.88	17	0.006*

Note. CRTTE = Certification for Respiratory Therapy Technician Examination. Dashes indicate the results were nonsignificant for all *t* test comparisons.
*$p < 0.01$.

Table 6
Results of Pearson-Product Moment Correlation

Variable	Graduates passing CRTTE	Mean program CRTTE		
		Raw score	Scale score	Percent pass rate
Mean college GPA on admission of 1997 class	$r = 0.24$, $p = 0.04$* $n = 60$			$r = 0.33$, $p = 0.01$** $n = 60$
Mean college GPA of 1997 program graduates		$r = 0.33$, $p = 0.003$** $n = 77$	$r = 0.26$, $p = 0.02$* $n = 77$	
Number of Faculty with EdD/PhD degree		$r = 0.22$, $p = 0.03$* $n = 97$	$r = 0.29$, $p = 0.004$** $n = 97$	
Faculty with MD degree	$r = 0.23$, $p = .024$*, $n = 97$			
Faculty with MS degree	$r = 0.21$, $p = 0.03$*, $n = 97$			
Years of faculty teaching experience	$r = 0.31$, $p = .003$**, $n = 97$			
Textbooks published	$r = 0.30$, $p = 0.002$**, $n = 98$			
Journal articles published	$r = 0.21$, $p = 0.04$*, $n = 100$			
Credit hours required on admission		r = 0.21, $p = 0.043$* $n = 96$		
Expenditures for travel, lab supplies, instructional aids, and electronic media	$r = 0.36$, $p = 0.001$ $n = 79$			

Note. CRTTE = Certification for Respiratory Therapy Technician Examination; GPA = grade point average; EdD = doctor of education; PhD = doctor of philosophy; MD = medical doctor; MS = master's of science. *p* is two-tailed.
*$p < 0.05$. **$p < 0.01$.

For number of scientific journal publications produced by faculty, the mean was 5.31 (*SD* = 14.71). The independent respondent *t* test indicated a significant difference between AD and BD programs for total number of scientific journal publications ($t = -2.319$, $df = 18.43$, $p = 0.032$). The mean for number of scientific journal publications by BD programs was 16.79 (*SD* = 26.43), which exceeded the mean (2.57) for AD programs (*SD* = 8.06).

Curriculum component variables. There was a significant difference ($t = -4.74$, $df = 20.9$, $p \leq 0.001$) in the total number of semester credit hours of general education between AD ($M = 27.42$, $SD = 10.9$) and BD ($M = 55.2$, $SD = 25.6$). There was also a significant difference ($t = -4.42$, $df = 21.3$, $p \leq 0.001$) observed in the total number of semester credit hours required to complete the professional curriculum between AD programs ($M = 54.88$, $SD = 15.65$, $n = 79$) and BD programs ($M = 88.99$, $SD = 32.07$, $n = 20$). There was no significance difference in the number of clinical contact hours between types of programs. For all programs, the mean for total number of clinical contact (clock)

hours was 923.02 (*SD* = 294.24, *n* = 88).

Financial resource variables. The mean for total expenditures by programs was $188,574.50. Expenditures for salaries of faculty and support personnel made up 88.1% of total program budgets. The two-tailed independent respondent *t* test indicated no significant differences in resource component variables between AD and BD programs.

Comparisons between respondents above and below 80% pass rates. Student, faculty, curriculum, and financial expenditure variables were compared among respondents with CRTTE pass rates at, above, and below 80%. Results of one-sample *t* tests indicated significant differences in means for the number of faculty holding doctorates ($t = -5.65$, $df = 17$, $p = 0.008$) and fiscal expenditures for travel, lab supplies, instructional aids, and electronic media ($t = -5.65$, $df = 15$, $p \leq 0.001$).

Approximately 75% of the program population had pass rates 80% and higher, compared to 81% for the program sample. When variables exhibiting small but significant predictive power were compared between programs above and below the pass rate threshold, three significant differences were observed. The difference in means for pass rate was 22.4%. The number of faculty holding EdD/PhD degrees was slightly

Table 7
Summary of Analysis for Research Questions 2a, 2b, 2c, and 2d

Question	*r*	*p*
2a. What is the correlation between college GPA on admission and		
pass rate on the CRTTE?	0.33	0.01**
number of graduates passing?	0.24	0.04*
What is the correlation between program graduates' GPA and raw score on the CRTTE?	0.33	0.004**
2b. What is the correlation between CRTTE measures and the number of faculty holding the following:		
MD degree	0.23	0.024*
MS degree	0.21	0.03*
EdD/PhD degrees	0.29	0.004**
What is the correlation between CRTTE measures and the following:		
Number of years of faculty teaching experience	0.31	0.03*
Number of textbooks published	0.30	0.002**
Number of journal articles published	0.21	0.04*
2c. What is the correlation between total credit hours on admission into programs and CRTTE raw score of programs?	0.21	0.04*
2d. What is the correlation between expenditures for travel, lab supplies, instructional aids, and electronic media, and the total number of program graduates passing the CRTTE?	0.35	0.002**

Note. GPA = grade point average; CRTTE = Certification for Respiratory Therapy Technician Examination; EdD = doctor of education; PhD = doctor of philosophy; MD = medical doctor; MS = master's of science. *p* is two-tailed.
*$p < 0.05$. **$p < 0.01$.

Table 8
Summary of Analysis for Research Question 3: Simultaneous Stepwise Multiple Regression Analysis for Variables Predicting Program CRTTE Performance

Question	ß	*B*	*t*	*p*
3. To what extent do the following student, faculty, curriculum, and resource factors individually and collectively predict program performance on the CRTTE?				
GPA of graduates	0.34	0.10	3.34	0.001**
Number of faculty holding EdD/PhD degrees	0.22	0.04	2.15	0.034*
Number of years of faculty teaching experience	0.32	0.10	2.85	0.006**
Expenditures for travel, lab supplies, instructional aids, and electronic media	0.47	0.22	3.73	<0.001**

Note. CRTTE = Certification for Respiratory Therapy Technician Examination; GPA = grade point average; EdD = doctor of education; PhD = doctor of philosophy. Dependent variable = CRTTE; independent variables = graduates' GPA (r^2 = 0.114), number of faculty holding EdD/PhD degrees (r^2 = 0.126), faculty teaching experience (r^2 = 0.103), and selected resource expenditures (r^2 = 0.22). n = 91; number of steps = 10. R = 0.75. R^2 = 0.56, $F(1, 91)$ = 7.38. Intercept: a = 59.6.
*p < 0.05. **p < 0.01.

higher for programs above the threshold. However, the mean for expenditures on travel, lab supplies, instructional aids, and electronic media of programs below the threshold was higher than programs with 80% and higher pass rates. One-sample *t* tests comparing CRTTE pass rates of program respondents are presented in Table 4.

Generalizability of the results was limited for three reasons: (a) range restriction was evident by the low response rate, (b) respondents had significantly higher pass rates and score averages than those of nonrespondents, and (c) pass rates of respondents were more positively skewed than those of nonrespondents. Nonrespondents gave varying reasons for not participating in the study. Reasons for not participating included (a) lack in the availability of data, (b) workload does not permit time to obtain the data, (c) the institution does not permit the release of the data requested, and (d) the program does not wish to participate.

Analysis of Research Questions

The remaining findings were derived in order to respond to three research questions. The level of significance for all analyses was p = 0.05 or less. For Question 1, *t* tests were conducted to determine whether there were differences in CRTTE results between the various types of institutional sponsorship and degrees awarded. Question 1 was subdivided into two parts: 1a and 1b. A summary of the findings is presented in Table 5.

In response to Question 2, a bivariate analysis was conducted to ascertain the extent to which variations in the student, faculty, curriculum, and financial resource component variables were related to variations in CRTTE pass rates and average of scores. Question 2

was subdivided into four parts: 2a, 2b, 2c, and 2d. The Pearson product-moment procedure was conducted to obtain correlation coefficients and to screen for variables statistically significant. A summary of the results obtained by the Pearson product-moment correlation is provided in Table 6. Variables determined insignificant were excluded from inclusion in the stepwise regression analyses. A summary of the bivariate analysis to Question 2 is presented in Table 7.

For Question 3, stepwise multiple regression analysis was conducted to test the theoretical assumption that program components were individually and collectively related to program effectiveness (CRTTE performance). Regression analysis was also used to determine how much each program component variable contributed to predicting program performance (number of graduates passing, pass rate, and average scores) on the CRTTE. The regression analyses included 10 predictor variables. These were the variables that exhibited significant positive correlations as indicated in Table 7. Each variable was regressed against CRTTE results (number of graduates passing, pass rate, and average of the raw and scaled scores). A summary of the findings is presented in Table 8.

Discussion

The low response rate places considerable limitations on making inferences about characteristics of the population of educational programs. While the overall mean for pass rate of the population at or above 80% was 76.4%, the mean for respondents was 82%. The mean for pass rates of BD programs exceeded that of AD programs. Both respondent and nonrespondent BD programs had significantly higher pass rates than the population. This finding was consistent with that reported by O'Daniel (1987).

Concerning student variables, program respondents maintained a relatively low enrollment. GPA of graduates was the only student variable related to the CRTTE. Consistent with the literature, GPA of graduates was a significant predictor. The mean for GPA of graduates was 3.14. There was no significant difference in GPA between AD and BD programs despite the difference in group CRTTE performance. Likewise, there was no difference in GPA between programs above the 80% pass rate threshold. It is therefore likely that there were factors other than GPA that contributed to the difference in group performance on the CRTTE.

The mean for number of full-time employed faculty was 2.9. Community colleges employed a greater number of part-time faculty. Program faculty enjoyed a somewhat low student-to-faculty ratio (1:5) compared to other allied health disciplines. As one might expect, the majority of faculty members held graduate degrees. Few faculty held doctorates. Four-year colleges and universities employed 65% of faculty who held EdD or PhD degrees. Publication in scientific journals was also dominated by faculty employed by senior institutions. The fact that the number of scientific journal publications and faculty holding EdD or PhD degrees were prevalent among 4-year colleges and universities shows consistence with the mission of senior research institutions.

While faculty and student credentials and financial resources exhibited some predictive power, one cannot ignore the fact that environmental variables also play an important part in influencing outcomes. This study excluded possible social, political, and cultural

interactions that potentially could have affected outcomes. None of the curriculum variables cleared the criteria ($p \leq 0.05$) for the Pearson product-moment correlation procedure. Therefore, these variables were not entered in the regression procedure.

Conclusion

Because the performance of the respondents was not representative of that of the nonrespondents, representativeness of this study was limited to the sample. The performance of RC programs was marginal because only two thirds of the population met or exceeded the 80% threshold level established by CoARC. While program performance on the CRTTE criterion was positively related to student, faculty, curriculum, and financial resource variables, curriculum variables did not exhibit significant predictability. Although results of curriculum component variables may not have exhibited acceptable statistical significance for inclusion in the prediction equation, they are substantively meaningful precursors to effective program performance. In all, input variables in this study accounted for 56% of the variation in CRTTE criterion measure.

Program respondents exhibiting pass rates at and above the 80% threshold level had a higher number of doctoral prepared faculty and financial expenditures (for travel, lab supplies, instructional aids, and electronic media). Since the sample was limited in terms of its representation, generalization about the population is not advised. Even though student, faculty, and resource variables offered some explanatory power for programs' CRTTE pass rates at or above 80%, limitations of the sample and research design precludes making conclusions about cause and effect.

There were factors unaccounted for in the study, which may have also affected program performance. For example, it is plausible that environmental factors such as attitude of administration, allocation of resources, capacity and availability of physical facilities, and quality and availability of clinical experiences likely mitigate effects on program outcomes.

The presumption that factors relevant to function are related to program success was an applicable theoretical conception for this study. The findings reinforce the importance of programs maintaining appropriate credentialed students and faculty and adequate financial resources in order to effectively achieve desired educational outcomes. Like other industries, higher education is under intense scrutiny for cost containment, and effective and efficient productivity. An awareness of the degree of influence student, faculty, curriculum, and financial resource factors play in program administration increases accountability, assists in making defensible decisions, and contributes to programs' progress towards success. In order for RC educators to compete with other colleagues in higher education, student enrollment, the number of doctorate-prepared faculty, scholarly productivity, and external funding must increase.

To the knowledge of this investigator, this is the first evaluation of multiple RC programs since implementation of the outcome-oriented system in 1986. Further study is indicated in order to examine longitudinal and interaction effects that academic and nonacademic factors have in influencing program effectiveness.

References

Agho, A. O., Mosley, B. W., & Williams, A. M. (1999). A national survey of current admission practices in selected allied health educational programs. *Journal of Allied Health 28*(1), 8-14.

Ary, D., Jacobs, L. C., & Razavieh, A. (1985). *Introduction to research in education.* Fort Worth, TX: Holt, Rinehart and Winston.

Astin, A. W. (1993). *Assessment for excellence: The philosophy and practice of assessment and evaluation in higher education.* Phoenix, AZ: American Council on Education and Oryx Press.

Banta, T. W. (1993). *Making a difference: Outcomes of a decade of assessment in higher education.* San Francisco: Jossey-Bass

Banta, T. W., & Pike, G. R. (1989). Methods for comparing outcomes instruments. *Research in Higher Education, 30*, 455-469.

Cameron, K. (1978). Measuring organizational effectiveness in institutions of higher education. *Administrative Science Quarterly, 23*(4), 604-629.

Cisneros-Blagg, T. C. (1984). *Allied health program quality as related to degree of compliance with accreditation standards and other selected variables.* Unpublished doctoral dissertation, Rutgers University, State University of New Jersey, Brunswick.

Cisneros-Blagg, T. C., & Scanlan, C. L. (1986). A model for assessing the validity of allied health accreditation standards. *Journal of Allied Health, 15*, 93-106.

Committee on Accreditation for Respiratory Care. (2000). *CoARC accreditation information: Standards and guidelines* [On-line]. Available: http://www.coarc.com/accred/standards.html

DeLapp, G. T. (1979). The systems approach for administration of respiratory therapy education programs. *Respiratory Care, 24*, 514-520.

Douce, F. H. (1993). A critical analysis of respiratory care scope of practice and education: Past, present, and future. In *Year 2001: Delineating the educational direction for the future respiratory care practitioner* (pp. 43-62). Dallas, TX: American Association for Respiratory Care.

Douce, F. H., & Coates, M. A. (1984). Attrition in respiratory therapy education: Causes and relationship to admission criteria. *Respiratory Care, 29*, 823-828.

Etzioni, A. (1964). *Modern organizations.* Englewood Cliffs, NJ: Prentice-Hall.

Flanigan, K. S. (1985). A model for the evaluation of respiratory therapy program admissions criteria. *Respiratory Care, 30,* 334 - 338.

Georgopolous, B. S., & Mann, B. C. (1962). *The community general hospital.* New York: MacMillan.

Georgopolous, B. S., & Tannenbaum, A. S. (1957). The study of organizational effectiveness. *American Sociological Review, 22,* 534-540.

Gordon, J. D. (1988). The Gordon rule: A state legislator fulfills his responsibility. *New Directions for Community Colleges, 64,* 23-29.

Hall, R. P. (1972). *Organizations: Structures and process.* Englewood Cliffs, NJ: Prentice-Hall.

Johnson, P. L. (1999). A study of relationships between program components and outcome of accredited respiratory therapist programs (Doctoral dissertation, Florida State University, 1999). *Dissertation Abstracts International, 60,* 07A1999.

Joint Review Committee for Respiratory Therapy Education. (1986). *Essentials and guidelines of an accredited educational program for respiratory therapy technician and respiratory therapist.* Euless, TX: Author.

Joint Review Committee for Respiratory Therapy Education. (1997). *Respiratory therapy educational programs.* Euless, TX: Author.

McMillan, J. H., & Schumacher, S. (1989). *Research in education: A conceptual introduction.* Boston: Little & Brown.

Miller, D. C. (1991). *Handbook of research design and social measurement* (5th ed.). Newbury Park, London: Sage Publication.

National Board for Respiratory Care. (1997). *Entry level certification examination reports.* Lenexa, KS: Author.

National Board for Respiratory Care. (1998). E*ntry level CRT examination, RRT written examination and RRT clinical simulation examination: Revised content outlines.* Lenexa, KS: Author.

National Commission on the Cost of Higher Education. (1998). *College tuition going up... up... and up, Citizens for Responsible Education Reform* [On-line]. Available: http://www.house.geocities.com/Heartland/Ranch/4851/hi-edcst.htm

O'Daniel, C. H. (1987). *A study of respiratory therapy educational programs and graduate performance on the national board for respiratory care 1984 entry-level examinations.* Unpublished doctoral dissertation, University Kentucky, Lexington.

O'pt Holt, T. B., & Dunlevy, C. D. (1992). The use of preadmission criteria to predict academic success in a 4-year respiratory care educational programs *Respiratory Care, 37,* 439 - 443.

Oosterhof, A. (1990). C*lassroom applications of educational measurements.* Columbus, OH: Merrill Publishing.

Parks, R. B. (1981). Assessing the reliability and validity of educational standards (mimeographed). Chicago: Department of Allied Health Education and Accreditation, American Medical Association.

Pedhazur, E. J. (1982). *Multiple regression in behavioral research: Explanation and prediction.* Fort Worth, TX: Holt, Rhinehart and Winston.

Pew Health Professions Commission. (1993, February). *Health professions education for the future: Schools in service to the nation.* San Francisco: Author.

Price, J. L. (1968). *Organizational effectiveness: An inventory of propositions.* Homewood, IL: Irwin.

Price, J. L. (1972). The study of organizational effectiveness. *Sociology Quarterly, 13,* 3-15.

Shaw, R. C., & Prewitt, R. C. (1995). Salting students for a baccalaureate-degree respiratory care program. *Respiratory Care, 40,* 1052-1067.

Smith, D. L. (1992). Validity of faculty judgments of student performance: Relationship between grades and credits earned and external criterion measures. *Journal of Higher Education, (63)*3, 329-340.

Tuckman, B. W. (1979). *Evaluating instructional programs.* Boston: Allyn and Bacon, Inc.

Uniform guidelines on employee selection procedures. (1973). Washington, DC: U.S. Government Printing Office, U.S. Department of Labor.

von der Heydt, P. A., & Grossman, G. D. (1991). Education of respiratory care personnel. In G. G. Burton, J. E. Hodgkin, & J. J. Ward (Eds.), *Respiratory care: A guide to practice* (3rd ed., pp. 19-34). New York: J. B. Lippincott.

Ward, J. J., & Helmholz, H. F. (1997). Roots of the respiratory care profession. In G. G. Burton, J. E. Hodgkin, & J .J. Ward (Eds.), *Respiratory care: A clinical guide to practice* (5th ed., pp. 3-25). Philadelphia: Lippincott.

Wholey, J. S. (1989). Evaluability assessment: Developing program theory. In L. Binkman (Ed.), *New directions for program evaluation* (pp. 77-91). San Francisco: Jossey-Bass.

Author Note

This study was supported in part by the NBRC/AMP H. F. Helmholtz, Jr., MD, Education Research Award funded by the American Respiratory Care Foundation. The author would like to thank the National Board for Respiratory Care for the assistance given in making nonrespondent data available for study.

Correspondence concerning this article should be addressed to Patrick L. Johnson, Jr., PhD, RRT, Associate Professor, Division of Cardiopulmonary Science, School of Allied Health Sciences, Florida A&M University, Ware-Rhaney Building Room 223, Tallahassee, Florida 32307-3500. Electronic mail may be sent to patrick.johnsonjr@famu.edu.

Respiratory Care Education Annual
Volume 10, Spring 2001, 33-53

Practitioner Temperament and Attitudes Concerning Career Satisfaction in the Cardiopulmonary Profession

Jeffery E. Ludy
University of Central Florida

Abstract

Attrition of respiratory care practitioners (RCPs) from the practice of respiratory care is a significant problem for the profession. The profession's ability to develop a stronger professional image is related to the profession's career-committed practitioners remaining in the profession. This research reviewed the relationships found between individual temperament and personality domain in career-committed RCPs. Study methodology consisted of a voluntary national survey of registered respiratory therapists. Survey participants completed a demographics questionnaire, the Keirsey Temperament Sorter II (Keirsey, 1998) and the Neuroticism, Extraversion, Openness - Five-Factor Inventory (Costa & McCrae, 1992). Personality and temperament results were correlated with gender, educational level, length of career service, job function, and career satisfaction. Results indicated that common temperaments and personality characteristics exist in career-committed RCPs.

Practitioner Temperament and Attitudes Concerning Career Satisfaction in the Cardiopulmonary Profession

The purpose of this research centered on understanding which personality characteristics and temperaments might best describe a career-satisfied respiratory care practitioner (RCP). Similar studies conducted with other health care professions have provided similar information on those professionals and how they cope with career stresses (Arnold, 1990; Blau, 1988; Blau & Lunz, 1998; Boone, Biedermann, & Kostroun, 1994; Meyer, Allen, & Smith, 1997). The development of a template for RCPs for personality characteristics, temperament, and career attributes would be a major asset to both educators and leaders in the respiratory care (RC) profession.

Research on personality characteristics and temperaments is needed because RCPs work in difficult patient care environments that continuously challenge them on highly technical and emotional levels (Decker, 1997; Treanor, 1993). The current nature of American health care does not provide many examples of idyllic workplaces, so finding manageable alternatives to promote career commitment and satisfaction in RCPs is necessary (Coile, 1997; Kester & Stoller, 1996). Furthermore, changes in the workplace are often associated with heavier workloads, redesigned jobs, increased job responsibilities, and too often, the loss of full-time staff positions as employers discover the cost advantages of "leasing" their employees rather than maintaining them in full-time positions (Robert Wood Johnson Foundation, 1995; Tett & Meyer, 1993).

An answer to finding a workable definition of career commitment might be found by looking at personality psychometrics. Personality psychometrics is the measure of different aspects of the human personality, and the use of statistics to judge whether or not certain of these personality aspects relate, conflict, or enhance one another (Brunas-Wagstaff, 1998). This analysis allows human traits and characteristics to be manipulated to find correlations between variables. Such analysis allows investigators to use single or multiple statistical tools to develop correlations between various factors of personality, and from those findings develop conclusions unique to that study (Brunas-Wagstaff, 1998; Lowman, 1991).

Numerous personality assessment tools exist which provide methods of clarifying what researchers in vocational psychology feel is necessary to understand how people deal successfully with their work environments and stress (Arnold, 1990; Lowman, 1991; Parnell, 1998). Much of workplace personality research is directed toward explaining how specific personality attributes contribute to a person's ability to succeed in a particular career or working environment (Lowman, 1991; Meyer & Allen, 1997).

Because comprehensive psychological data on the "RCP personality" is limited, the development of a prototypical personality profile for career-satisfied RCPs might be of use to the profession as a development tool. Such psychometric data could provide a new avenue for RC's leadership to use in understanding not only what makes a career-satisfied and -committed RCP, but what the profession might do to help cultivate that generalized personality profile in current and future RCPs.

The following questions were investigated in this study:

1. What are the specific personality traits, characteristics, and temperament types

associated with career-committed RCPs?

2. Which of the five personality scales devised by Costa and McCrae (1992) for their Neuroticism, Extraversion, Openness (NEO)- Five-Factor Inventory (FFI) is most significantly related to a career-committed RCP?

3. Will there be a statistically significant relationship between an RCP's statement of positive career satisfaction and a specific Keirsey temperament type?

Methodology

This study was designed to identify the elements of career satisfaction and commitment that might be found in a population of career-committed RCPs. The study reviewed RCP demographics (age and gender), work environment (job title and years on the job), and career development (academic preparation). Personality and temperament data for the survey population were also collected using the Keirsey Temperament Sorter II (KTS II; Keirsey, 1998) and Form S of the NEO-FFI (Costa & McCrae, 1992). These variables were selected because of their importance in research dealing with commitment and satisfaction in the general workplace (Meyer & Allen, 1997; Tett, Jackson, & Rothstein, 1991) and in research with RCPs dealing with career commitment and satisfaction (Meyer & Allen, 1997; Shelledy, Youtsey, & Rau, 1992; Treanor, 1993).

Procedures

This research sought statistical evidence of connections between the five personality domains of Costa and McCrae's (1992) NEO-FFI, the KTS II (Keirsey, 1998), and characteristics of the typical career-committed RCP. Previous research on RCP career satisfaction has often been based on workplace-related factors such as poor staffing, and poor pay and benefits (Treanor, 1993). Those studies used variables found in traditional job and career satisfaction studies, such as level of perceived professional respect by others. However, such factors that affect RCPs extrinsically were not included in this study because there was no way to control for the positive or negative effects of these variables. The information used in this study focused on three distinct data sets that were all central to the individual subject's own life, and therefore a more direct measure of the individual, not his or her current work setting.

Research Design

A descriptive design was chosen for this study to investigate any relationships that might exist between the various character facets of a selected group of health care providers (RCPs), and their personal commitment to their chosen professional career path. Correlation analysis was used to assess the relationships or variations that existed between one or more workplace or personality factors (Dickter & Roznowski, 1996; Isaac & Michael, 1997).

Multiple regression analysis (MRA) was used to parcel out contributions of variables to a dependent variable, in this case RCP career commitment (Fraenkel & Wallen, 1993; Shavelson, 1996). MRA utilizing the enter technique assisted the researcher in finding relationships between variables.

Further analysis of these variables was carried out with MRA utilizing a modified approach for the variables and their relationships to the RCPs. The modified approach was conducted using the three statistically strongest demographic indicators (age range, job title, and years on the job), and the five domains of the NEO-FFI (Costa & McCrae, 1992). This modified MRA split each of the five NEO-FFI personality domains at their mean. This division identified whether a majority of the subjects resided above or below the mean, or if an equal distribution existed for a particular domain. This process of splitting subjects at the mean for each of the five domain scores to find influences in the subject group's personality is supported by research done by Costa and McCrae and others (Brunas-Wagstaff, 1998; Lanyon & Goodstein, 1997).

Sample Population

This population was drawn from a sample of RCPs across the United States. Subjects in this study were chosen from mailing lists of respiratory care professional organizations, i.e., the American Association for Respiratory Care (AARC) and the National Board for Respiratory Care (NBRC). Subjects were picked for inclusion in the survey based on the criteria that they were (a) officers on national professional boards or committees, (b) members of chartered state affiliates of the AARC, and (c) subjects holding the NBRC credential of registered respiratory therapist (RRT) and at least one other voluntary professional certification from the NBRC.

No effort was made to include RCPs in this study who were not active AARC or NBRC members. However, while this action introduced a degree of bias into the study, it also provided subjects for the study possessing high levels of career satisfaction and commitment to RC. These "active" members of the profession represent approximately 33% of the respiratory therapists working in the United States (AARC, 1993, 1998).

Response Rate

A total of 520 surveys were mailed out over a period of approximately 3 months beginning in mid October 1998. A total of 259 surveys (49.8%) were returned. Four surveys were returned incomplete, with major parts of data missing from survey sections, and were rejected from the study, leaving a total of 255 surveys (49%) for the final data analysis.

Within that group of 255, six of the acceptable surveys had data missing on either the KTS II or the NEO-FFI. The missing data on these surveys was either disregarded (on the KTS II) or filled in with neutral responses (on the NEO-FFI). None of these instruments had data missing in excess of the publisher's stated rejection point, and none of the surveys were rejected due to data missing on the demographic part of the survey instrument.

Instrumentation

This study consisted of a self-administered survey package that contained the following items: a descriptive cover letter, a return postcard, instructions for handling the survey, a demographic survey for the individual RCP, the KTS II, and the NEO-FFI (see excerpts of survey instruments in Appendix A).

The KTS II (Keirsey, 1998), developed by Keirsey and Bates (1984), is made up of 70 forced-choice questions and was used to identify which of the personality types (temperaments) the study population fell within. The KTS II provided each subject with a temperament type belonging to one of 4 single or 6 dual temperament pairs. The survey respondent's answers to these forced-response statements determined which of the 10 personality assignments the RCP matched. A more detailed explanation for each of the 4 primary KTS II personalities can be found in Appendix B.

The KTS II (Keirsey, 1998) is an example of a simple way to assess which temperament or combination of temperaments an individual displays. The KTS II refers to each temperament pattern by name rather than the four-letter codes used in the Meyers-Briggs Type Indicator (Meyers & McCauley, 1985). The KTS II primary temperaments are Artisan, Guardian, Rational, and Idealist.

The NEO-FFI, developed by Paul Costa, Jr., and Robert McCrae (1992), measures five specific personality domains found among all individuals. The NEO-FFI provides means to assess an individual's unique way of thinking, feeling, or interacting with others (Goldberg, 1993; Matthews & Deary, 1998; McCrae & Costa, 1996). The NEO-FFI was developed to meet the need for a comprehensive measure of the five domains of personality: neuroticism, extraversion, openness, agreeableness, and conscientiousness. The NEO-FFI is a 60-question, Likert-scale, self-scoring personality instrument that has been scaled to be used with college-level subjects. See Appendix C for a more detailed description of each of the NEO-FFI personality domains.

Data Analysis

Descriptive statistics were calculated for all of the demographic values obtained in the survey package. Multiple regression coefficients and other statistical values developed in this study were calculated using SPSS Base 8.0, a statistical software package. Analysis included the following areas: (a) response rate, (b) frequency data associated with the study sample, (c) descriptive statistics for the three primary elements (demographics, KTS II, and NEO-FFI) of the survey package, (d) reliability statistics, and (e) response to the three research questions.

Demographics

The personal characteristics of the study RCPs are summarized in Table 1. This gender-equal sample (128 women and 127 men) found 85% of the subjects to be 36 years of age or older. Nearly 40% (38.4%) identified themselves as clinically based, and 70.9% had been in the field for at least 16 years. This subject group also held academic degrees beyond the entry-level associate's degree (71.7% held a bachelor's or master's degree). The study also explored the subjects' job satisfaction, career commitment, and KTS II data. A majority (56.1%) were Guardians.

Descriptive Statistics for the NEO-FFI Instrument

The data analysis for the NEO-FFI included range, mean, median, and standard

deviation for each of the instrument's five factors. A comparison of the publisher's survey mean and standard deviation for the NEO-FFI domains against this study's subjects showed no difference existed between all subjects (see Table 2). A student's *t* test for independent means was performed on these data to ensure no differences existed between the groups. Results for student t tests indicated there was no significant difference based on national data provided by the publisher for the NEO-FFI (Costa & McCrae, 1992).

Table 1
Percentage and Frequency Distributions of Subjects' (N = 255) Variables

Variable	*n*	Percentage
Age		
Between 23 and 35 years old	37	14.51
Between 36 and 46 years old	136	53.33
Older than 46 years old	82	32.16
Gender		
Female	128	50.2
Male	127	49.8
Job title		
Staff therapist	52	20.4
Clinical specialist	22	8.6
Supervisor	24	9.4
Department manager	45	17.6
Academic	63	24.7
Other	49	19.2
Years on the job		
Less than 5 years	11	4.3
Between 5 and 8 years	19	7.5
Between 9 and 15 years	44	17.3
More than 16 years	181	71.0
Academic degree held		
Associate	52	20.4
Bachelor	101	39.6
Master	82	32.2
Doctorate	20	7.8
Job satisfaction		
Yes	246	96.5
No	2	0.8
Neutral	7	2.7
Career commitment		
Yes	11	4.3
No	225	88.2
Neutral	19	7.5

Table 1 Continued
Percentage and Frequency Distributions of Subjects' (N = 255) Variables

Variable	*n*	Percentage
Keirsey temperament		
Artisan	31	12.2
Guardian	143	56.1
Idealist	39	15.3
Rational	9	3.5
Artisan-Guardian	13	5.1
Artisan-Idealist	6	2.4
Artisan-Rational	1	0.4
Guardian-Idealist	6	2.4
Guardian-Rational	2	0.8
Idealist-Rational	5	2.0

Note. Other allowed subjects to describe work in their own terms. These respiratory care practitioners had unique positions ranging from physician's assistant to salesperson, researcher, and entrepreneur. Under "Job satisfaction," *Yes* is positive; under "Career commitment," *No* is positive. Aggregate percentages do not total 100% because of rounding.

Reliability Estimates for Instrument Scales

An estimate of the reliability to determine observer agreement between the NEO-FFI given to this study's subjects and similar subjects was required because the instrument was administered to a single group of RCPs (Fraenkel & Wallen, 1993). The scores obtained from the 255 RCPs completing the five NEO-FFI personality domains were evaluated using Cronbach's alpha reliability estimates. Estimates of internal consistency (coefficient alpha) were calculated for each of the NEO-FFI personality domains. Then comparisons with the publisher's NEO-FFI alphas were made (Costa & McCrae, 1992). Reliability coefficients for all five of the measured NEO domains were above the minimum alpha value (> .70) suggested by Fraenkel and Wallen as sufficient proof of internal consistency (see Table 3). Reliability estimates similar to those done for the NEO-FFI were not done for KTS II data because the KTS II functions as a personal exploration (best-fit) device, not as a distinct psychometric tool (Keirsey, 1998).

While the KTS II results were not utilized as a primary measure of psychometric data, the researcher used them to provide broad temperament categories for these subjects. The KTS II data provided a neutral means of assigning personality traits to subjects, and the researcher took due care concerning the practical and ethical considerations in assessing personality characteristics at a distance (Keirsey & Bates, 1984).

Results

Descriptive statistics and MRA models were computed for the first research question

Table 2

Frequency Table for the NEO-FFI and Comparison of All Subjects (N = 255) Against Publisher's Means and Standard Deviations

Variable	Range	*M*	*Mdn*	*SD*
Neuroticism				
Subject values	39	16.0	15	7.41
Publisher values		19.07		7.68
Extraversion				
Subject values	30	31.7	32	5.82
Publisher values		27.69		5.85
Openness				
Subject values	35	29.0	29	5.88
Publisher values		27.03		5.84
Agreeableness				
Subject values	28	33.0	33	5.27
Publisher values		32.84		4.97
Conscientiousness				
Subject values	33	37.0	37	6.12
Publisher values		34.57		5.88

Note. $t(255) = 0.245$, nonsignificant. Publisher values are from *Revised NEO Personality Inventory Manual* by P. T. Costa, Jr., and R. R. McCrae, 1992, p. 78. Copyright 1992 by Psychological Assessment Resources. Adapted with permission of the publisher.

Table 3

Reliability Estimates for the Five Primary Domains of the NEO-FFI: A Comparison Between the Publisher Alpha and Study Alpha (N = 255)

Variable	Study alpha	Publisher alpha
Neuroticism	.86	.79
Extraversion	.78	.79
Openness	.75	.80
Agreeableness	.74	.75
Conscientiousness	.85	.83

Note. $t(8) = 0.16$, nonsignificant. Publisher values are from *Revised NEO Personality Inventory Manual* by P. T. Costa, Jr., and R. R. McCrae, 1992, p. 45. Copyright 1992 by Psychological Assessment Resources. Adapted with permission of the publisher.

to identify statistically significant contribution to career satisfaction and commitment. The analysis for career satisfaction indicated that years on the job ($p < 0.001$) and age range ($p < 0.05$) were the only statistically significant contributions. However, the model only explained 6% of the variance. The second MRA with career commitment as the dependent variable produced no statistically significant findings.

The analysis of the KTS II data found the four primary KTS II temperaments (Keirsey, 1998) accounted for 87.1% of the total distribution. This sample also produced 12.9% mixed-type temperaments. A majority of these mixed types occurred in the Artisan-Guardian pairing (n = 13). If all mixed-type pairings were split equally to partition them into the four parent temperaments as Keirsey (Keirsey & Bates, 1984) recommended, the resulting distribution would be Artisan, 16.15%; Guardian, 60.25%; Idealist, 18.7%; and Rational, 5.1%.

For the second research question, another MRA was conducted utilizing the three statistically strongest demographic indicators (age range, job title, years on the job), and the five NEO-FFI domains (neuroticism, extraversion, openness, agreeableness, and conscientiousness). This analysis selected ranges (above and below the mean) for each of the five NEO-FFI domain scores, which represented influences on the subject's personality as supported by research by Costa and McCrae (1992) and others (Brunas-Wagstaff, 1998; Lanyon & Goodstein, 1997). NEO-FFI mean scores were used to represent positive or negative influence by domain for (a) neuroticism scores above and below 16, (b) extraversion scores above and below 32, (c) openness scores above and below 29, (d) agreeableness scores above and below 33, and (e) conscientiousness scores above and below 37. Table 4 presents the MRA results for selected variables and NEO-FFI personality domains.

A third analysis utilizing MRA was conducted to find a statistically significant relationship in RCP levels of career satisfaction and specific KTS II types. These MRAs were carried out utilizing RCP career satisfaction as the dependent variable with demographic variables, and the three most populous KTS II temperaments (Artisan, Guardian, and Idealist) as independent variables. These three temperaments were utilized because each of the others contained fewer than 15 members (n = 42). This modification left 213 survey subjects for analysis purposes. The KTS II temperament MRAs produced statistically significant relationships in each of the main temperaments. For the Artisan temperament, current job title ($p < 0.05$) and years on the job ($p < 0.05$) were statistically significant. For the Guardian temperament, the most statistically significant result was age range ($p < 0.05$). For the Idealist temperament, years on the job produced the most statistically significant finding ($p < 0.001$) of the three temperaments.

Conclusions

This research investigated the RCP's basic demographic profile (age and gender), work environment (job title and years on the job), and personal career development (academic preparation). Data were also collected on the RCP's KTS II and NEO-FFI personality domains. The research questions explored these data, seeking insight into the personality of the career-committed or -satisfied RCP. While the MRAs conducted on the NEO-FFI mean scores provided statistically significant results, these results were not overwhelming: extraversion, 12.8% (mean greater than or equal to 32); agreeableness, 17.1% (mean greater than or equal to 33); and conscientiousness, 14.7% (mean less than or equal to

Table 4

Summary of Multiple Regression Models for Selected Demographic and NEO-FFI, Form S, Personality Domains on Career Commitment in RCPs

Neuroticism ≤ 16 (*n* = 138)				
Variable	*B*	ß	*T*	Significance of *T*
(Constant)	.968		7.936	.000
Age range	7.685E-02[a]	.184	1.8351	.066
Job title	7.505E-03[a]	.048	.567	.571
Years on the job	-5.645E-02[a]	.162	1.599	.112
Neuroticism ≥ 16 (*n* = 117)				
Variable	*B*	ß	*T*	Significance of *T*
(Constant)	1.228		6.873	.000
Age range	8.087E-02[a]	.139	1.330	.186
Job title	3.746E-02[a]	.178	1.856	.066
Years on the job	-.153	.353	3.235	.002
Model summary	Neuroticism ≤ 16		Neuroticism ≥ 16	
*R**	.166		.302	
R^2	.028		.091	
Adjusted R^2	.008		.067	
SE	.28		.37	
Extraversion ≤ 32 (*n* = 120)				
Variable	*B*	ß	*T*	Significance of *T*
(Constant)	1.090		6.034	.000
Age range	.142	.240	2.343	.021
Job title	2.193E-02[a]	.097	1.132	.260
Years on the job	-.147	.284	2.762	.007
Extraversion ≥ 32 (*n* = 135)				
Variable	*B*	ß	*T*	Significance of *T*
(Constant)	1.215		15.277	.000
Age range	-5.267E-03[a]	.019	.203	.840
Job title	2.410E-02[a]	.232	2.646	.009
Years on the job	-7.957E-02[a]	.360	3.610	.000
Model summary	Extraversion ≤ 32		Extraversion ≥ 32	
*R**	.257		.358	
R^2	.066		.128	
Adjusted R^2	.045		.108	
SE	.41		.16	

Table 4 Continued

Summary of Multiple Regression Models for Selected Demographic and NEO-FFI, Form S, Personality Domains on Career Commitment in RCPs

Openness ≤ 29 (*n* = 114)				
Variable	*B*	ß	*T*	Significance of *T*
(Constant)	1.235		8.242	.000
Age range	9.361E-02[a]	.181	1.655	.101
Job title	2.967E-02[a]	.151	1.699	.092
Years on the job	-.161	.394	3.532	.001
Openness ≥ 29 (*n* = 141)				
Variable	*B*	ß	*T*	Significance of *T*
(Constant)	.952		6.363	.000
Age range	8.208E-02[a]	.178	1.872	.063
Job title	9.193E-03[a]	.054	.616	.539
Years on the job	-5.624E-02[a]	.137	1.413	.160
Model summary	Openness ≤ 29		Openness ≥ 29	
*R**	.315		.173	
R^2	.099		.03	
Adjusted R^2	.077		.009	
SE	.34		.30	
Agreeableness ≤ 33 (*n* = 112)				
Variable	*B*	ß	*T*	Significance of *T*
(Constant)	.879		5.401	.000
Age range	.121	.233	2.247	.026
Job title	-6.889E-03[a]	.035	.376	.707
Years on the job	-4.474E-02[a]	.100	.929	.355
Agreeableness ≥ 33 (*n* = 143)				
Variable	*B*	ß	*T*	Significance of *T*
(Constant)	1.277		10.694	.000
Age range	4.729E-02[a]	.108	1.133	.259
Job title	4.096E-02[a]	.247	3.105	.002
Years on the job	-.155	.451	4.618	.000
Model summary	Agreeableness ≤ 33		Agreeableness ≥ 33	
*R**	.197		.414	
R^2	.039		.171	
Adjusted R^2	.016		.153	
SE	.36		.26	

Table 4 Continued

Summary of Multiple Regression Models for Selected Demographic and NEO-FFI, Form S, Personality Domains on Career Commitment in RCPs

Conscientiousness ≤ 37 (*n* = 126)				
Variable	*B*	ß	*T*	Significance of *T*
(Constant)	1.226		8.571	.000
Age range	8.478E-02[a]	.171	1.813	.072
Job title	4.857E-02[a]	.250	3.088	.002
Years on the job	-.175	.408	4.266	.000
Conscientiousness ≥ 37 (*n* = 129)				
Variable	*B*	ß	*T*	Significance of *T*
(Constant)	1.147		7.023	.000
Age range	8.106E-02[a]	.149	1.1393	.166
Job title	3.401E-03[a]	.017	.189	.850
Years on the job	-9.783E-02[a]	.237	2.168	.032

Model summary	Conscientiousness ≤ 33	Conscientiousness ≥ 33
*R**	.384	.193
R^2	.147	.037
Adjusted R^2	.129	.014
SE	.32	.36

Note. The *n* value varies by domain and by mean. Values were calculated using SPSS Base 8.0, a statistical software package. NEO-FFI = Neuroticism, Extraversion, Openness - Five-Factor Inventory; RCPs = respiratory care practitioners.

[a]Indicates an error or nonsignificant finding at this step in the analysis.

*Predictors were (constant), age range, job title, and years on the job. Each model also utilizes a split in the subjects above and below the mean value for each NEO domain.

37). However, they do explain a small but reasonable portion of the variance within the MRA models.

A snapshot of the "average" survey subject whose temperament qualified as a Guardian would reveal a middle-aged man or woman who had (a) completed at least a bachelor's degree while working in a clinical job based within a traditional health care setting, (b) been employed at least 16 years in the field, and (c) expressed positive feelings toward the profession and career choice as an RCP. Given the homogeneity of these "active" members of the profession who participated in this survey, it is not possible to generalize these findings beyond this unique cohort of long-serving, career-committed RCPs.

A comparison of the NEO-FFI profile for career-committed RCP Guardians (*n* = 143) was produced and showed the following characteristics: (a) lower than the mean neuroticism scores, (b) higher than the mean extraversion scores, (c) higher than the mean openness scores, (d) higher than the mean agreeableness scores, and (e) conscientiousness

resting right at the mean. From this description, the typical career-committed RCP might be described as an empathetic man or woman who is reserved and serious, primarily older than 46, down-to-earth, practical, skeptical, proud, competitive, dependable with clear goals, and moderately well organized, as well as someone who prefers to work alone or with a small team and knows when to relax (Costa & McCrae, 1992, 1997).

Discussion and Suggestions for Future Research

While this study did not find a single personality type that could be called the prototypical career-satisfied RCP, the data did describe demographics and personality domains of a selection of career-committed RCPs. These subjects were evenly split across gender, and were older and more professionally established in their work, years on the job, and degree held. This combination of factors set the study subjects apart from rank-and-file RCPs who are younger, less established in their careers, hold an associate's degree, and are less likely to be members of professional organizations. While the method used to draw this subject cohort produced a bias toward the more established members of the profession, this bias does not lessen the importance of the data as it relates to this particular segment of the RCP community, i.e., the role models, the "joiners," and the leaders.

These study subjects are the core group that is still leading the profession through the challenges of the workplace and the attrition problems seen in our educational programs and hospitals (Czachowski, 1997; Goodfellow, Valentine, & Holt, 1999). One of the findings of this research was that these leaders and role models are the older members of the RC profession with at least 16 years in the field. These are the RCPs who are the second and third generations of the profession since its incorporation in 1947. This aging group of RCPs are the practitioners whose survival tactics and career satisfaction must be understood so we can utilize it for the next generation of RCPs who are just now starting school or beginning their first full-time job.

Finally, the fact that a large number of career-satisfied and -committed therapists are Guardian or Artisan temperaments should not be overlooked. Understanding how people relate to their training or work environment might provide educators and managers with a better way to prepare students or new employees for their challenging professional careers (Wicklein & Rojewski, 1995). Such thoughtful work might also lessen later career dissatisfaction and attrition seen in academic programs and on the job (Douce & Coates, 1984; Tiffin, 1995; Treanor, 1993;).

Recommendations for Further Research

Further study of the KTS II temperaments and NEO-FFI personality domains of RCPs should be carried out. While this cohort of subjects provided statistically significant findings for certain NEO personality domains, they are too unique a group of practitioners to extrapolate to the entire profession. Research should be conducted with a broader population of RCPs. Among the groups that should be included are pre-RC students, certified respiratory therapists, RCPs who are nonmembers of state or national organizations, career-dissatisfied RCPs, and 2-year associate degree RC students prior to

their graduation. This broader collection of subjects would provide a much richer collection of data concerning the temperament and personality make up of RCPs, career satisfied and otherwise.

References

American Association for Respiratory Care. (1993). *Year 2001: Delineating the educational direction for the future respiratory care practitioner. Proceedings of a National Consensus Conference on Respiratory Care Education.* Dallas, TX: Author.

American Association for Respiratory Care. (1998). *The future of allied health: The American Association for Respiratory Care responds to the Pew Commission Report.* [On-line]. Available: http://www.aarc.org/members_area/resources/pew.html

Arnold, J. (1990). Predictors of career commitment: A test of three theoretical models. *Journal of Vocational Behavior Psychology, 37,* 285-302.

Blau, G. J. (1988). Further exploring the meaning and measurement of career commitment. *Journal of Vocational Behavior Psychology, 32,* 284-297.

Blau, G. J., & Lunz, M. (1998). Testing the incremental effect of professional commitment on intent to leave one's profession beyond the effects of external, personal, and work-related variables. *Journal of Vocational Behavior Psychology, 52,* 260-269.

Boone, J. L., Biedermann, S., & Kostroun, P. (1994). Satisfaction, motivation, and commitment of senior medical records administration and medical technology students. *Journal of Allied Health, 23*(4), 229-236.

Brunas-Wagstaff, J. (1998). *Personality: A cognitive approach.* New York: Routledge.

Coile, R. C., Jr. (1997, June). Healthcare 2000: Future trends impacting healthcare and respiratory care. *AARC Times, 21,* 34-37.

Costa, P. T., Jr., & McCrae, R. R. (1992). *Revised NEO personality inventory manual.* Odessa, FL: Psychological Assessment Resources.

Costa, P. T., Jr., & McCrae, R. R. (1997, July). *The five-factor model as a universal passport to understanding personality.* Presidential address at the 8th biennial meeting of the International Society for the Study of Individual Differences, Aarhus, Denmark.

Czachowski, R. J. (1997). Respiratory care education: Quo vadis? *Respiratory Care, 42,* 844.

Decker, F. H. (1997). Occupational and nonoccupational factors in job satisfaction and psychological distress among nurses. *Research in Nursing Health, 20*(5), 453-64.

Dickter, D. N., & Roznowski, M. (1996). Basic statistical analysis. In F. T. L. Leong & J. T. Austin (Eds.), *The psychology research handbook: A guide for graduate students and research assistants* (pp. 208-218). Thousand Oaks, CA: Sage.

Douce, F. H., & Coates, M. A. (1984). Attrition in respiratory therapy education: Causes and relationships to admission. *Respiratory Care, 29,* 823-828.

Fraenkel, J. R., & Wallen, N. E. (1993). *How to design and evaluate research in education* (2nd ed.). New York: McGraw-Hill.

Goldberg, L. R. (1993). The structure of phenotypic personality traits. *American Psychologist, 48,* 26-34.

Goodfellow, L.T., Valentine, T., & Holt, M. E. (1999, Spring). Construction and validation of an instrument to assess critical thinking in respiratory care: An empirical process. *Respiratory Care Education Annual, 8,* 13-25. Dallas, TX: American Association for Respiratory Care.

Isaac, S., & Michael, W. B. (1997). *Handbook in research and evaluation* (3rd ed.). San Diego: Educational and Industrial Testing Services.

Keirsey, D. (1998). *Please understand me II: Temperament, character, intelligence.* Del Mar, CA: Prometheus Nemesis Book Co.

Keirsey, D., & Bates, M. (1984). *Please understand me: Character and temperament types* (5th ed.). Del Mar, CA: Prometheus Nemesis Book Co.

Kester, L., & Stoller, J. K. (1996). Respiratory care education: Current issues and future challenges. *Respiratory Care, 41,* 98-99.

Lanyon, R. I., & Goodstein, L. D. (1997). *Personality assessment* (3rd ed.). New York: John Wiley & Sons.

Lowman, R. L. (1991). *The clinical practice of career assessment: Interests, abilities, and personalities.* Washington, DC: American Psychological Association.

Matthews, G., & Deary, I. J. (1998). *Personality traits.* New York: Cambridge University Press.

McCrae, R. R., & Costa, P. T., Jr. (1996). Toward a new generation of personality theories: Theoretical contexts for the five-factor model. In J. S. Wiggins (Ed.), *The five-factor model of personality theoretical perspectives* (pp. 51-87). New York: The Guilford Press.

Meyer, J. P., & Allen, N. J. (1997). *Commitment in the work place: Theory, research, and application.* Thousand Oaks, CA: Sage Publications.

Meyer, J. P., & Allen, N. J., & Smith, C. A. (1997). Commitment to organization and occupations: Extension and test of a three-component conceptualization. *Journal of Applied Psychology, 78*(4), 538-551.

Meyers, I. B., & McCauley, M. H. (1985). *Manual: A guide to the development and use of the Meyers-Briggs Type Indicator.* Palo Alto, CA: Consulting Psychologists Press

Parnell, J. A. (1998, Winter). Improving the fit between organizations and employees. S.A.M. *Advanced Management Journal, 63,* 35-43.

Robert Wood Johnson Foundation. (1995). *The transformation of the U.S. health care market: Lessons from 15 communities.* Princeton, NJ: Author.

Shavelson, R. J. (1996). *Statistical reasoning for the behavioral sciences* (3rd ed.). Boston: Allyn and Bacon.

Shelledy, D. C., Youtsey, J. W., & Rau, J. L. (1992, Spring). A comparison of one, two, and four-year respiratory care program graduates on selected job-related variables. *Distinguished Papers Monograph, 1,* 21-37. Dallas, TX: American Association for Respiratory Care.

Tett, R. P., Jackson, D. N., & Rothstein, M. (1991, Winter). Personality measures as predictors of job performance: A meta-analytic review. *Personnel Psychology, 44,* 703-742.

Tett, R. P., & Meyer, J. P. (1993, Summer). Job satisfaction, organizational commitment, turnover intention, and turnover: Path analyses based on meta-analytic findings. *Personnel Psychology, 46,* 259-293.

Tiffin, N. (1995). Motivation of respiratory therapists: An analysis using Maslow's theory of motivation. *Canadian Journal of Respiratory Therapy, 31*(2), 13-18.

Treanor, S. (1993, Spring). Factors affecting job satisfaction among respiratory care practitioners. *Distinguished Papers Monograph, 2,* 13-28. Dallas, TX: American Association for Respiratory Care.

Wicklein, R. C., & Rojewski, J. W. (1995). The relationship between psychological type and professional orientation among technology education teachers. *Journal of Technology Education, 7,* 1.

Appendix A

The Demographics Survey Instrument

The first part of this survey is designed to identify basic details about you as a respiratory care practitioner. Data gathered in this first survey will be correlated with the data developed from the other survey instruments in this package. Your answers on this and the other survey instruments will be held in confidence and used only for statistical analysis. Please read each question carefully and blacken the circle which represents the best response.

1. Which of these age ranges includes you?
   - ❒ older than 23 up to 35 years old
   - ❒ between 36 and 46 years old
   - ❒ older than 46 years old
2. Which gender are you?
   - ❒ Female
   - ❒ Male
3. Which of these job descriptions is closest to your current job title?
   - ❒ staff therapist
   - ❒ clinical specialist
   - ❒ supervisor
   - ❒ department or group manager
   - ❒ department or academic program educator
   - ❒ Other _____
4. Which of these ranges for years working as a respiratory therapist includes you?
   - ❒ less than 5 years in respiratory therapy
   - ❒ between 5 and 8 years in respiratory therapy
   - ❒ between 9 and 15 years in respiratory therapy
   - ❒ greater than 16 years in respiratory therapy
5. Which of these academic degrees is closest to your current level of education? If you are working on a degree, that academic degree is what you should indicate here (any field).
   - ❒ Associate's Degree
   - ❒ Bachelor's Degree
   - ❒ Master's Degree
   - ❒ Doctorate (includes Medical Degree)
6. What is the highest professional credential you hold?
   - ❒ CRT
   - ❒ RRT
7. Which State or Territory do you live in? (write the State or Territory's name below)

   _____
8. Do you consider the years that you have spent in the field of Respiratory Therapy to have been a positive or a negative personal experience for you?
   - ❒ Yes (a positive personal experience)
   - ❒ No (a less than positive personal experience)

- ❒ Neutral

9. Today, do you regret having made Respiratory Therapy your career choice?
   - ❒ Yes
   - ❒ No
   - ❒ Neutral

The Keirsey Temperament Sorter II

The Keirsey Temperament Sorter II is a copyrighted product produced from the work of Keirsey and Bates by the Prometheus Nemesis Book Company, Del Mar, California (Keirsey, 1998). The Keirsey instrument is a 70-question, self-report personality inventory designed as a frequency inventory where the subject is asked to choose between sets of forced-choice word pairs. The final combination of a subject's 70 choices provides a specific "intensity" or recurrence in the particular recurring word choices a subject picks for various elements of this instrument. The first seven questions of the Keirsey instrument are listed below:

1. When the phone rings do you (E vs. I)*
   a) hurry to get it first
   b) hope someone else will answer
2. Are you more (S vs. N)*
   a) observant than introspective
   b) introspective than observant
3. It is worst to (S vs. N)*
   a) have your head in the clouds
   b) be in a rut
4. With people you are usually more (T vs. F)*
   a) firm than gentle
   b) gentle than firm
5. Are you more comfortable in making (T vs. F)*
   a) critical judgments
   b) value judgments
6. Is clutter in the workplace something you (J vs. P)*
   a) take time to straighten up
   b) tolerate pretty well
7. Is it your way to (J vs. P)*
   a) make up your mind quickly
   b) pick and choose at some length

* This instrument produces four direct temperament comparisons: extroversion (E)-introversion (I), sensation (S)-intuition (N), thinking (T)-feeling (F), judging (J)-perceiving (P).

Each of the potential answer pairs (a or b) represents a balance between Keirsey's temperament definitions. In the first question the subject is asked to choose between word

pairs that provide a certain score (total number of *a*'s vs. the total number of *b*'s chosen by the subject). The frequency of *a*'s and *b*'s determines the subject's primary personality characteristic for that pairing. This process is repeated across all 70 questions in this inventory until all questions have been completed. Upon completion the subject (or researcher) compiles the total responses for each of the four pairings to identify the subject's personality characteristics, or as Keirsey and Bates (1984) would say, the subject's temperament.

These comparisons produce these four primary temperament pairs: Artisan, SP; Guardian, SJ; Idealist, NF; and Rational, NT; and 6 combined temperament pairs: Artisan-Guardian, Artisan-Idealist, Artisan-Rational, Guardian-Idealist, Guardian-Rational, and Idealist-Rational.

The NEO Five-Factor Inventory, Form S

The Neuroticism, Extraversion, Openness - Five-Factor Inventory (NEO-FFI), Form S, was developed by Costa and McCrae (1992), and is a copyrighted product published by Psychological Assessment Resources.

The NEO-FFI instrument is a 60-question, self-report personality inventory designed as an intensity inventory instrument. In the NEO-FFI, the subject is asked to choose between 5 Likert-scale descriptors – from *strongly disagree* to *strongly agree* – to answer questions designed to illicit feelings about certain facets of the subject's personality. The values for the scales switch back and forth throughout the instrument across each of the instrument's five major domains of personality. A score for each facet is developed after all 60 questions (12 questions per facet) have been answered, and this score represents the subject's level of neuroticism, extraversion, openness, agreeableness, and conscientiousness (Costa & McCrae, 1992; Lanyon & Goodstein, 1997).

Appendix B

Brief Descriptions of the Four Primary Temperaments (Keirsey & Bates, 1984)

SP - Artisans' core needs are to have freedom to act without restriction, and then to be able to see that their action had a measurable result. Personal energy of an Artisan is focused on performance that the Artisan expects to carry out in good order and with results coming immediately, not in the future. The Artisan is the impulsive doer, the free spirit.

SJ - Guardians' core need is to be useful to the society they belong to. The Guardian seeks to belong to his or her social grouping. However, the Guardian also knows that this belonging must be earned, and as a matter of nature the Guardian is bound by duty to the society he or she serves. The Guardian lives the work ethic. Guardians are also very concrete in their communications methods with others.

NT - The Rational's core value centers on his or her desire to understand and explain the mysteries of life, and then seek to control those mysteries. Rationals seek knowledge, love intelligence, and are not averse to pushing themselves forward by the use of self-criticism. The Rational will strive to know, to be competent. Rationals are abstract in their communications. The Rational can become the compulsive perfectionist.

NF - The Idealist is engaged in a continuous search for the self, which is more a quest to define one's own existence. The Idealist searches for self-actualization, which he or she hopes will lead to a perfectly unique understanding of self. Idealists do not wish to fade into the crowd; rather, Idealists wishes their contribution would be significant and recognized by those around them whom they value and seek approval from. Idealists often express their thoughts in an abstract manner, but they are quite willing to cooperate toward a common good or goal.

A recent national distribution for the four primary Keirsey temperaments from a ongoing Internet survey taken by more than 270,000 subjects is as follows: Artisan, 12.19%; Guardian, 43.15%; Rational, 14.63%; and Idealist, 30.04% (Keirsey, 1998).

Appendix C

The Five-Factor Model

The NEO-FFI highlights five personality attributes (OCEAN, or openness, conscientiousness, extraversion, agreeableness, neuroticism) in individuals who take it. An analysis of the results from the NEO-FFI provides the researcher (and the survey-taker) with a snapshot of observable personality characteristics. However, not everyone (researcher or survey-taker) will always agree with the definitions that are contained in this or any other word-based descriptive system. There are no right or wrong character facets, attributes, or traits. A brief description of each factor follows from the *Revised NEO Personality Inventory Manual* (Costa & McCrae, 1992):

Neuroticism. This domain is associated with psychological adjustment or emotional stability. This personality scale is a measure of an individual's coping ability in the face of a stressful world.

Extraversion. Higher scores (extroverts) reflect personalities with desires toward assertive behavior, an active lifestyle, and the gift of gab. High scores are correlated with the enterprising occupations. Lower scores (introverts) are not associated with negative personality traits; rather, they point to individuals who are more reserved in their behavior and more independent in their decision-making processes. The word pairing between extrovert and introvert is often thought of as friendly versus unfriendly or open versus closed. This could not be further from the meaning of the NEO-FFI instrument.

Openness. Individuals with high openness scores tend to be curious about the inner and outer worlds. These individuals are willing to except alternative ideas and hold unconventional values. These people also experience positive and negative emotions more acutely. Lower scores are often found in more traditional individuals who are more conventional or conservative in their overall outlook.

Agreeableness. This domain represents a dimension of interpersonal tendencies. The two sides of this domain are cooperative and competitive.

Conscientiousness. Individuals with higher levels of this scale are often seen as scrupulous, punctual, and reliable (steady). However, traits of the workaholic can also be found in individuals with high scores in this area. Lower scores here are associated with less compulsiveness and individuals who can also be more relaxed in the way they apply their personal principles.

Author Note

Correspondence concerning this article should be addressed to Jeffery E. Ludy, Assistant Professor and Director of Clinical Education, Cardiopulmonary Sciences, University of Central Florida, College of Health and Public Affairs, P.O. Box 162205, Orlando, Florida 32816-2205. Electronic mail may be sent to Jeffery E. Ludy at jludy@pegasus.cc.ucf.edu.

Respiratory Care Education Annual
Volume 10, Spring 2001, 55-66

An Analysis of Outcomes Data for Accredited Respiratory Therapist Educational Programs

David C. Shelledy, Tracey H. Dehm, and Janet Padilla
The University of Texas Health Science Center at San Antonio

Abstract

We sought to determine educational program-related factors associated with improved success rates for the National Board for Respiratory Care (NBRC) examinations and employer and graduate surveys. Data reported on the 1996 accreditation *Report of Current Status* (Joint Review Committee for Respiratory Therapy Education, 1996a) for all accredited respiratory therapist programs (N = 300) was analyzed. Significant predictors of NBRC examination pass rates included maximum number of students accepted, job placement, NBRC self-assessment examination results, and number of students dropping out due to science coursework, finances, and "other." Programs at 4-year colleges had the highest entry-level certification examination (CRTT), written registry examination (WRRT), and clinical simulation examination (CSE) pass rates. Programs awarding an associate's degree had the highest CRTT pass rates, while programs awarding a bachelor's degree had the highest WRRT and CSE pass rates. Attrition rates ranged from 12.5% to 24.5%.

An Analysis of Outcomes Data for Accredited Respiratory Therapist Educational Programs

Respiratory therapist (RT) educational programs seek to prepare competent respiratory therapists for clinical practice. Measures used to assess an educational program's success in meeting this goal may include graduates' performance on the National Board for Respiratory Care (NBRC) examinations, employer evaluations of program graduates' performance, and graduates' self-evaluations. Other measures of a program's success may include program attrition rates and job placement of graduates.

RT educational programs have varying degrees of success in preparing graduates for the NBRC examinations and the workplace. One purpose of programmatic accreditation is to ensure that programs meet minimum standards. RT education has been outcome oriented since 1986 (Joint Review Committee for Respiratory Therapy Education [JRCRTE], 1986). In spite of this outcome orientation, little is known about specific program-related factors associated with improved outcomes for program graduates.

The purpose of this study was to determine what, if any, program-related factors in the *Report of Current Status* (JRCRTE, 1996a) are associated with improved graduate performance on NBRC examinations, employer evaluations of graduates, or graduates' evaluations of the program.

Specifically, we sought to determine what factors associated with RT programs are predictive of the performance of program graduates on selected outcome measures. We compared the performance of RT program graduates by program type, degree awarded, type of institution (technical institute, community college, 4-year college, and university), credentials of program key personnel, number of clinical affiliates, program enrollment, ratio of students accepted to number of applicants, attrition rates, number of full-time paid faculty, number of part-time paid faculty, total full-time equivalent (FTE) faculty positions, and student-teacher ratio.

Program performance was assessed by graduate NBRC entry-level certification examination (CRTT) pass rate; entry-level self-assessment examination (CRTT SAE) pass rate; employer survey of cognitive (COG), psychomotor (PSM), and affective (AF) skills; graduate survey of COG, PSM, and AF skills; written registry examination (WRRT) pass rate; clinical simulation examination (CSE) pass rate; and registry and CSE self-assessment examination pass rates (WRRT SAE and CSE SAE), as reported on JRCRTE's (1996b) *Thresholds Input Form*. In the case of board examination and SAE performance, outcomes were analyzed as number of graduates passing divided by number of graduates attempting the examination (percent passing). For the employer and graduate surveys, outcomes were analyzed as number exceeding the cut score divided by number of surveys sent (percent exceeding cut score).

We specifically addressed the relationship between type of program, institution, degree awarded, credentials of key personnel, number of clinical affiliates, class size, number of applicants, attrition rate, number of faculty or student-teacher ratio, and graduate performance on NBRC examinations, employer evaluations of graduates, and graduate evaluations of the program. We also examined correlations between specific outcomes to determine the degree of co-variance. For example, are SAE pass rates predictive of actual

class performance on the CRTT or WRRT? Multiple regression analyses were then performed to assess the ability of specific program attributes, when used in combination, to predict program outcomes for the CRTT, WRRT, and CSE; employer and graduate evaluations; and attrition and job placement.

Method

Data reported on the 1996 JRCRTE annual *Report of Current Status* for all accredited RT programs (N = 300) was provided to the researchers in a blinded fashion so that program names and personnel could not be identified. Programs identified as technician level were excluded from the analysis. We entered data into a spreadsheet and analyzed it with a microcomputer statistical package (STATISTICA, 1998). Means and standard deviations for outcomes variables were calculated by sponsoring institution and degree awarded. Outcomes variables compared included pass rates on the NBRC CRTT, WRRT, and CSE; percentage of graduates meeting or exceeding the cut scores for employer and graduate evaluations for COG, PSM, and AF skills on employer and graduate surveys; program attrition; and job placement.

Means and standard deviations were also calculated for NBRC pass rates by highest degree held by the program director and director of clinical education (DCE). Pass rates and percentages meeting or exceeding the cut score on outcomes measures were entered as provided by individual programs on their annual report. Data for each outcome were averaged for each program over a 5-year period. If less than 5 years of outcomes data were reported, the available data were averaged and included in the analysis.

When analyzing data from samples, statistical inference and hypothesis testing are required to permit generalizations from the sample to the target population. Because this study included data from the entire population of therapist programs (N = 300), observed differences in means are not due to sampling error, and tests of statistical significance to compare means would be inappropriate (Ary, Jacobs, & Razavieh, 1985). Put another way, conclusions may be drawn with confidence based on observed differences in means between categories when one can observe all instances of a population.

Pearson product-moment correlation coefficients were calculated to determine the degree of association between predictor and outcome variables. The following were compared to determine their ability to predict program outcomes on the NBRC examinations, employer surveys, and graduate surveys: number of clinical affiliates; number of students accepted into the program; number of students currently enrolled; number of applicants; maximum number of students; number of students dropping out (due to RT coursework, science coursework, clinical coursework, finances, personal reasons, learning style differences, personality conflicts with faculty, "other," and total); number of FTE faculty (full-time, part-time, and total); CRTT, WRRT, and CSE SAE pass rates; job placement rates; and attrition. A significant correlation ($p < 0.05$) would indicate a relationship or association between two variables (Ary et al., 1985).

Multiple regression analysis uses two or more independent variables to predict a dependent or outcome variable. Forward step-wise multiple regression analyses, which included all of the independent variables as predictors of program outcomes, were

performed. Outcome variables for the regression analyses were CRTT, WRRT, and CSE pass rates, and employer and graduate evaluations for COG, PSM, and AF program standards expressed as a percentage of graduates meeting or exceeding the cut score. A significant ($p < 0.05$) coefficient of multiple correlation (R) would indicate the ability of the predictor variables, when used in combination, to predict a specific program outcome (Kerlinger & Pedhazur, 1973).

A significant t test of the partial regression coefficients ($p < 0.05$) for each variable in the regression equations would indicate that particular variable's ability to predict a specific program outcome after the other variables had already contributed to the prediction. The R^2 values were then reviewed to determine the amount of variance in the outcome scores accounted for by the independent variables (Kerlinger & Pedhazur, 1973).

Results

Table 1 shows means and standard deviations of program outcomes by sponsoring institution and degree awarded. All programs were included in the analysis, and mean scores represent the entire population. Programs at 4-year colleges had the greatest CRTT, WRRT, and CSE pass rates. Programs awarding an associate's degree (AD) had the highest CRTT pass rates, while programs awarding a bachelor's degree (BD) had the highest WRRT and CSE pass rates.

Success rates for employer evaluations were similar by sponsor and degree awarded, with graduates who were awarded certificates receiving the lowest ratings from employers. Graduate evaluations for BD tended to be lower than AD or certificate programs. Attrition rates ranged from 12.5% (BD) to 24.5% (AD). Job placement for all programs ranged from 93% to 95%.

Table 2 compares CRTT, WRRT, and CSE pass rates by highest degree achieved by the program director and DCE. Pass rates for graduates of programs in which the program director held an AD ($n = 6$) were higher on the CRTT; however, pass rates for these graduates were lower on the WRRT and CSE. Programs in which the program director held a doctorate ($n = 31$) had higher pass rates on the CRTT, WRRT, and CSE than those in which the program director held a BD or master's degree. Programs in which the DCE held a master's degree had higher pass rates on the CRTT, WRRT, and CSE than programs in which the DCE held a lower degree.

Table 3 lists the Pearson product-moment correlations for program-related variables that were significantly correlated ($p < 0.05$) with program outcomes. Factors significantly associated with specific program outcomes included maximum number of students accepted, job placement, and number of students dropping due to science coursework, finances, learning style differences, and "other." There were also significant correlations between the number of FTE part-time faculty and total FTE faculty, and specific program outcomes. The CRTT SAE significantly correlated with CRTT, WRRT, and CSE pass rates and job placement. The WRRT SAE significantly correlated with the CRTT, graduate COG evaluations, and job placement. The CSE SAE significantly correlated with graduate COG and AF evaluations. As the student-teacher ratio

Table 1
Outcomes Data for CoARC Accredited RT Programs by Sponsor and Degree Awarded

	Sponsor *M* (*SD*)			
Variable	Technical institute (*n* = 28)	Community college (*n* = 159)	4-year college (*n* = 23)	University (*n* = 66)
CRTT % Pass	93.9 (13.1)	96.7 (5.6)	97.6 (4.4)	94.2 (14.3)
WRRT % Pass	86.3 (12.2)	85.6 (12.1)	90.3 (10.1)	87.2 (12.8)
CSE % Pass	79.6 (15.8)	80.3 (14.3)	87.0 (12.1)	81.6 (14.1)
EMP % COG	94.6 (12.1)	91.6 (11.8)	88.7 (16.4)	94.3 (8.2)
EMP % PSM	94.9 (15.2)	92.4 (13.7)	91.9 (15.1)	94.6 (9.4)
EMP % AF	93.0 (9.0)	93.0 (12.3)	92.8 (14.3)	95.6 (6.7)
GRAD % COG	93.3 (9.1)	92.1 (12.5)	89.8 (20.8)	91.3 (12.6)
GRAD % PSM	91.8 (18.2)	92.2 (15.3)	91.0 (15.6)	91.9 (11.8)
GRAD % AF	98.1 (3.6)	94.2 (11.9)	98.8 (1.5)	95.5 (8.8)
Attrition	21.7 (12.7)	25.2 (14.5)	19.1 (13.6)	17.6 (12.0)
Job placement	94.1 (7.0)	94.8 (7.8)	94.2 (7.1)	94.2 (8.5)
	Degree awarded *M* (*SD*)			
Variable	Certificate (*n* = 13)	Associate (*n* = 221)	Bachelor (*n* = 40)	
CRTT % Pass	85.6 (25.8)	96.9 (5.97)	94.5 (12.3)	
WRRT % Pass	82.7 (16.7)	86.1 (11.7)	89.7 (12.5)	
CSE % Pass	78.3 (16.98)	80.8 (14.4)	83.2 (12.0)	
EMP % COG	89.2 (18.7)	92.5 (10.7)	92.1 (13.7)	
EMP % PSM	91.1 (16.1)	96.8 (56.6)	94.9 (11.8)	
EMP % AF	92.8 (15.1)	93.6 (10.7)	94.7 (11.6)	
GRAD % COG	86.2 (17.7)	93.5 (10.6)	85.0 (19.3)	
GRAD % PSM	92.0 (13.8)	92.4 (14.8)	89.6 (16.3)	
GRAD % AF	96.3 (4.5)	95.6 (9.9)	94.3 (11.4)	
Attrition	19.4 (9.0)	24.5 (14.2)	12.5 (10.3)	
Job placement	92.7 (8.5)	94.6 (7.8)	94.8 (7.9)	

Note. CoARC = Committee on Accreditation for Respiratory Care; RT = respiratory therapist; CRTT % Pass = pass rate of program graduates on the National Board for Respiratory Care (NBRC) entry-level certification examination; WRRT % Pass = pass rate of program graduates on the NBRC written registry examination; CSE % Pass = pass rate of program graduates on the NBRC clinical simulation examination; EMP % COG, PSM, and AF = percentage of program graduates meeting or exceeding the cut score for success on employer cognitive, psychomotor, and affective evaluations; GRAD % COG, PSM, and AF = percentage of program graduates meeting or exceeding the cut score for success on graduate cognitive, psychomotor, and affective evaluations. Attrition is the percentage of students completing the program. Job placement is the percentage of graduates finding employment in the field within 6 months of graduation.

Table 2
NBRC Pass Rates by Key Personnel Educational Credentials

Credential	CRTT % Pass *M* (*SD*)	WRRT % Pass *M* (*SD*)	CSE % Pass *M* (*SD*)
Program director			
Associate (*n* = 6)	97.3 (3.1)	81.7 (18.4)	73.0 (21.9)
Bachelor (*n* = 70)	95.1 (9.7)	84.8 (12.6)	76.1 (15.7)
Master (*n* = 148)	96.3 (7.3)	87.5 (11.8)	83.2 (13.3)
Doctorate (*n* = 31)	96.9 (6.0)	89.5 (9.5)	84.8 (11.6)
Clinical director			
Associate (*n* = 23)	95.0 (6.3)	79.6 (14.0)	75.5 (15.3)
Bachelor (*n* = 109)	96.1 (9.2)	86.8 (11.8)	80.2 (15.3)
Master (*n* = 97)	97.5 (6.2)	88.7 (10.3)	83.5 (12.1)
Doctorate (*n* = 5)	85.6 (25.0)	78.5 (23.3)	83.5 (13.9)

Note. NBRC = National Board for Respiratory Care; CRTT % Pass = pass rate of program graduates on the NBRC entry-level certification examination; WRRT % Pass = pass rate of program graduates on the NBRC written registry examination; CSE % Pass = pass rate of program graduates on the NBRC clinical simulation examination.

decreased, CSE pass rate increased.

Table 4 contains the results of the regression analyses. Based on the coefficient of multiple correlation, R^2, the independent variables were able to account for the following: 18% of the variance in CRTT pass rates, 21% of the variance in WRRT pass rates, 18% of the variance in CSE pass rates, 15% of the variance in the employer survey (COG), 9%

Table 3
Pearson Product-Moment Correlation Coefficients for Program-Related Variables Related to NBRC Examination Pass Rates

Variable	CRTT % Pass	WRRT % Pass	CSE % Pass
Maximum number of students	-0.17	-0.20	-0.15
Job placement	0.38	0.26	0.30
Students dropping out due to			
Science coursework	-0.45	-0.22	
Finances	-0.29		
Learning style differences			
Other	-0.52	-0.25	
FTE part-time			
FTE total			
CRTT SAE	0.45	0.29	0.27
WRRT SAE	0.15		
CSE SAE			
Student-teacher ratio			-0.15

of the variance in the graduate survey (COG), 17% of the variance in attrition, and 16% of the variance in job placement.

Based on the regression analysis, the strongest predictors of CRTT pass rates were number of students dropping out of the program due to "other" reasons, total number of students dropping out of the program, and CRTT SAE pass rates. The strongest predictors of WRRT pass rates were CRTT SAE pass rates, number of students dropping out due to "other" reasons, maximum number of students, number of students dropping out due to a personality conflict with faculty, and number of students accepted. Based on the regression analysis, no individual variables significantly improved prediction of CSE pass rates or employer survey (COG) results. The strongest predictor of graduate survey (COG) results was CSE SAE pass rates.

In combination, the program variables were unable to predict any of the variance observed in the employer and graduate survey (PSM and AF) results. The strongest predictors of attrition were number of students dropping the program due to finances, number of full-time FTE faculty, maximum number of students accepted, and actual

Table 3 Continued

Pearson Product-Moment Correlation Coefficients for Program-Related Variables Related to NBRC Examination Pass Rates

	Employer evaluations			Graduate evaluations				
Variable	COG	PSM	AF	COG	PSM	AF	Attrition	Job placement
Maximum number of students							0.19	-0.14
Job placement								
Students dropping out due to								
Science coursework								
Finances							0.23	
Learning style differences	-0.23		-0.18					
Other								-0.16
FTE part-time								-0.14
FTE total		-0.12	-0.27		-0.15			
CRTT SAE								0.19
WRRT SAE				0.19				0.15
CSE SAE				0.27		0.32		
Student-teacher ratio								

Note. NBRC = National Board for Respiratory Care; CRTT % Pass = pass rate of program graduates on the NBRC entry-level certification examination; WRRT % Pass = pass rate of program graduates on the NBRC written registry examination; CSE % Pass = pass rate of program graduates on the NBRC clinical simulation examination; COG = cognitive skills; PSM = psychomotor skills; AF = affective skills; FTE = full-time equivalent; SAE = self-assessment examination.

Table 4
Results of Forward Step-Wise Multiple Regression Analyses Utilizing Independent Variables to Predict Program Outcomes

Variable	*R*	R^2	*F*	*p*
CRTT % Pass	0.42	0.18	2.49	0.02*
WRRT % Pass	0.46	0.21	4.37	0.001**
CSE % Pass	0.43	0.18	2.49	0.02*
EMP % COG	0.38	0.15	2.75	0.02*
EMP % PSM	0.23	0.05	2.39	0.10
EMP % AF	0.22	0.05	2.12	0.13
GRAD % COG	0.31	0.09	4.31	0.02*
GRAD % PSM	0.23	0.05	1.54	0.21
GRAD % AF	0.36	0.13	3.02	0.06
Attrition	0.42	0.17	4.31	0.003**
Job placement	0.39	0.16	2.44	0.03*

Note. CRTT % Pass = pass rate of program graduates on the National Board for Respiratory Care (NBRC) entry-level certification examination; WRRT % Pass = pass rate of program graduates on the NBRC written registry examination; CSE % Pass = pass rate of program graduates on the NBRC clinical simulation examination; EMP % COG, PSM, and AF = percentage of program graduates meeting or exceeding the cut score for success on employer cognitive, psychomotor, and affective evaluations; GRAD % COG, PSM, and AF = percentage of program graduates meeting or exceeding the cut score for success on graduate cognitive, psychomotor, and affective evaluations. Attrition is the percentage of students completing the program. Job placement is the percentage of graduates finding employment in the field within 6 months of graduation.
*$p < 0.05$. **$p < 0.01$.

number of students accepted. The strongest predictors of job placement were CRTT SAE pass rates and number of students dropping the program due to "other" reasons.

Discussion

Predictors of RT program graduates' performance on NBRC board examinations include students' entering grade point average (GPA), prerequisite GPA, critical thinking ability, and CRTT and WRRT SAE scores (LeGrand & Shelledy, 1999). With respect to program characteristics, increased program length and sponsorship by a community or 4-year college have been associated with improved NBRC examination performance (Scanlan, 1986, 1989).

Other specific program characteristics have not been shown to be clearly associated with improved program outcomes (Scanlan, 1989, 1993). While most RT educational program directors believe that NBRC examination performance and graduates'

evaluations of the program should be used to evaluate program quality (Van Scoder & Cullen, 1998), there continues to be a paucity of data describing specific program characteristics associated with improved outcomes.

For our study, programs at 4-year colleges had the highest CRTT, WRRT, and CSE pass rates. It is important to note that when the data were analyzed by the sponsoring institution, the 4-year college and university-based programs included programs offering both an AD and BD. BD programs at 4-year colleges had pass rates on the CRTT, WRRT, and CSE of 98%, 97%, and 92%, respectively; this compares to pass rates of 97%, 88%, and 85%, respectively, for AD programs at 4-year sponsoring institutions. Both AD and BD programs at 4-year colleges did well when compared to the averages for all programs in each category. One might speculate that a 4-year college setting is beneficial in terms of graduate outcomes, regardless of program type.

Programs awarding an AD had the highest CRTT pass rates, while programs awarding a BD had the highest WRRT and CSE pass rates. This is what might be expected, based on program length and the focus of BD programs on preparing students for advanced practice. These findings may also lend support to the view that BD programs are well suited to prepare future advanced-level RTs, while entry-level education may best reside at the AD level.

Success rates for employer evaluations of COG, PSM, and AF graduate performance were similar by sponsor and degree awarded. Graduates' self-evaluations of their achievement of COG, PSM, and AF standards tended to be lower for BD programs, and this may be related to graduates' expectations for themselves and their programs.

Few program-related factors were useful in predicting success rates on the graduate and employer surveys, and this would support the contention that the validity of these assessments may be marginal. The only variables significantly correlated with the employers' evaluations of graduates were number of dropouts due to learning style differences, and total number of FTE faculty. As FTE faculty increased, success rates for employer PSM and AF evaluations declined. Perhaps larger programs are less successful in these areas; however, there were no relationships between numbers of students or student-teacher ratio and employer evaluation results. In all cases, the variance in employer ratings accounted for by these variables individually was only 1% to 7%, a very small amount.

The only significant predictors of graduates' self-evaluations were WRRT SAE pass rates, CSE SAE pass rates, and total number of FTE faculty. As NBRC SAE pass rates went up, success rates for graduates' evaluations for COG skills improved. As with the employer surveys, as FTE faculty increased, there was a decrease in success rates on the graduate surveys for PSM skills. Once again, the variance accounted for was small (2% to 10%). When regression analysis was used to predict survey success rates, only the employer and graduate COG survey results had significant R values ($p < 0.05$). The independent variables, when used in combination, had no predictive value for PSM or AF graduate or employer survey results.

Attrition rates ranged from 12.5% for BD programs to 24.5% for AD programs. This information may be useful to programs in assessing how well they are doing compared to similar programs in terms of retention of students. Job placement was good for all programs and ranged from a low of 93% for certificate programs to a high of 95% for AD, BD, and community college-based programs.

Programs in which the program director held a doctorate or master's degree tended to have higher WRRT and CSE pass rates than programs in which the program director held a BD or AD. This finding lends support to the view that the educational requirements for this position should be increased. Programs in which the DCE held a doctorate tended to have lower pass rates on the CRTT and WRRT. We believe that this may be an unimportant finding, given the small number of programs ($n = 5$) in which the DCE held a doctorate. Programs in which the DCE held a master's degree outperformed those in which the DCE held a lower degree.

There were no significant correlations ($p > 0.05$) between number of clinical affiliates, number of students accepted, number of students enrolled, number of applicants, percentage of applicants accepted, number of FTE full- or part-time faculty, total FTE faculty, or average attrition rate and CRTT, WRRT, or CSE pass rates. These findings were somewhat disappointing, in that we had hoped to be able to demonstrate relationships between program resources and board exam pass rates. There was a weak but significant correlation ($r = -0.15$; $p < 0.05$) between student-teacher ratio and CSE pass rates, and a lower ratio was associated with an improvement in CSE pass rates.

We were unable to find a significant correlation between the number of applicants or percentage of applicants accepted and any specific program outcome. While one might expect program outcomes to improve with larger numbers of applicants and a more selective admissions process, we were unable to demonstrate such a relationship.

There were no significant correlations between the NBRC board examination pass rates and the numbers of students who dropped out due to RT didactic coursework, clinical coursework, personal reasons, learning style differences, or personality conflicts with faculty. And as noted above, few of the items on JRCRTE's (1996a) *Report of Current Status* had any relationship with the results of the employer and graduate surveys.

There were significant correlations ($p < 0.05$) between maximum number of students accepted, percentage of students placed on the job within 6 months of graduation, and CRTT, WRRT, and CSE pass rates. Programs reporting a larger maximum number of students had lower board exam pass rates, and programs with higher job placement had better board exam pass rates. There were also significant correlations between the number of students dropping out due to science coursework, finances, and "other" for CRTT pass rates, and between the number of students dropping out due to science coursework and WRRT pass rates. Exam pass rates improved as the number of students dropping out in each of these categories increased.

In combination, the independent variables were able to account for a significant amount of the variance in CRTT, WRRT, and CSE pass rates, as well as employer and graduate survey (COG) results. In combination, the independent variables were unable to account for any of the variance observed in employer or graduate survey success rates for PSM or AF skills.

It should be noted that the results of this study are based on program self-reports, as submitted to the Committee on Accreditation for Respiratory Care as part of the annual program accreditation report. While programs make every effort to report accurate data, it is possible that some of the data reported are inaccurate, due to mistakes, confusion, or misunderstandings on the part of individuals completing the report. It is also important

to note that the information reported in this study is based on the 1996 annual accreditation reports (JRCRTE, 1996a, 1996b), and outcomes for programs may have changed since that time, due to changes in the NBRC examination matrixes as well as the implementation of computer-based testing.

Conclusions

Significant predictors of NBRC examination pass rates include maximum number of students accepted, graduates' job placement rate, CRTT and WRRT SAE results, and number of students dropping out due to science coursework, finances, and "other."

Graduates of programs sponsored by 4-year colleges outperformed those sponsored by technical institutes, community colleges, and universities. Programs awarding a bachelor's degree had higher pass rates on the WRRT and CSE, the lowest attrition rates, and highest job placement rates, while programs awarding an associate's degree had the highest CRTT pass rates.

References

Ary, D., Jacobs, L. C., & Razavieh, A. (1985). *Introduction to research in education* (3rd ed.). New York: Holt, Rinehart and Winston.

Joint Review Committee for Respiratory Therapy Education. (1986). *Essentials and guidelines of an accredited educational program for the respiratory therapy technician and respiratory therapist.* Euless, TX: Author.

Joint Review Committee for Respiratory Therapy Education. (1996a, October). *Report of current status.* (Available from the Committee on Respiratory Care Education, Committee on Accreditation for Respiratory Care, 1248 Harwood Road, Bedford, TX 76021-4244)

Joint Review Committee for Respiratory Therapy Education. (1996b, October). *Thresholds input form*. (Available from the Committee on Respiratory Care Education, Committee on Accreditation for Respiratory Care, 1248 Harwood Road, Bedford, TX 76021-4244)

Kerlinger, F. N., & Pedhazur, E. J. (1973). *Multiple regression in behavioral research.* New York: Holt, Rinehart & Winston.

LeGrand, T. S., & Shelledy, D. C. (1999). Predicting graduate performance on selected respiratory care program outcome measures: Development of a correlational model. *Respiratory Care Education Annual, 8,* 3-11.

Scanlan, C. L. (1986). *Predictive validity of the 1977 JRCRTE Essentials executive summary.* Euless, TX: Joint Review Committee for Respiratory Therapy Education.

Scanlan, C. L. (1989). *Essentials validation and study.* Euless, TX: Joint Review Committee for Respiratory Therapy Education.

Scanlan, C. L. (1993). *Validation study 1988-1992 longitudinal analysis.* Euless, TX: Joint Review Committee for Respiratory Therapy Education.

STATISTICA (Version 5.1) [Computer Software]. (1998). Tulsa, OK: StatSoft.

Van Scoder, L., & Cullen, D. L. (1998). Program directors' preferences on selected respiratory therapy accreditation issues. *Respiratory Care Education Annual, 7,* 3-19.

Author Note

David C. Shelledy, PhD, RRT, RPFT, Chairman, Department of Respiratory Care. Tracey H. Dehm, BS, RRT, and Janet Padilla, BS, RRT, were enrolled in the bachelor's degree respiratory care program at the time of this study.

The authors wish to thank the Committee on Accreditation for Respiratory Care (CoARC) for permission to use program records and for technical assistance. The analysis and opinions contained in this report are solely those of the authors. All compilations of data from the records made available were prepared by the authors, who are responsible for their accuracy and completeness. CoARC is not a party to, nor does it sponsor or endorse, this report.

Correspondence concerning this article should be addressed to David C. Shelledy, Department of Respiratory Care, The University of Texas Health Science Center at San Antonio, Mail Code 6248, 7703 Floyd Curl Drive, San Antonio, Texas 78229-3900. Electronic mail may be sent to shelledy@uthscsa.edu.

Respiratory Care Education Annual
Volume 10, Spring 2001, 67-74

Integrating Teaching Skill Education with Basic Life Support Instruction: A Unique Solution to Two Instructional Problems

Phillip D. Hoberty and F. Herbert Douce
The Ohio State University

Abstract

Preparing respiratory therapy (RT) students as patient and caregiver educators has evolved as an expectation. Providing curriculum and developing their competency have become challenges. Our students and new graduates rated the course in educational methods required by our curriculum as less than satisfactory and significantly lower than other RT courses. We found a solution by integrating two new courses, one in educational methods and one using RT students to teach cardiopulmonary resuscitation (CPR) to other allied medical students. Student and new graduate evaluations of the RT education course improved significantly, and the CPR students rated their course as excellent. The benefits of having RT students teach CPR at their colleges include incorporating appropriate and needed curriculum for them, serving the needs of other students in the college, and providing interdisciplinary student interactions that might not have occurred. Since we designed our CPR course as a traditional college course, we benefited by an increase in our productivity.

Integrating Teaching Skill Education with Basic Life Support Instruction

For almost a decade, the expectation that all respiratory therapists possess instructional skills has been evolving. In 1992, experts predicted that respiratory care practitioners would need patient education skills in the future (O'Daniel et al., 1992), and later that year there was a consensus that patient education and educational techniques would be expectations in our future scope of practice (Cullen et al., 1993). To assist respiratory care practitioners as patient and caregiver educators, two clinical practice guidelines were published in 1996 (Hilling, Hoberty, Hoberty, Sobash, & Southorn, 1996a; Hilling, Hoberty, Hoberty, Sobash, & Southorn, 1996b).

Furthermore, the current standards of accreditation include "provide patient, family, and community education" in the description of the profession and "patient and caregiver education" in the suggestions for curriculum (Committee on Accreditation for Respiratory Care [CoARC], 2000). Finally, job analysis research has concluded that assessing patient learning needs and providing instruction to patients are within our scope of practice at entry and advanced levels (National Board for Respiratory Care [NBRC], 2000a; NBRC, 2000b). Creating curriculum and providing students with meaningful learning opportunities for them to develop their instructional skills are the challenges for all respiratory therapist educational programs.

From its inception, the baccalaureate curriculum for the respiratory therapist in the School of Allied Medical Professions at The Ohio State University had included a core course in educational methods. Feedback from graduates and members of the advisory committee indicated that graduates need teacher skills in providing patient and in-service education in their roles as advanced respiratory therapists. The course used in the curriculum was taught by another academic unit in support of a variety of curriculums, including the professional curriculum in the School of Allied Medical Professions. Using a 5-point Likert scale (1 = *unsatisfactory*, 2 = *poor*, 3 = *satisfactory*, 4 = *good*, 5 = *excellent*), new graduates of the respiratory therapy (RT) program consistently rated the interdisciplinary education course significantly lower than the mean for RT courses ($p < .05$), with the interdisciplinary education course consistently rated less than satisfactory (see Table 1).

We hypothesized that the predominately lecture-based course lacked the opportunity for students to develop and participate in real-life teacher-learner interactions so as to practice their teaching skills in a professional setting. The course provided for a single micro-teach session in a classroom setting. It was surmised that the course failed to meet student needs because this session was not adequate to build confidence in ongoing performance in multiple sessions or to deliver instruction in a context that closely resembled the professional world of the therapist. The RT faculty further surmised that the development of an RT education course that offered both of these would be more successful than the current education course.

Simultaneously, there arose a need to offer cardiopulmonary resuscitation (CPR) training at the American Heart Association (AHA) Basic Life Support (BLS) for Healthcare Providers course level to students enrolled in other baccalaureate allied medical curriculums of the School of Allied Medical Professions. Students were currently

Table 1
Graduate Evaluations of RT Education Course and RT Courses Overall

Graduate class year(s)	Interdisciplinary education course *M* (*SD*)	RT courses *M* (*SD*)
1995	2.08	4.00
1996	2.78	3.64
1997	2.92	4.04
1998	1.85	3.60
1995-1998	2.41 (0.52)	3.82 (0.12)*

Note. Judgments were made on 5-point scales (1 = *unsatisfactory*, 5 = *excellent*).
RT = respiratory therapy.
*p = 0.007.

acquiring their CPR training in a number of different ways. Most of these courses were through sites outside of the medical center and university. These courses were often without academic credit, at a number of provider levels of training, and for a community-based audience. As a result, the students had very inconsistent, nonhealthcare-related training. Finally, the administration of our school provided us with the additional challenge to increase the number of academic credit hours earned by our division. Creating two new courses seemed to meet these challenges.

The RT program faculty wished to test our hypothesis that RT students would be more satisfied with their teacher preparation if the program included a new course in which teacher preparation was focused on and applied to laboratory instruction in a second new course (CPR for the Healthcare Provider). The purpose of this report is to test this hypothesis and evaluate our efforts.

Methods

We created two new courses to meet these challenges: in allied medicine, CPR for the Healthcare Provider, and in RT, Advanced Clinical Practice: Education.

CPR Course

We desired that our CPR course for allied medical students meet the guidelines of the AHA's BLS for Healthcare Providers course and that RT students be instructors in the course (American Heart Association, 1998). To begin development of a RT student-taught CPR course for allied medical students, a member of the RT faculty completed the BLS instructor trainer course during spring quarter 1998. Senior RT students completed a BLS instructor course and obtained BLS instructor certification during autumn quarter 1998.

We developed a pilot CPR course for allied medical students in a traditional 10-week, two-quarter credit hour format, with a faculty-taught weekly large group lecture and a

Table 2
Major Topics in RT Education Course

Topic
Teaching roles for respiratory therapists
Characteristics of good teachers
Assessing learning needs and environment
Developing goals and learning objectives
Selecting teaching methods
Use of instructional media
Developing courses and programs
Evaluating learning
Assessing performance

Note. RT = respiratory therapy.

student-taught weekly small group practice laboratory session. We offered the pilot course initially in winter quarter 1999 in conjunction with the pilot of the RT education course. We proposed the new allied medicine course, CPR for the Healthcare Provider, and received approval to offer the course in winter quarter 2000.

RT Education Course

For the new RT education course, Advanced Clinical Practice: Education, the course content was adopted from teacher preparation handbooks provided to new university instructors. The course met twice a week for three hours each session and awarded three quarter credit hours. Table 2 outlines the course's major class topics.

Students developed lesson plans for each CPR laboratory session they were assigned to teach, as well as class sessions on these topics. The RT students were divided into groups of 2 to 3 student instructors per CPR laboratory section so that a mannequin practice ratio of 4:1 could be maintained in all groups; an additional mannequin was available in each group so that any student with a respiratory infection could have a separate mannequin for practice.

Table 3
Student Evaluations of RT Education Course and CPR Course

Course	SEI tool	AHA evaluation tool
RT education	4.12	
CPR	4.80	4.90

Note. Judgments were made on 5-point scales (1 = *unsatisfactory*, 5 = *excellent*). RT = respiratory therapy; CPR = cardiopulmonary resuscitation; SEI = student evaluation of instruction; AHA = American Heart Association. See Appendices A and B for evaluation tools.

Course Evaluations

Using a 5-point Likert scale (from 1 = *unsatisfactory* to 5 = *excellent*), four assessments were used to determine the degree of students' satisfaction with their instructional experience (RT students evaluated the RT education course, RT graduates evaluated the RT education course within their overall curriculum, and allied medical students evaluated their CPR course using both university and AHA tools). We determined the means of these evaluations and compared graduates' ratings of their RT education course to the ratings of the other RT courses using a student's *t* test at an alpha level of 0.05.

Results

In winter quarter 2000, nine senior RT students enrolled in the RT education course, and 43 allied medical students enrolled in the CPR course. The results of student and graduate evaluations are provided in Tables 3 and 4, respectively. Students rated their courses as good and approaching excellent. When the RT graduates of 2000 rated the courses in their curriculum, there was no significant difference between their education course and the other RT courses.

Discussion

In the education of adults, locating learning in real-life experiences is recognized as good practice (Merriam, 1996). Formal classroom-only education, which emphasizes abstract, decontextualized knowledge, gives little opportunity for transfer back to real-life situations in which the learners are expected to function. Educators recognize that authentic tasks provide practical situations in which knowledge has meaning, and reflect the ambiguity and complexities of applying learning to real situations (Choi & Hannafin, 1995). It is on this basis that apprenticeships, internships, and practicums are pinned, and on which laboratory and supervised clinical practice are mandated in curriculums that educate respiratory therapists (Wilson, 1993). Preparation in teacher skills for advanced practitioners at the baccalaureate level can be viewed in this same way as requiring realistic, supervised practice in a learner-relevant professional setting.

Table 4
Graduate Evaluations of RT Education Course and RT Courses Overall

Graduate class year	RT education course *M* (*SD*)	RT courses *M* (*SD*)
2000	4.33 (0.87)	4.42 (0.42)*

Note. Judgments were made on 5-point scales (1 = *unsatisfactory*, 5 = *excellent*).
RT = respiratory therapy.
*$p = 0.783$.

Results of student and graduate evaluations demonstrated our solution to be very satisfactory for participants in both audiences. Based on these evaluations, the combination of the education course taught in the RT curriculum and the CPR course taught in the allied medicine curriculum was considered successful for both audiences. It was a unique solution to both the need to improve the quality of the RT education course offering and the need to offer a BLS for Healthcare Providers course in the School of Allied Medical Professions. The solution to our challenges might serve as a model for other programs.

The benefits of having RT students teach CPR at their colleges include incorporating appropriate and needed curriculum for them, serving the needs of other students in the college, and providing interdisciplinary student interactions that might not have occurred. Finally, by offering these two new courses, we added 113 quarter credit hours to our productivity.

References

American Heart Association. (1998). *Basic life support instructor's manual.* Dallas, TX: Author.

Choi, J. I., & Hannafin, M. (1995). Situated cognition and learning environments: Roles, structures and implications for designs. *Educational Technology Research and Design, 43*(2), 53-69.

Committee on Accreditation for Respiratory Care. (2000). Commission on Accreditation of Allied Health Education Programs standards and guidelines for the profession of respiratory care [On-line]. Available: http://www.coarc.com/accred/standards.html

Cullen, D. L., Sullivan, J. M., Bartel, R. E., Fuson, P., Galvin, W. F., Rinker, R. M., Sheldon, R., Van Scoder, L., Wiezalis, C. P., & Wojciechowski, W. V. (1993). A summary report. In *Year 2001: Delineating the Educational Direction for the Future Respiratory Care Practitioner* (pp. 67-75). Dallas, TX: American Association for Respiratory Care.

Hilling, L., Hoberty, P., Hoberty, R., Sobash, D., & Southorn, P. (1996a). AARC clinical practice guideline: Providing patient and caregiver training. *Respiratory Care, 41*, 658-663.

Hilling, L., Hoberty, P., Hoberty, R., Sobash, D., & Southorn, P. (1996b). AARC clinical practice guideline: Training the health-care professional for the role of patient/caregiver educator. *Respiratory Care, 41,* 654-657.

Merriam, S. B. (1996). Updating our knowledge of adult education. *Journal of Continuing Education in the Health Professions, 16,* 136-143.

National Board for Respiratory Care. (2000a). *CRT content outline.* Lenexa, KS: Author.

National Board for Respiratory Care. (2000b). *RRT content outline.* Lenexa, KS: Author.

O'Daniel, C., Cullen, D. L., Douce, F. H., Ellis, G. R., Mikles, S. P., Wiezalis, C. P., Johnson, P. L., Jr., Lorance, N. D., & Rinker, R. (1992). The future educational needs of respiratory care practitioners: A Delphi study. *Respiratory Care, 37,* 65-78.

Wilson, A. L. (1993). The promise of situated cognition. In S. B. Merriam (Ed.), *An update on adult learning theory* (pp. 71-79). San Francisco: Jossey-Bass.

Appendix A

Student Evaluation of Instruction

Students were asked to rate these items using a 5-point Likert scale (1 = *unsatisfactory*, 2 = *poor*, 3 = *satisfactory*, 4 = *good*, 5 = *excellent*).

1. The subject matter of the course was well organized.
2. The course was intellectually stimulating.
3. The instructor was genuinely interested in teaching.
4. The instructor encouraged students to think for themselves.
5. The instructor was well prepared.
6. The instructor was genuinely interested in helping students.
7. I learned a great deal from this instructor.
8. The instructor created an atmosphere conducive to learning.
9. The instructor communicated the subject matter clearly.
10. Overall, I would rate this instructor as….

Appendix B

American Heart Association Evaulation Tool

Students were asked to rate these items using a 5-point Likert scale (1 = *unsatisfactory*, 2 = *poor*, 3 = *satisfactory*, 4 = *good*, 5 = *excellent*).

1. The faculty's presentation style facilitated my learning.
2. The faculty demonstrated respect for my needs as a learner.
3. The faculty's teaching methods were effective.
4. The content was relative to my practice.
5. The in-service increased my knowledge of BLS standards.

Author Note

Phillip D. Hoberty, EdD, RRT, Assistant Professor and Director of Clinical Education; F. Herbert Douce, MS, RRT, Associate Professor and Division Director, both of the Respiratory Therapy Division, School of Allied Medical Professions.

The authors thank Sarah Varekojis, MS, RRT (for her assistance with the educational theory foundation for this article) and Georgianna Sergakis, MS, RRT (for her assistance with course development), both of the Respiratory Therapy Division, School of Allied Medical Professions, The Ohio State University, Columbus, Ohio.

Correspondence concerning this article should be addressed to Phillip D. Hoberty, Respiratory Therapy Division, School of Allied Medical Professions, The Ohio State University, 1583 Perry Street, Columbus, Ohio 43210. Electronic mail may be sent to phoberty@amp.osu.edu.

Respiratory Care Education Annual
American Association for Respiratory Care
11030 Ables Lane
Dallas, TX 75229-4593

Non-Profit
Organization
U.S. Postage
PAID
Permit No. 7607
Dallas, TX

Respiratory Care Education Annual is a publication
of the American Association for Respiratory Care