

A STUDY OF COGNITIVE AND NON-COGNITIVE SELECTION CRITERIA  
FOR STUDENTS IN COMMUNITY COLLEGE  
RADIOLOGIC TECHNOLOGY PROGRAMS

by

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Fear not, I am with you; be not dismayed;  
I am your God. I will strengthen  
you, and help you, and up  
hold you with my right  
hand of justice.

Isaiah 41:10

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## CHAPTER I

### INTRODUCTION

Changes in the types and characteristics of the allied health work force in the 20th century, including the field of radiologic technology, have been dramatic. Health professions requiring a college education or professional preparation account for approximately 200,000 persons in 1900; 692,00 in 1940; 914,00 in 1960; and 4.9 million in 1990 (Kissick, 1968; U.S. Department of Health, Education and Welfare, 1970; Genzberg, 1990). Employment in the allied health care industry has grown more rapidly than overall employment. In 1900, persons employed in health occupations accounted for 1.2 percent of the labor force. This proportion increased to 2.1 percent in 1940, 3.0 percent in 1960, and 7.6 percent in 1990 (Freudenheim, 1990; U.S. Department of Labor, 1990).

If President Bill Clinton's National Health Care Plan is enacted, most people predict there will be an increase in allied health professionals as the nation shifts from an acute care illness base to one based on health promotion, and preventive medicine.

With this increase, how will students in the allied health professions be selected? Who will make up the future health care worker? Within the guise of open access, open door higher education, how can allied health programs, including the field of radiologic technology, promote access and equity, existing as selective programs in non-selective institutions? This is a problem that has gained the

attention of community college radiologic technology program directors, practitioners and other allied health program directors for a number of years.

### Health Care

The earliest evidence of healing as a profession dates back to Mesopotamia and Egypt some 5,000 years ago. At that time healing was a quasi-religious art practiced with exorcisms, incantations and prayers for treating diseases. The Chinese based their treatment of disease on the theory of Yin and Yang balance. The Greeks and Hippocrates gave the guidelines for patient-physician relationship and the ethical basis of treatment (Stanfield, 1990).

The evolution of medicine and rise of technology-based treatments set the stage for the development of health care services beginning in the mid-nineteenth century. By 1900, most infectious disease epidemics such as influenza, diphtheria and whooping cough had been brought under control, and a gradual shift of attention toward the treatment of individual illnesses occurred. Pneumonia, tuberculosis, heart disease, and nephritis as well as accidents and war victims were the major conditions requiring treatment in the first decades of this century. The arrival of antibiotics in the 1940s ended the dominance of acute infectious disease and marked the ascent of chronic illness such as heart disease, stroke and cancer. Thus, from approximately 1850 to about 1900, the scientific basis of American medical technology was very narrow and the number of treatment modalities was quite limited (Stanfield, 1990).

After 1900, technology began to advance rapidly. The great improvements brought by the application of technologies such as x-rays in 1895, and the discoveries of insulin and the Salk vaccine in the first decades of the twentieth century, coincided with a gradual shift and recognition that health care was a right and not a privilege (Stanfield, 1990). The establishment of the National Institutes of Health (NIH) in 1937 and the landmark federal hospital-construction program of 1946, commonly referred to as the Hill-Burton Act, are evidence of this movement. The National Institutes of Health (NIH) committed the federal government to the direct support of medical research and applications training, while the Hill-Burton Act required hospitals constructed with federal funds provided through the Act to serve a percentage of indigent people (Stanfield, 1990). Medicare, passed in 1965, and President Bill Clinton's 1993 universal health plan are other demonstrations of the move toward health care as a right and not a privilege.

Delivery of health care traditionally has been directed by physicians in private practice. America's health care system has been primarily financed by personal nongovernment funds, typically paid for by consumers through private health insurance. Over the years, Americans have come to expect the best medical care possible, and health care expenditures in the United States are rapidly rising. In 1986, Americans spent an average of \$1,837 per person on health care for a total of \$458 billion. This total constituted 10.9 percent of the national gross national product (GNP), an increase from 10.3 percent in 1984 and just 5.9 percent in 1965. The Health Care Financing Administration projected in 1987 that health care expenditures would total \$1.5 trillion in the year 2000, of which 33 percent would be borne

by the federal government, 30 percent by private insurance and 25 percent by patients (Health Care Financing Administration, 1987).

With the creation of the National Institutes of Health (NIH) in 1937, the federal government began to support large medical research projects. As the quality of antibiotics improved, medical care greatly expanded. New techniques and technology motivated practitioners in the allied health profession as the public came to expect a better standard of health care. The creation of NIH also served to augment the widespread usage of technology-based medical treatments.

The growth of allied health occupations has paralleled the rapid growth in the demand for many types of health services. The American Medical Association's Committee on Allied Health Education and Accreditation (CAHEA) defines health care practitioners as:

a large cluster of health care related professions and personnel whose functions are: assisting, facilitating, or complementing the work of the physician and other specialists in the health care system, and who choose to be identified as allied health personnel (CAHEA, 1987).

More than 7,000 allied health programs have been established in the United States to meet the needs of an ever-expanding health care industry (National Commission on Allied Health Education, 1980). The number of students enrolled in allied health care programs accredited as of July, 1990 was 83,573, with 33,942 graduating in the 1989-90 academic year (Allied Health Education Directory, 1991). As the decade of the 1980s began, the ratio of health care applicants to positions in health care programs had been about 2.1 to 1 in two-year college programs, and 2.6 to 1 in four-year college programs, demonstrating both the high value the society places upon having well trained health care professionals, as well as the economic status completers of health care

programs are able to attain (National Commission on Allied Health Education, 1980).

Factors leading to the increased use of health care services include population growth, aging and the intensifying role of the federal government to provide better access to health care. The Federal Bureau of Labor Statistics (BLS) identified more than seven million health care workers in 185 occupations in 1984, and projected that in 1995, 9.1 million workers would be employed in 200 separate health care-related occupations. The BLS estimated that between 1986 and the year 2000, the number of jobs within the field of radiologic technology will grow by 65 percent, from 115,400 to 190,100. To prepare their estimates, the BLS analysts evaluated job opportunities in the many areas radiology encompasses, including sonography, fluoroscopy, mammography, computerized tomography, magnetic resonance imaging (MRI) and radiation therapy. Given the gradual shift toward a wellness oriented paradigm, with emphasis on the early identification of preventable diseases and cancers, radiography by all accounts is projected to have a bright future within the family of allied health occupations (Institute of Medicine, 1989).

The future supply of allied health personnel is highly sensitive to small increments within a number of variables. These variables include adequately trained people, job availability, job location and salaries. Salary adjustments is a key variable to any strategy designed to alleviate labor market concerns. Salary increases can attract new entrants to the field, encourage the return of those who left and prolong the attachment to the field of those already in it (Institute of Medicine, 1989).

To compare trends between hospital-based and college-based

radiologic technology programs, Hansett (1992) conducted a survey in the northeastern United States (1992). The average salary range of participating institutions in Hansett's survey revealed a low salary of \$16,500 in Pennsylvania and a high of \$32,00 in New Jersey. This compared to a national average of \$27,100 as determined by a recent American Society of Radiologic Technologist (ASRT) survey (Hansett, 1992).

The most comprehensive profile measuring specifics of income, education, and the attitudes of radiologic science professionals in recent years has been the American Society of Radiologic Technologists (ASRT) annual survey. The ASRT survey in 1992 was mailed to 11,386 radiologic technologists. There were 4,692 surveys returned for a 41.2 percent response rate. One of the survey findings was that technologists believed higher education not only was equated to increased professionalism, but to increased earnings potential as well. Nationally, technologists who held an Associate Degree in Radiologic Technology earned about \$13.75 an hour (American Society of Radiologic Technologists, 1992).

How health care needs are addressed depends in part upon whether people with requisite education are available and how those skilled professionals are deployed. Consequently, comprehensive assessment of future allied health personnel needs has never been more important. Allied health care personnel will need to develop a broader understanding and competence in health care delivery. Tomorrow's health care personnel will need to develop special skills in order to deal with changing demographic, cultural and scientific/technological conditions. One critically important task is to ensure that the educational curricula for health care professionals includes courses with

competency-based objectives and a programmatic relevance to these changes (Institute of Medicine, 1989).

Perhaps the most comprehensive definition of health was stated in the Charter of the World Health Organization, one of the six constituent organizations affiliated with the United Nations: "the state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (French, 1974, p. 1). Within this definition lies the philosophical basis for a shift toward a wellness-based health care paradigm, away from merely an acute illness care system as presently exists. The growth in the utilization of health services, the broadening of the types of services offered and technological advances have resulted in an increased demand for qualified allied health personnel. This demand for allied health services will likely be further increased by well-established socioeconomic trends that are projected as likely to continue (Williams & Torrens, 1988).

Population growth in the United States is slowing. The population increased by one percent annually between 1972 and 1986, but the Bureau of the Census projects growth of only 0.8 percent annually to the year 2000. The rate of growth will not be uniform among age, race or ethnic groups, based on moderate projections of the Bureau of the Census (Fullerton, 1987). Future health care needs will depend in part on the health and functional status of the growing elderly population. Clearly, a wide range of health services will be required to address the health care needs of our human population.

The primary purpose of allied health education is to prepare students for service in health care professions. Therefore, educational processes must be related to practical needs in the field and viewed as

a means of achieving standard performance objectives. In a 1980 report, the National Commission on Allied Health Education (NCAHE) stated:

Educational institutions, with the advice and counsel of professional associates and practitioners, should evaluate student selection procedures to determine whether more reliable predictors of probable success than those presently in use can be found and utilized (NCAHE, 1980, p. 166).

With an abundance of applicants and limited enrollments, one of the most perplexing problems for allied health care educators today is student selection (Barry, 1983). It therefore follows that the selection criteria used in allied health programs such as radiologic technology should be good indicators of success (i.e., be clinically competent and pass the appropriate national certification test). However, when allied health educators meet, concerns over selection criteria for entry into these highly competitive programs are consistently voiced. Thus, the concern for reliable indicators of student success to improve the selection process of community college radiologic technology programs provides the impetus for this study.

#### Statement of the Problem

Student selection for community college radiologic technology programs is a significant problem because such programs have a responsibility to produce graduates with an appropriate mix of cognitive, affective, and psychomotor skills (Essentials, 1990). The changing nature of prospective radiologic technology student backgrounds requires that community college radiologic technology programs identify and assess these students' personal attributes in different ways. The results of a study by Blagg and Blagg (1985) have several implications



for practice in the area of student selection procedures, particularly for educators in the radiologic sciences who are faced with the problem of identifying adequate selection procedures for increasing numbers of qualified applicants. First, the results suggested that evaluators must be especially sensitive to potential gender-related biases, especially in the screening phase of the selection process.

Otherwise, enrollment distributions for whites, Mexican Americans, Puerto Ricans, other Hispanics, Asians or Pacific Islander, and American Indians or Alaskan Natives were consistent between the academic years (Allied Health Education Fact Sheet, 1992). The number of women in the labor force is projected to increase more than twice as fast as the number of men, and in the year 2000 women will constitute nearly half the labor force. The number of African-American workers will increase twice as fast, Asian workers will increase five times as fast, and Hispanic workers more than five times as fast as the number of white workers. Thus, by the year 2000, the economy will be more dependent on women workers (who have always been prominent in the allied health profession) and on minority workers (Institute of Medicine, 1989).

White students constituted the majority (79 percent) of 1990-91 enrollments in all accredited allied health programs which included radiologic technology. African-American students made up 11 percent, Hispanic students including Mexican Americans (3 percent), Puerto Ricans (1 percent) and other Hispanics (2 percent), Asians or Pacific Islanders (4 percent), and American Indians or Alaska Natives, less than one percent. Between 1989-90 and 1990-91 there was a one percent enrollment decrease for blacks in all accredited allied health programs.

The report of the National Commission on Allied Health Education stressed that educational institutions should assess their student

selection procedures to identify the most reliable indicators of probable program success (National Commission on Allied Health Education, 1980). Allied health education programs should prepare students who can meet standard performance objectives and adapt to changing health services needs and technologies. These skills should be closely linked to practice requirements and standardized through role delineation studies. Therefore, to have a quality program, the maximum student enrollment in a radiologic technology program should not exceed the capacity which should be determined according to the volume and variety of radiological procedures, equipment, and personnel available for educational purposes (Essentials, 1990).

The fixed number of clinical education centers available for training radiologic technology students further compounds the issue, resulting in high rates of application rejection and low rates of applicant acceptance. Allied health educators need to be reasonably certain that their student selection policies identify candidates who have the actual and latent abilities to benefit from the program's goals and objectives (French & Rezler, 1976). Performing this selection process well, while operating as one of the most selective programs within non-selective open-access institutions, is a major challenge for the 199 community college radiologic technology program directors across the nation. All of the problems associated with increasing diversity in programs that use selective admissions are found in these programs. This, along with the fact that there has not been a national study of appropriate selection criteria to be used by community college radiologic technology programs, provides the impetus for this study.

## Purpose

The purpose of this study was to assess and analyze perceptions of community college radiologic technology program directors throughout the United States and their usage of selection criteria for prospective students through the use and analysis of the Survey of Recruitment, Admission and Selection Criteria for Radiologic Technology Programs.

The 199 radiologic technology program directors were asked to fill out a survey that had as its purpose to:

1. Obtain a profile of the selection criteria that are used to select radiologic technology students.
2. Obtain opinions of community college radiologic technology program director's regarding the selection criteria that are being used now.
3. Determine what cognitive and non-cognitive selection criteria to use in selecting radiologic technology students.
4. Determine the importance of selection criteria used to assure applicant equity.

## Scope of the Study

The scope of the study was limited to the 199 community college radiologic technology programs in the United States, as recognized by the 1990 edition of The Allied Health Directory. The Directory contains specific information on educational programs in 28 separate and distinct allied health occupations that range from Blood Bank Technology to Surgical Technology, as well as a description of the accreditation process used by the Committee on Allied Health Education and

Accreditation (CAHEA), in cooperation with various discipline specific review committees. No attempt was made to examine four-year or hospital-based radiologic technology programs, which comprised 49 and 348 of the 666 total number of programs, respectively.

Because most allied health programs operate as highly selective programs at open-access, non-selective institutions, this single issue justifies the study's scope. At present, formal training in radiologic technology range from two to four years in length. These programs are varied by length and degree awarded, which can range from the granting of certificates, associate's degrees or bachelor's degrees. Two-year programs are the most common, both in terms of numbers and enrollments. Since most educational programs in the radiologic sciences have a much greater number of qualified applicants than can be accepted, the screening of applicants is a crucial step in the selection process.

Radiologic technology is considered to be a relatively young allied health profession. Therefore, the research literature available in the area of community college radiologic technology program entrance assessment, as well as student success, is limited. The category of institutions sponsoring the highest number of radiologic technology enrollments and graduates were junior and community colleges, with 53.3 percent of enrollments and 51.8 percent of graduates, respectively. Knowledge of some of the significant personality characteristics of prospective allied health professions appears to be an important variable in assessing the needed qualities to complete successfully the program of study and to function adequately in the profession (Psychological Services Bureau Bulletin, 1979, 1986, 1987). There are few instruments presently available to measure vocational adjustments, and these at best have limited application to radiologic technology

programs. This limited availability of appropriate instruments likely accounts for some of the frustration expressed by radiologic technology program directors.

An individual's characteristic life style is reflected in his or her personal, educational and occupational adjustment. Knowledge of some of the significant personality characteristics of the prospective allied health professional would thus seem to be important. Feelings, attitudes and opinions frequently determine success or failure (Psychological Services Bureau Bulletin, 1986-1987).

The criteria for judging the relative success of radiologic technology programs has typically been based on the completion and passing of a written certification test which admits the graduate to the work force. The American Registry of Radiologic Technologists (ARRT) requires that candidates who plan to take its Registry Examination must have successfully completed a program of formal education which has been approved by the Committee on Allied Health Education and Accreditation. All applicants who have completed the eligibility requirements by the date of the examination take this 200-item objective test.

The examinations are scheduled for the third Thursday of March, July, and October at locations throughout the United States. Approximately five weeks after the examination date, the American Registry of Radiologic Technologists will mail reports of scores to all examinees. The release of the examinee's score report by the American Registry of Radiologic Technologists is governed by a policy that information about an individual shall be released only with that person's written consent. A section on the answer sheet requests the examinee to indicate whether the examinee wishes his/her score to be released to the educational program from which the examinee graduated.

It is important that the examinee scores are released to programs. This allows feedback to radiologic technology educators and program directors to internally and externally evaluate whether or not students meet minimum comprehension levels within the five required subject areas: radiation protection, equipment operation and maintenance, image production and evaluation, radiographic procedures, and patient care and management. These subject test areas are related to courses that are normally taught throughout a student's training. Therefore, student scores allow program officials to perform a form of quality control on their program.

Two statistical procedures are utilized in reporting scores on the Registry. The first, equating, takes into account the difficulty level of each version of the examination and the ability of each group tested. The statistical equating process is designed to identify examinees of comparable ability, regardless of the group with which the examinee is tested or the difficulty level of the examination. The second statistical procedure deals with scaled scores. Total scores for all examinees are converted to a score scale ranging from 1 to 99, with a scaled score of 75 defined as passing. A passing score does not constitute certification unless all other radiologic technology program requirements are also satisfied. These include satisfying all sponsoring institution and program curriculum requirements, including successful completion and documentation of defined objectives and competencies.

### Research Questions

1. What cognitive and non-cognitive selection criteria are currently being used?
2. What are the opinions regarding the selection criteria that are being used now?
3. What cognitive and non-cognitive criteria should be used, and how should such criteria be used?

### Definition of Terms

For the purpose of this study and to assure common understanding, the significant terms were identified.

Affective:--The affective, or emotional, component refers to positive or negative feelings toward an issue or subject (Belkin, 1979).

Allied Health Practitioners:--"A large cluster of health care related professions and personnel which includes a radiologic technologists whose functions include assisting, facilitating or complementing the work of physicians and other health care specialists in the health care system, and who choose to be identified as health personnel" (Allied Health Education Directory, 1991, p. 328).

Aptitude:--"A level of educational preparation and achievement appropriate for the needs of the academic studies and clinical practice that will constitute each of the allied health programs" (Psychological Services Bureau Bulletin, 1979, p. 5).

Attitude:--a relatively enduring tendency to respond consistently to an object, person, or event in either a favorable or an unfavorable way. Attitudes have three components: cognitive, affective and behavioral (Kiesler & Munson, 1979).

Behavioral:--The behavioral component refers to the tendency to react to the object in specific ways (Belkin, 1979).

Certificate of Accreditation:--"The Certificate of Accreditation is a certificate given to programs [allied health programs, including radiologic technology] on behalf of the Committee on Allied Health Education and Accreditation and the appropriate review committee" (Allied Health Education Directory, 1990, p. 329).

Clinical Education (also Directed Clinical Experience/Field Work/Practicum):--"Clinical Education is composed of (a) didactic clinical preparation, that is, units of classroom instruction in knowledge related to the professional practice content of a given vocational field and (b) supervised clinical practice, in which the student learns how to use the knowledge and practice skills taught in the didactic and clinical phases" (Allied Health Education Directory, 1991, p. 329).

Cognitive:--The cognitive aspect refers to our beliefs and knowledge about the object or issue (Belkin, 1979).



Cognitive Predictors:--Predictors, as well as aptitude tests.

Recall or recognition of knowledge, and the development of intellectual abilities and skills (Krathwohl, 1964).

Committee on Allied Health Education and Accreditation (CAHEA):--"An allied health education accrediting agency sponsored by the American Medical Association" (Allied Health Education Directory, 1991, p. 329).

Competency-Based Education (CBE):--"A course, program or curriculum designed on the basis of what the student is supposed to learn to do, or on demonstrable outcomes" (Allied Health Education Directory, 1991, p. 329).

Credibility:--Trustworthiness or credence (Random House Dictionary, 1980, p. 215).

Essentials:--"The minimum standards of quality used in accrediting programs that prepare individuals to enter an allied health profession" (Allied Health Education Directory, 1991, p. 331).

Evaluate:--"To determine the quality of an educational program by careful appraisal and study" (Allied Health Education Directory, 1991, p. 331).

External Degree:--"An academic award earned through one or more of the following means: prior learning, credit by examination, specially devised sponsored experimental learning programs, self-directed study or

satisfactory completion of campus or off-campus courses" (Allied Health Education Directory, 1991, p. 331).

Health:--"The state of complete physical, mental, and social well-being; not merely the absence of disease or infirmity" (United Nations World Health Organization, as cited in French, 1976, p. 1).

Hospital-Based Program:--"An accredited educational program sponsored by a hospital" (Allied Health Education Directory 1991, p. 331).

Joint Review Committee (JRC):--"A generic term applicable to all review committees sponsored by two or more organizations" (Allied Health Education Directory, 1991, p. 332).

Non-Cognitive Predictors:--"Personality characteristics and their special attributes or traits with emphasis on muscular and motor control (Dietrich, 1981).

Performance Objectives:--"The interim competencies achievable by students within the course of their training and the terminal competencies to be achieved by students by the end of the program" (Allied Health Education Directory, 1991, p. 333).

Program Director:--"The person in charge of developing and maintaining an educational program within an institution, hospital or other sponsoring agency in accordance with the qualifications and

responsibilities established by the institution and delineated in the Essentials" (Allied Health Education Directory, 1991, p. 333).

Psychomotor:--The psychomotor domain emphasizes some muscular or motor control, some manipulation of material or objects, some act which requires a neuromuscular coordination (Krathwohl, 1964).

Radiography:--"The development of an image of a bodily part by transmitting radioactive energy (x or gamma rays) through it onto a sensitized film" (Melloni, 1993, p. 405).

Registry:--A published list of those who are registered in one of the three disciplines of radiologic technology, nuclear medicine technology and/or radiation therapy technology" (Allied Health Education Director, 1991, p. 334).

Reliability:--"The consistency with which an instrument or tool measures the same way each time it is used" (Allied Health Education Directory, 1991, p. 334).

School of Allied Health:--"An administrative unit with assigned responsibility for delivering several allied health educational programs" such as nursing, respiratory care and radiologic technology. Such schools may exist within a variety of institutions including but not limited to universities, colleges, community colleges, academic medical centers, and hospitals (Allied Health Education Directory, 1991, p. 334).

Standards:--"The criteria by which programs or institutions are reviewed for accreditation purposes" (Allied Health Education Directory, 1991, p. 335).

Technician:--"One who specializes in the technical details of a body of work; one who has acquired the ability to perform a complex task or set of tasks" (Allied Health Education Directory, 1991, p. 335).

Technologist:--"One who specializes in the application of scientific knowledge to solve practical and/or theoretical problems." Knowledge and skills for performing these functions are usually achieved through a period of formal education and a period of supervised clinical practice (Allied Health Education Directory, 1991, p. 335).

Validity:--"The extent to which an instrument or tool measures or performs in the manner in which it was intended" (Allied Health Education Directory, 1991, p. 335).

#### Assumptions of the Study

1. It was assumed that the measuring instrument utilized was adequate for the purpose of the study.
2. It was assumed that the responses to the questionnaire reflected actual perceptions of the respondents toward the various facets of selection criteria used in community college radiologic technology programs.
3. It was assumed that respondents to this study had a significant impact on the student selection process, and that their

perceptions played a role in providing a radiologic technology student with an appropriate array of cognitive and non-cognitive traits.

4. It was assumed that because radiologic technology is considered to be a relatively young allied health profession, research literature in the area of community college radiologic technology program entrance assessment and students success outcomes would be limited.

#### Limitations of Study

In this study's attempt to answer research questions about selection criteria for students in community college radiologic technology programs, the following limitations were noted:

1. This study was limited to the students enrolled in the 1990-91 academic year at Committee on Allied Health and Education Accreditation-accredited associate degree radiologic technology programs at community colleges in the United States.
2. Because of the survey structure and content, personality traits and characteristics of students noted as desirable and important for all allied health students to possess during the training period, and subsequently in the working environment, were not fully measured by program directors.

#### Significance of Study

The Committee on Allied Health Education and Accreditation (CAHEA) is an allied health education accrediting agency sponsored by the

American Medical Association (AMA). Moreover, CAHEA acts as an umbrella accrediting agency in as much as it works cooperatively with externally-sponsored review committees to accredit educational programs in the numerous fields of postsecondary allied health education. In this role, CAHEA accredits most of the formal training programs in radiologic technology (Allied Health Education Directory, 1990).

There were 666 CAHEA-accredited programs in radiologic technology in 1989. The category "junior or community college" comprised 199 of the radiologic technology programs, vocational or technical schools comprised 30, and academic health centers/medical schools comprised 28 programs. The U.S. Department of Defense operated 4 of these programs. Hospitals and/or medical centers comprised 353 programs. Four-year college or university represented 47 of these programs, and the U.S. Department of Veteran Affairs operated 4 of the programs. There was one non-hospital health care facilities with a program.

Table I, "Radiologic Technology Programs in the United States: Enrollment and Degrees Awarded in 1989-90, by Institution Type, Number and Percent," describes the enrollment and degrees awarded in radiologic technology programs according to types of institution in 1989-90. According to Table I, the institutions sponsoring the highest number of enrollments and graduates in radiologic technology were programs at junior or community colleges and vocational or technical schools, as compared to four-year colleges or universities, academic health centers and medical schools, and hospitals or medical centers (Allied Health Education Directory, 1990). During the 1989-90 academic year, a total of 83,573 students were enrolled in the CAHEA-accredited programs; 33,942 of these students graduated. Fifty-three percent (44,577) of all 1989-90 enrollees were enrolled in programs sponsored by junior or

community colleges (30,003) or at vocational or technical schools (14,574).

TABLE I

RADIOLOGIC TECHNOLOGY PROGRAMS IN THE UNITED STATES: ENROLLMENT AND GRADUATES IN 1989-90, BY INSTITUTION TYPE, NUMBER AND PERCENT

<u>Type of Institution</u>	<u>Enrollment</u>		<u>Degrees Awarded</u>	
	<u>Number</u>	<u>Percent</u>	<u>Number</u>	<u>Percent</u>
Academic Health Center/Medical School	10,255	12.3	4,441	13.1
Department of Defense	2,139	2.6	1,447	4.4
Department of Veteran Affairs	177	0.2	117	0.3
Four-Year College or University	17,100	20.5	5,112	15.1
Hospital or Medical Center/1-99 Beds	7	0.0	4	0.0
Hospital or Medical Center/100-299 Beds	1,615	1.9	861	2.5
Hospital or Medical Center/300-499 Beds	3,284	3.9	1,809	5.3
Hospital or Medical Center/500 or more beds	4,050	4.8	2,254	6.6
Junior or Community College	30,003	35.9	11,176	32.9
Vocational or Technical School	14,574	17.4	6,425	18.9
Non-Hospital Health Care Facilities or Lab	369	0.4	266	0.8
Total	83,573	100.0	33,942	100.0

Source: Allied Health Education Directory, 1991, published by the AMA.

Within the overall family of allied health professions, junior and community colleges, together with vocational or technical schools comprised 39 percent of all institutions sponsoring CAHEA-accredited programs. Programs in medical laboratory sciences, respiratory care and the radiologic sciences comprised the majority (73 percent) of all CAHEA-accredited programs, a long standing pattern. Radiologic science programs, including radiation therapy technologists, nuclear medicine technologists and radiographers made up 31 percent (883) of the above CAHEA-accredited programs (Allied Health Education Directory, 1991).

The trends in programs, enrollments, and graduates by occupation in 1986-90 showed changes that occurred in allied health education. The number of the CAHEA-accredited programs decreased by 68 from 1986 to

1988, increased by 6 from 1988 to 1989, and increased by 24 from 1989 to 1990. Programs in the field of radiologic technology totaled 701 in 1986, with an enrollment of 15,225 and 6,400 graduates. In 1988, there were 667 radiologic technology programs, with enrollments of 15,313 students and 6,080 graduates. In 1989 there were 666 programs with 16,529 students and 6,528 graduates (Allied Health Education Directory, 1991). From 1986 to 1988 enrollments in radiologic technology programs increased by 88, while the number of graduates declined by 320. From 1988 to 1989, enrollments increased by 1,216 and graduates increased by 448. From 1989 to 1990, enrollments increased by 2,164 and graduates increased by 874, representing a consecutive increase in graduates since 1988. Female students comprised approximately 74 percent of the 1989-90 total program enrollments and graduates, a long-standing trend.

The 1990 Report of Program Directors' Perspectives indicated that the total number of radiologic technology student applicants was 39,004. The relative number of radiologic technology student applicants who were considered by program directors to be qualified for admission into radiologic technology educational programs was 21,996 (Allied Health Education Directory, 1991). Thus, while operating institutions that profess open access, open door in their mission statements, radiologic technology programs reject one out of every two applicants.

Radiologic technology programs are generally two to four years in length, depending on program design, objectives, and the degree or certificate awarded. They require a minimum of a high school diploma or equivalent for admission. Educational background in mathematics, physics, chemistry, and biology is generally helpful. Successful completion of a radiologic technology program is dependent on documented achievements of defined objectives and competencies. The requirements



for a degree, usually the Associate of Applied Science degree, is generally consistent with the requirements for other degrees awarded by the sponsoring institution.

It is important to consider how specialized, highly competitive radiologic technology programs fit within the philosophic context of the universal access that lies at the heart of the community college movement in America. President Harry Truman's 1947 Commission on Higher Education strongly urged that the door to higher education be opened. The development of community colleges, with open admission policies and programs for everyone, was designed to ensure that no member of society misses a chance to acquire knowledge and expand career opportunities (Higher Education for American Democracy, 1948). With approximately 43.3 percent of all Committee on Allied Health and Education Accreditation-accredited programs sponsored by either community or junior colleges (n = 1232), the question still remains: should community colleges educate for further studies, or should they be the capstone for graded education? (Cohen, 1987)

Because the field of radiologic technology is considered to be a relatively young allied health profession, the literature related to selection criteria and student success was limited. This study will investigate the practices employed by radiologic technology programs at community colleges, specifically focusing on non-cognitive and cognitive admission predictors, in that cognitive predictors will not allow measurement of competency-based learning in the affective and psychomotor domains.

In 1944, x-ray technology, the predecessor of radiologic technology, joined the allied health professions as the fourth health occupation to establish standards of education and qualifications for accreditation.

From 1944 until 1969, the American College of Radiology's Commission on Technologists Affairs, Committee on Technologist Training carried out program evaluation. In 1969, the American Society of Radiologic Technologists and the American College of Radiology established the Joint Review Committee on Education in Radiologic Technology (JRCERT) within the structure for allied health education accreditation provided by the American Medical Association's Council on Medical Education. The Joint Review Committee on Education in Radiologic Technology (JRCERT) was incorporated in 1971.

In 1976, the AMA's Council on Medical Education formally delegated responsibility for all allied health education accreditation to the Committee on Allied Health Education and Accreditation (CAHEA), which is broadly representative of allied health education interests.

Accreditation of educational programs in radiography is a voluntary, peer review process that the Joint Review Committee on Education in Radiologic Technology conducts with the Committee on Allied Health Education and Accreditation. This cooperative process is formally recognized by the United State Department of Education and the Council on Postsecondary Accreditation, governmental and private agencies respectively, with oversight responsibilities for broad areas of institutional and programmatic accreditation. Over the years, the Joint Review Committee on Education in Radiologic Technology has become established as one of the largest review committees within the CAHEA accreditation system.

The Essentials and Guidelines of an Accredited Educational Program for the Radiographer (commonly called Essentials) is the standard for the accreditation of educational programs in radiologic technology. The radiography profession was the first imaging related science to

establish Essentials. The first radiography Essentials resulted from negotiations between the executive committee of the ASXT and the Council on Medical Education of the American Medical Association. The American College of Radiology and the American Registry of X-ray Technicians also collaborated on the Essentials.

The Essentials evolved from a one-page narrative to a 12-page document that include all requirements for which an accredited program is held accountable. The Essentials were initially adopted in 1944; reviewed in 1955, 1969, 1978, 1983 and 1990 with the collaborative efforts of the American College of Radiology, American Medical Association and the American Society of Radiologic Technologists.

The Essentials have evolved to include more meaningful curricula and greater professional autonomy for radiographers to establish professional standards for entry-level radiography. It is important to realize that as radiographers have assumed more responsibilities in the preparation of students, educational standards have risen (Mixdorf, 1992).

Radiologic technology programs are a vital part of the health care system and are essential to meet health care needs. In order for a radiologic technology program to continue its role as a provider of qualified health care personnel, it is important that its graduates exhibit success, measured through demonstrated clinical competencies and by passing the American Registry of Radiologic Technologists Examination. The Registry was initiated in 1922 when the Radiologic Society of North America, with the support of the American Roentgen Ray Society and the cooperation of the Canadian Association of Radiologists and the American Society of X-ray Technicians, joined in the establishment of the American Registry of Radiological Technicians. In

1962, the Registry enacted a program of examination and certification in nuclear medicine technology and radiation therapy technology. At that time, the name was changed to the American Registry of Radiologic Technologists. In 1977, the Registry adopted the term "Radiographer" to replace the previous term "X-ray Technologist".

The purpose of the Registry is to encourage the study and to elevate the standards of radiologic technology, as well as to examine and certify eligible candidates (ARRT, 1991). The purpose of this study is to assess perceptions of community college radiologic technology program directors throughout the United States and their usage of selection criteria for prospective students to help identify what selective admission criteria are being used to assess cognitive capabilities and non-cognitive traits of prospective students.

The following chapters will summarize the literature pertaining to the historical prospective of radiology: the community college as it relates to radiologic technology education, radiologic technology programs in the United States, the radiologic technology curriculum, cognitive predictors, including standardized tests and their use in radiologic technology and other allied health profession programs; non-cognitive predictors, including aptitude testing; and the Registry examination. Additional chapters will report the findings of the survey, analysis the findings, conclusions and recommendations that were developed for further studies.

## CHAPTER II

### REVIEW OF SELECTED LITERATURE

The review of the literature for this chapter is divided into ten sections: (1) Historical Background of Radiologic Technology Programs, (2) Community Colleges, (3) Radiologic Technology Programs in the United States, (4) Curriculum, (5) Cognitive Predictors, (6) Standardized Tests and Radiologic Technology Programs, (7) Non-Cognitive Predictors, (8) Aptitude Testing, (9) The Registry Examination, and (10) Summary. The absence of current and appropriate information on radiologic technology selection procedures for 199 CAHEA-accredited programs based at community colleges provides impetus for this national study.

The field of radiologic technology is considered to be a relatively young Allied Health Profession. Due to limited research on community college radiologic technology entrance assessment and student success, it was decided that an investigation of selection criteria related to community college radiologic technology, including allied health, nursing and medical education, would be most relevant to this literature review.

Everywhere, men and women are beginning to realize that the education they received in the past, regardless of how little or how much, cannot sustain them for long in a time of rapid change. They are discovering that if they wish to remain in touch with the reality of an everchanging, ever-new present, they must change themselves-the only way to survive in a world where so much is new everyday, is to develop a process of continual self-renewal (Harlacher, 1978, p. 1).

The overall importance of the two-year college to the American democratic ideal through providing access to postsecondary education to the general population has been the normal consensus in the literature. This importance has been debated in light of the perceived shift in two-year college curricular orientation from collegiate/transfer to vocational/technical (Baser, 1991).

Demographic studies show that the proportion of the United States population ages 18 to 23 years old will decline through the mid-1990s. Experts have predicted that this shrinkage of the so-called traditional college-age population will make it increasingly difficult for allied health programs, including radiologic technology programs, to attract qualified applicants (Institute of Medicine, 1989). The 1990 Report of Program Directors' Perspectives indicated that the total number of radiologic technology student applicants was 39,004. The relative number of radiologic technology student applicants who were considered by program directors to be qualified for admission into radiologic technology educational programs was 21,996 (Allied Health Education Directory, 1991). Thus, while operating within institutions that profess open access, open door in their mission statements, radiologic technology programs reject one out of every two applicants.

#### Roentgenography

Professor Wilhelm Konrad Roentgen discovered x-rays on November 8, 1895, at the University of Wurzburg, Germany (Selman, 1985). For this discovery he was awarded the Nobel Prize for Physics in 1901. As the word of the "new rays" spread throughout the world, people who possessed Crooks Tubes, essential for generating of the invisible x-rays, started

examining human beings. The usefulness of x-rays in the diagnosis of human ailments soon became well recognized by the medical profession. The first documented medical examination using x-rays in North America was performed at Dartmouth Medical School on February 3, 1896 (Soule, 1966). Shortly thereafter, a medical specialty developed utilizing personnel skilled in the use of diagnostic x-rays. Between the years of 1920 and 1930, x-ray specialists (usually physicians) engaged men and women as apprentices and taught them the essentials of radiology (Soule, 1974).

Historians of higher education have traditionally viewed the apprenticeship system as the earliest formal method or process of educating members of a profession (Brubacher, 1968). The evolution of the profession of medicine is a good example of this, with two of its dimensions of learning, that of theory and clinical practice. However, the early training of radiologic technicians exemplified the apprenticeship system where practice was the rule and theoretical knowledge the exception. The apprenticeship system had limitations including, but not limited to:

1. the number of apprenticeships
2. a lack of consistency in training
3. the knowledge and experience gained which was related to the practitioner's background
4. training that often emphasized clinical experience over conceptual learning.

Because of these limitations, the apprenticeship system of learning was eventually replaced by professional medical schools. The medical school added theoretical knowledge to practical aspects, resulting in a more comprehensive education (Brubacher, 1968). Schools to produce radiologic technicians began operation during the decade of the 1920's.

The greatest influence in the transition from apprentice-type programs to professional schools of radiologic technicians resulted from the contributions of Ed C. Jerman (Coates, 1964). Radiology had begun to grow rapidly as a medical specialty during and immediately after World War I, but x-ray schools for training radiologic technicians were not yet functioning. Beginning in 1904, Jerman devoted his life to teaching of radiologic technicians, making him the first radiography instructor in the United States (Soule, 1966). Jerman began to give private instruction in 1917-18, when he became associated with the Victor X-ray Corporation, the forerunner to the General Electric Corporation. The purpose of this association was to develop a formal educational program for x-ray technicians. In 1920, Jerman founded the American Registry of X-ray Technicians (ARXT) and later organized the American Society of X-ray Technicians (ASXT), which directed educational aspects of the profession. In the United States, Jerman is deservedly recognized as "The Father of Radiography" (Carlton, 1992).

From the 1920's through the 1940's, radiologic technician programs were established in hospitals throughout the United States. Most of these schools were one-year in length and placed the greatest emphasis on the practical aspects of training (Soule, 1974). In an effort to standardize education for radiologic technicians, the American Registry Board in 1936 established a list of approved programs based on a survey of medical hospitals and schools (Soule, 1974). In 1944, the American Medical Association's Council on Medical Education and the American Society of X-ray Technicians jointly established inspection and accreditation guidelines for x-ray technician schools with the publication of the Essentials for an Approved School of X-ray Technology (Allied Health Education Directory, 1981). Within the field of



radiologic technology these educational standards were known as "The Essentials." The Essentials have repeatedly been updated, most recently in 1990, and are now officially called Essentials and Guidelines of an Accredited Educational Program for the Radiographer (Essentials, 1990, Appendix A).

The 1960's and 1970's saw further moves towards improving professional training of radiologic technology programs through lengthened educational programs, curricular improvements, and for the first time, reliance upon standardized tests for admissions. In 1960, the American Registry of Radiologic Technologists (ARRT), American Society of Radiologic Technologists (ASRT), the American Medical Association (AMA), and the Committee on Allied Health Education and Accreditation (CAHEA) established two years as the minimum length for the radiologic technology educational program. These three bodies took the position that nothing less than a two-year radiologic technology program could provide the theoretical and practical training and experience necessary to produce a competent radiologic technologist (Soule, 1966). In that same year of 1960, ASRT developed a "Teacher's Syllabus," designed to outline curricular and course requirements for good radiologic technology programs (Allied Health Education Directory, 1981). In 1976, ASRT published a comprehensive Curriculum Guide for Programs in Radiologic Technology (ASRT, 1976). This guide included a model curriculum, course descriptions, outlines and behavioral objectives with designated competency levels.

Education in radiologic technology--from its foundation as an apprenticeship program to the first formal schools in hospitals--had been a profession learned from practice and observation with little if any theoretical framework (Koenig, 1971). In comparison with other

allied health care curricula, radiologic technology programs were among the top one-third in terms of number of hours spent in clinical practice and among the lower third in terms of the number of classroom hours (Weil, 1967). Thus, while community college radiologic technology programs still rely on practical clinical training, appropriate learning experiences and curriculum have been sequenced to develop theoretical "critical thinking skill" competencies necessary for graduation.

### Community Colleges

The supply of graduates in allied health fields depends not only on students' careers but also on the maintenance and expansion of educational opportunities. The emergence of the community college set the stage for what was to be the most significant trend in allied health education (Siebert, 1975). Support of the community college movement came from President Harry S. Truman's Commission on Higher Education. The commission was chaired by George F. Zook, one of the leading pioneers in the community college movement. The following quotation from the commission report reflects well the creed of the value of education and what Zook and others saw as the "democracy education" for community colleges:

Equal educational opportunities for all persons, to the maximum of their individual abilities and without regard to economic status, race, creed, color, sex, national origin, or ancestry, is a major goal of American democracy. Only an informed, thoughtful, tolerant people can maintain and develop a free society (Higher Education for American Democracy, 1947, Vol. 2, p. 7).

Later, President Dwight D. Eisenhower's Committee on Education Beyond the High School concluded:

Communities or groups of neighboring communities faced with an impending shortage of higher education capacity will do well to consider new two year community colleges as part of the solution. Experience in a number of areas has demonstrated that, with carefully planned facilities and programs, community colleges can be highly effective in affording readily available opportunities for excellent education beyond the high school (Report of President Dwight D. Eisenhower's Committee on Education Beyond the High School, 1955-56, p. 12).

In a 1964 statement the American Association of Junior Colleges (AAJC) stated: "The two-year college offers unparalleled promise for expanding through the provision of comprehensive programs embracing job training as well as traditional liberal arts and general education" (American Association of Junior Colleges, 1964, p. 546). Calls for occupational education in the two-year colleges had been made as early as 1900 by William Rainey Harper, who suggested that "many students who might not have the courage to enter upon a course of four years' study would be willing to do the two years of work before entering business or the professional school" (Brick, 1963, 1965, p. 18). Vocational, occupational and technical programs grew during the thirty year period following America's entry into World War II, a period when economic growth centered around manufacturing industries. By 1968, the Bureau of Labor Statistics would report that 40 percent of all full- and part-time students in two-year colleges were enrolled in career oriented programs (Bushnell, 1973). The demand for well-trained professionals assisting physicians in the delivery of health care prompted the AMA Commission in the 1960's to coordinate the relationship of medical with allied health professions and services, and to recommend creation of a separate department within the AMA to handle all activities related to allied health education. As other professional accrediting bodies came to exert their impact on the curriculum, so too did radiologic technology

come to be influenced by the powerful AMA through the Joint Review Committee on Education in Radiologic Technology (JRCERT). The JRCERT is vested with the responsibility and authority to evaluate radiologic technology programs that have requested accreditation services.

The evaluation activities of the JRCERT include receiving and analyzing Self-Study Reports, sending representatives to conduct a site visit of a radiologic technology program, and developing accreditation recommendations during scheduled committee meetings. The JRCERT sends their accreditation recommendations and rationale to CAHEA for action. Accreditation recommendations submitted by the JRCERT are reviewed by one of two CAHEA subcommittees. The subcommittee reviews are designed to ensure that due process and CAHEA and JRCERT policies and practices have been followed in arriving at accreditation recommendations.

Radiologic technologists and other allied health care professionals were affected by technological developments, and their education and training gradually became more specialized and lengthy (Stanfield, 1990). In recognition of this growing complexity, Congress passed the Allied Health Professions Training Act in 1966. This act was specifically designed to increase the opportunities for training of personnel in allied health professions and to improve the educational quality of the schools training such personnel. Given the nation's growing health care manpower needs and the emergence of community colleges, hospital-based allied health education programs suffered more closures than any other type of programs because the supply of graduates in allied health fields depended on the maintenance and expansion of educational opportunities. Formal education with college-based training programs supported by specific professional associations became the norm for almost all of the allied health profession.

The growth of technology has dramatically affected the health professions. Students entering allied health fields had to excel in academic theory as well as mastery of technical and clinical roles and procedures. During the transition from hospital-based to college-based radiologic technology programs, the American Society of Radiologic Technologists and the American College of Radiology promoted an orderly movement away from the totally clinical curriculum of the hospital-based training programs toward a more judicious mix of general education, theory, and specialized training anchored in more formalized education institutions (Light, 1973).

The move from hospital-based to college-based programs in radiologic technology took place during the period of greatest expansion of the community college movement, the 1960's. In 1960, there were 718 AMA approved radiologic technology programs, of which five were located at community colleges (Soule, 1969). As of January 1991, there were 666 Committee on Allied Health Education and Accreditation-approved programs, of which 199 (33.3 percent) were associate degree, 47 (14.1 percent) were baccalaureate degree, and 353 (47.0 percent) were hospital or medical center based (Allied Health Education Directory, 1990).

In a trend that accompanied a shift from hospital-based to college-based programs, the total number of radiography education programs decreased by 23 percent between 1976 and 1986. A sudden decline in graduations by approximately 15 percent had occurred, from 7,393 to 6,400 graduates in 1986 (Committee on Allied Health Education and Accreditation, 1987). Radiologic technologist educators became quite concerned, given the shortage of radiologic technologists that already existed. Radiologic technologist educators theorized that the decline might have been the result of potential students responding to

fears of reduced demand generated by the new prospective medical payment schedules of the federal government. Established as a cost containment measure, the prospective payment system (PPS) attempted to shift the risk of cost to the health-care provider.

The decade of the 1980's saw radical change in the way health care was financed. Four major factors changed health care. There were shifts of the balance of power, a shift of the health care setting, an excess of doctors, and diagnostic related groups. Hospitals were paid a set amount for each patient in any of the established 471 known disease categories and diagnostic related groups (DRGs). This meant that the federal government would not pay beyond a set fee for an identified type of illness, no matter how long the patient stayed or what services were offered. As a result hospital admissions dropped and the length of patient stay was shorter, so the need for qualified radiologic technologists personnel in the hospital(s) declined. This tended to support the views of those radiologic technology educators who argued that the decline in entry into radiologic technology programs was the result of changes in federal payment schedules, as cited above.

Even if the decline in graduations is halted, there will still be a significant shortage of radiologic technology practitioners through the year 2000. The Bureau of Labor Statistics estimated that between 1986 and the year 2000, the number of jobs for radiologic technologists and technicians would grow by 65 percent, from 115,400 to 190,100 (Bureau of Labor Statistics, 1986). The types of personnel likely to be in demand in the future depends in large degree upon technological changes. For example, the emergence of new imaging modalities such as Magnetic Resonance Imaging (MRI) and Position Emission Tomography (PET), and

the application of the computer technology of imaging have generated major improvements in diagnostic capabilities.

The Institute of Medicine was chartered in 1970 by the National Academy of Sciences to enlist distinguished members of appropriate professions in the examination of policy matters pertaining to the health of the public. The Institute acts under both the National Academy of Sciences and the National Academy of Engineering's 1863 congressional charter to advise the federal government and the profession in the identification and investigation of issues related to medical care, research and education. According to the Institute of Medicine, factors related to the labor market demands for competent radiologic technologists will likely include, but not be limited to, the following:

- hospital utilization
- growth of all types of physician free-standing facilities
- licensure changes
- technological changes that will cause new areas of specialization
- results of technology assessment (Institute of Medicine, 1989).

The problem of selection, differentiation and guidance of candidates for admission to programs of studies for allied health occupations concerns all professional educators involved with the preparation of such individuals (Psychological Service Bureau, 1986-87). The issue directly stated is: where the number of applicants significantly exceeds program capacity, how can those students who will be most likely to succeed be best selected (Maynard, 1974)?

Given the data which clearly show a nationwide shortage of qualified radiologic technologists, it is imperative that selection criteria maximize a student's success in the didactic and clinical areas, as well as aid in predicting successful passage of the American Registry of Radiologic Technologists examination. The regular eligibility

educational requirements for certification according to the American Registry of Radiologic Technologists require that candidates successfully complete a program of formal education which has been approved by the Committee on Allied Health Education and Accreditation (CAHEA). To those who have passed the examination and are otherwise eligible, a certificate is issued which confers upon the applicant the right to use the title Registered Technologist (ARRT, 1991).

Many allied health professional educators freely admit that the written certification test is primarily slanted toward the academic or cognitive achievement of the student, rather than the clinical performance or the non-cognitive aspects of the profession which do not rely upon many of the academic skills in the daily delivery of health care services (Kavanaugh, 1981). To achieve professional competence requires that radiographers apply knowledge of anatomy, physiology, positioning and radiographic techniques in the performance of their duties. Radiologic technologists should be able to communicate effectively with the public, other health professionals and their patient(s). The radiologic technologist should also display personal attributes of compassion, courtesy and concern in meeting the needs of the patient, especially since these are components of the Radiologic Technology Code of Ethics.

It is important here to make a distinction between the terms assessment and evaluation. Assessment is defined as "the process of gathering data and fashioning it into an interpretable form." It precedes the final decision-making stage of evaluation. Evaluation is defined as "the process of ascertaining or judging the value of something by use of a standard of appraisal." Final decisions concerning evaluation of students and their program completion are made



from internal evidence and external criteria (Anderson, 1975).

Strategies and instruments utilized for evaluation of student behaviors in the behavioral domains should be made available to support the score received on the written radiologic technology certification test.

### Radiologic Technology Programs in the United States

The overall importance of the two-year college to the American democratic ideal of access to postsecondary education to the general population is well established in the literature. This importance has been debated in light of the perceived shift in two-year college curricular orientation from collegiate/transfer to vocational/technical (Baser, 1991).

Demographic studies show that the proportion of the United States population ages 18 to 23 years old will decline through the mid-1990s. Experts have predicted that this shrinkage of the so-called traditional college-age population will make it increasingly difficult for allied health programs, including radiologic technology programs, to attract qualified applicants (Institute of Medicine, 1989). The 1990 Report of Program Directors' Perspectives indicated that the total number of radiologic technology student applicants was 39,004. The relative number of radiologic technology student applicants who were considered by program directors to be qualified for admission into radiologic technology educational programs was 21,996 (Allied Health Education Directory, 1991). Thus while operating within institutions that profess open access, open door in their mission statements, radiologic technology programs reject one out of every two applicants.

Eleven types of institutions sponsor the Committee on Allied Health

Education and Accreditation (CAHEA) -- accredited programs as of October 31, 1991: (1) academic health centers and medical schools, (2) four-year colleges and universities, (3) community and junior colleges, (4) vocational and technical schools, (5) hospitals and medical centers of 1 to 99 beds, (6) hospitals and medical centers of 100 to 299 beds, (7) hospitals and medical centers of 300 to 499 beds, (8) hospitals and medical centers of 500 or more beds, (9) non-hospital health care facilities, (10) the Department of Veteran Affairs, and (11) the United States Department of Defense. Table II, "Radiologic Technology Programs Accredited by the Committee on Allied Health Education and Accreditation (CAHEA) in 1990, By Number and Percent," shows the number and percentage distribution of each major category of CAHEA-accredited radiologic technology programs in 1990.

TABLE II

RADIOLOGIC TECHNOLOGY PROGRAMS ACCREDITED BY THE COMMITTEE  
ON ALLIED HEALTH EDUCATION AND ACCREDITATION (CAHEA)  
IN 1990, BY NUMBER AND PERCENT

Sponsoring Institutions	# of Programs	Percent
Academic Health Center/Medical School	28	4.2
Department of Defense	4	0.6
Department of Veteran Affairs	4	0.6
Four-Year College or University	47	7.0
Hospital or Medical Center: 1-99 Beds	1	
Hospital or Medical Center: 100-299 Beds	110	16.5
Hospital or Medical Center: 300-499 Beds	134	20.1
Hospital or Medical Center: 500 or more beds	108	16.2
Junior or Community College	199	29.8
Vocational or Technical School	30	4.5
Non-Hospital Health Care Facilities or Lab	1	0.5
Total Programs	666	100.0

- Note:
1. CAHEA is an allied health education accrediting agency sponsored by the American Medical Association (AMA).
  2. Percentages do not add to 100.0 due to rounding.

The category "junior and community colleges" comprised 29.8 percent of all institutions sponsoring CAHEA-accredited programs, while hospital-based sponsors comprised 52.8 percent and vocational or technical schools comprised 4.5 percent. Four-year colleges or universities constituted 17 percent, while academic health centers comprised 4.2 percent. The Department of Defense (0.6 percent), Department of Veteran Affairs (0.6 percent), and non-hospital health care facilities (0.5 percent) comprised the remaining proportion of institutions sponsoring CAHEA-accredited programs.

The 1990 Report of Program Directors' Perspectives indicated that the total number of radiologic technology student applicants was 39,004. The relative number of radiologic technology student applicants who were considered by program directors to be qualified for admission into radiologic technology educational programs was 21,996 (Allied Health Education Directory, 1991). Thus, while operating with institutions that profess open access, open door in their mission statements, radiologic technology programs at community colleges reject one out of every two applicants.

### Curriculum

A structured radiologic technology curriculum, with written course syllabi which describe learning objectives and competencies to be achieved for both didactic and supervised clinical education, should be provided to assure that adequate opportunity to acquire the needed knowledge and skills can take place (Essentials, 1990, Appendix A). The curriculum should be based upon clearly stated objectives that identify

professional competencies and include cognitive, affective and psychomotor capabilities (Essentials, 1990).

The cognitive domain includes all objectives which deal with the intellectual behaviors of the learner. The psychomotor domain covers all those objectives in which the learner is engaged in some physical, kinesthetic behavior. The affective domain is concerned with attitudes, feelings, interests, and values of the learner. The cognitive and psychomotor domains are concerned with the question: What can the learner do? The affective domain is concerned with the question: What will the learner do? Many allied health professional educators freely admit that the Registry is primarily slanted toward the academic or cognitive achievement of the student in the curriculum, rather than the clinical performance or the non-cognitive aspects of the profession which do not rely upon many of the academic skills in the daily delivery of health care services (Kavanaugh, 1981).

According to the Essentials, curriculum content of radiologic technology programs should produce graduates who are both competent and compassionate. Instilled professional value should be evidenced by affective domain objectives and evaluations. Competencies developed by the radiologic technology program should be supported by specific behavioral objectives documented throughout the didactic and clinical curriculum and should include specific knowledge areas (Essentials, 1990).

Many educators have found that constructs devised by B. Bloom, D. Krathwohl, and their associates, in Taxonomies of Educational Objectives are useful in considering instructional objectives. Objectives in the cognitive domain deal with recall or recognition of knowledge, and the development of intellectual abilities and skills (Krathwohl, 1964).

Affective objectives emphasize a feeling tone, an emotion or a degree of acceptance or rejection (Krathwohl, 1964). Psychomotor domain objectives emphasize some muscular or motor control, some manipulation of material or objects, or some act which requires a neuromuscular coordination (Krathwohl, 1964). The six major classes of taxonomy in the cognitive domain are knowledge, comprehension, application, analysis, synthesis, and evaluation. The five major classes of taxonomy of the affective domain are receiving, responding, valuing, organizing, and characterizing. The five classes of psychomotor taxonomy are perception, set, guided response, and mechanism and complex overt response. The establishment of sound goals and objectives represents one of the most crucial steps in curriculum development. Without quality objectives, a course or curriculum might wander from topic to topic and result in students being unprepared for the Registry Examination or for the professional life that follows.

The development of meaningful outcomes for each course within the radiologic technology curriculum is important. As in all of vocational education, outcomes are of prime importance in radiologic technology programs. Outcomes can represent the extent to which students demonstrate competence once specific curriculum content has been taught. Some outcomes might be measurable while some others might not. Measurable outcomes in vocational and technical education such as radiologic technology can take many forms: for example, a student might identify the components of an x-ray tube, mix processor chemistry for film developments, or complete a quality assurance/quality control form. Measurable outcomes represent results which can be assessed with quantifiable data or in an objective manner. The other extreme represents outcomes that tend to be immeasurable. Examples might be

where a student develops an appreciation of the value of work in society, develops the ability to use leisure time wisely, or forms an attitude conducive to working in a group setting. Any vocational curriculum will have both measurable and immeasurable outcomes; thus objectives that are developed should address both cognitive and non-cognitive domains, and included in measurement of the cognitive should be an assessment of the psychomotor abilities as well as academic knowledge base.

### Cognitive Predictors

The profession of radiography demands that entering students become highly skilled technically, qualified by education to perform imaging procedures as well as to be compassionate health care providers. The maintenance of standards of excellence in radiologic technology admissions is therefore necessary to assure accountability and quality care by program graduates. For this reason, it is important that reliable predictors, both cognitive and non-cognitive, are developed to assess the full potential for success of all individuals in the radiologic technology applicant pool (Blagg, 1985). The literature has shown that traditional admissions criteria, including previous academic performance and aptitude tests, have been effective cognitive predictors of academic success. Research findings on the use of non-cognitive predictors in the allied health field of radiologic technology, unfortunately, are quite limited.

Many researchers have designed studies to investigate admission criteria for allied health fields, however few exist for the field of radiologic technology. Published results of a study by Ballinger (1976)

supported high school class rank as the most significant predictor of factors studied for performance on the American Registry of Radiologic Technologists (ARRT) Certificate Examinations. Ballinger performed a multiple regression analysis and found that the strongest predictor of success on the national Registry was high school graduating percentile. The second best predictor was the score on the English competency portion of the American College Test Program (ACT) English Composite score (Ballinger, 1976).

A study by McCausland and Stewart (1974) cited the results of an analysis of factors affecting the success of 154 college freshman enrolled at the University of Wyoming. College freshman grade point average, study skills, high school grade point average, and other variables were examined. The primary purpose of the study was the identification of study and attitudinal factors which were relevant to college success. It found the high school grade point average in addition to the ACT composite scores to be a good combination for selection purposes. While McCausland and Stewart concluded that high school averages tended to be the best cognitive indicator of college success, high school grade point averages did not indicate specific student strengths and weakness. Therefore, for diagnostic and counseling purposes at the college level, the high school grade point average had little value. The results of this study suggested that the cognitive and non-cognitive variables of academic aptitude, study skills and attitudes were important components of college success (McCausland, 1974).

A 1973 study by Chisson studied the records of college freshmen correlating high school grade point average, SAT scores, freshman English and mathematics grades, and total grade point average for the

first college semester. The study concluded that the high school grade point average was the most valued predictor (Chisson, 1985). Goldman and Slaughter (1976) attempted to discount grade point average composites as a valid predictor of total student performance. Errors in the selection of college students are universally related to the validity of the predictors employed. The generally weak validity with which grade point average in college has been predicted gives rise to a number of selection errors. This situation has produced criticism of standardized tests and a search for alternative models of fair selections. Goldman and Slaughter suggested that the problem was a criterion problem rather than a predictor problem. Their investigation demonstrated high validity for predicting grades in single classes. Since single class grades are components in the GPA composite, it seemed paradoxical that GPA prediction is inferior to grade point prediction in single classes. From their study, grade point averages of individual courses appeared to be valid, but due to different evaluation methods, and different grading standards in different types of college classes, performance in different subject areas was nonequivocal (Goldman and Slaughter, 1976).

A study by Tidd and Conine (1974) investigated correlations among physical therapy program courses, biological sciences, clinical performance and academic grade point average (GPA). High correlations between total grade point average and achievement in the biological and physical sciences were recorded, indicating that students performed better in clinical settings with increased biological and physical science training (Tidd, 1974).

Zufall (1974), in a review of research articles related to the selection of students in medical technology programs, found various



tests to be helpful as predictors of success. In a study by McCune and Rausch (1969), the predictor used was the Strong Vocational Interest Blank. The Strong Vocational Interest Blank employed 325 items to inquire about a respondent's interest in a wide range of occupations, occupational activities, hobbies, leisure activities, school subjects and types of people. The respondent was asked to indicate "like," "indifferent," or "dislike" in response to the items; the answers then were analyzed by computer to devise scores on 264 scales. The results of the Strong Vocational Index were reported on a sheet called a profile, which represented the scaled scores in an organized format, and interpretive information offered. Eberfield and Love (1970) used the Bell Adjustment Inventory, Kuder Preference Record, and Selective College Ability Test (SCAT) as an aptitude battery. The scores of these tests were used along with the grade point average (Zufall, 1974). The Selective College Ability Test is designed to measure academic aptitude, and has long been a staple in school testing programs. The Bell Adjustment Inventory reports six students scores concerning home, health, submissiveness, emotionality, hostility, and masculinity. The Kuder Preference Record (Kuder General Interest Survey) can help to provide a more complete picture of a school age person and can be especially helpful in making educational and vocational plans at various opportunities for choices in a person's career development.

#### Standardized Tests and Radiologic Technology Programs

The American College Test is a composite of four sub-tests which measure educational development in the areas of English, mathematics, social studies and natural sciences. The overall composite test is

regarded by their creators as measures of academic development which rely partly on the students' reasoning abilities and partly on their knowledge of the subject matter fields in an effort to emphasize their abilities to use both. The English usage sub-test measures students' understanding of the conventions of standard written English and the use of basic elements of effective expository writing: punctuation, grammar, sentence structure, diction, style, logic, and organization. The mathematics sub-test measures students' mathematical reasoning ability. The test emphasizes quantitative reasoning rather than recall of formulas, knowledge of specific techniques, or computational skill. The social studies reading sub-test measures students' ability to read, analyze, and evaluate social studies materials. There are two types of items: the first type (70 percent of the test) is based upon reading passages and the second (30 percent of the test) on general background or information. These items require inferential reasoning and the application of general information rather than rote recall of specific facts. The natural science reading sub-test measures students' ability to read, analyze and evaluate material from the natural sciences. The items require inferential reasoning and the application of general information rather than the rote recall of specific facts. The composite will be the average score for the English, mathematics, social studies, and natural sciences tests.

American College Test assessment results are summarized on the ACT Assessment College Report, which ACT sends to institutions and agencies designated by each student. The ACT Assessment also includes an interest inventory to help students compare interests with those of students who have completed various major college majors, and identifies groups of jobs the student may want to explore. According to the ACT,

the ACT examination is administered in 50 states while the Scholastic Aptitude Test (SAT) is administered in 22 states (Appendices B & C). About two-thirds of the majority of accepted freshmen nationally were in the highly-selective or top 10 percent of high school graduating classes which had average ACT Composite Scores between 27 and 31, while the SAT total (Verbal + Math) was between 1120-1290. The majority of accepted freshmen in the selective or top 25 percent of high school graduating classes had average ACT Composite Scores between 22-27, while the SAT total (Verbal + Math) was between 920-1090. The majority of accepted freshmen in the traditional or top 50 percent of high school graduating classes had average ACT Composite Scores of 20-23, while the SAT total (V + M) was between 810-950. Because the ACT examination is administered in 28 states and is used to a high degree at public community colleges, opinion rating questions were developed for the Survey of Recruitment, Admission and Selection Criteria for Radiologic Technology Programs.

Lauer (1981) examined the effects of six manipulatable factors on Registry performance in 15 Western college-based programs. Hospital-based and university medical center-based radiography programs were not studied. Two-year associate degree radiography programs delivered by community colleges and universities were studied. The findings implied that students had an equal chance for success on the Registry examination regardless of a number of factors including the educational expertise of faculty, the institutional academic degree requirement, the number of clinical education hours required, the methods used in assigning student to clinical affiliates, the use of on-campus energized laboratories, and the use of Registry preparation and review courses (Lauer, 1981). With the variety of training

approaches that exist among college-based radiography programs, further research will be needed to substantiate educational standards.

In Kavanaugh's study, grades in selected high school courses such as biology and algebra were compared to grades received in selected courses in the radiography curriculum. Biology was chosen as the admission reference because of its similarity to anatomy and physiology. Algebra was chosen as the mathematics reference because of its use as a required course and the frequency of algebraic problems in radiation physics, and principles of exposure, and problem solving questions on the certification examination. The results of the study appeared consistent with literature that cited high school grade point average, algebra grades and biology grades in the selection of radiologic technology students as valid predictors of success. The correlations between high school algebra and biology and radiography program counterparts were significant enough to continue to use these subjects as admission criteria, according to Kavanaugh. Kavanaugh made no statistical comparison between high school grade point average or grades in biology or algebra and the Registry Examination results, although reference was made to five first-time program failures on the American Registry of Radiologic Technologists Examination and their high school grade point averages, as well as algebra and biology grades (Kavanaugh, 1981).

A study by Schimfhauer and Broski (1976) investigated allied health students, examining the variables of the ACT subtest scores, high school grade point average and five subscores of the Allied Health Profession's Admission Test (AHPAT). Their study revealed that the math subtest of the ACT outranked preprofessional grade point averages in predicting success. When all allied health programs were combined, the grade point average was again the strongest predictor variable followed by the

mathematics subtest of the ACT, and the Allied Health Profession's Admission Test (AHPAT) verbal subtest score. Schimfhauer did not have evidence on Radiologic Technology as a specific allied health profession (Schimfhauer, 1976).

A study by Stankovich (1977) investigated the statistical predictability of academic performance. This study concluded that a student's success could be predicted by high school grade point average and college entrance test examination scores, specifically by examining the ACT mathematics subtest scores (Stankovich, 1977). A study completed by Bello (1977) concluded that valid factors predictive of success or failure were best determined by age, comparative placement and guidance program (CGP), reading and sentence scores, high school algebra grades and college science grades (Bello, 1977).

Merritt (1972) examined the predictive validity of the American College Test in determining college grade point averages for students coming from low socioeconomic backgrounds. Merritt concluded that the ACT was a valid predictor of college grades for students from low socioeconomic backgrounds (Merritt, 1972). Ferguson (1975) cited self-reported grades in ACT or Scholastic Aptitude Test composite scores and high school rank as admission criteria. Ferguson also reported that the American College Test was used for more than admissions at many colleges. Ferguson noted that when American College Test scores were combined with either high school grade point averages or high school ranking, the results were highly predictive of college success (Ferguson, 1979).

Wesolowski (1988) found that 45.2 percent of radiologic technology programs used the American College Test examination, 31.5 percent used the School/College Ability Test (SCAT), and 1.7 percent used the

Psychological Test Examination for Radiologic Technology. About eighteen percent (18 percent) of the radiologic technology programs indicated they used no pre-admission test, and Wesolowski questioned whether this was an oversight on the part of the respondents or if an open-door policy was in effect.

Francis (1990) investigated the relationship between pre-admission ACT Composite Scores and the Registry Examination for two-year community college programs. Program officials were surveyed to determine if there were any similarities among individuals who had failed the American Registry of Radiologic Technologists examination on their first attempt. High school grade point averages; algebra, biology and chemistry grades; college grade point average; college grades in courses such as anatomy and physiology; radiographic exposure; and exposure techniques and physics were all examined. Results demonstrated no similarities among this group who had failed the ARRT in their first attempt. Only one item did appear to be related, and that was that six of the seven failing students had ACT composite scores of 14 or lower. The program director decided to determine the connection, if any, of the students' pre-admission ACT composite scores and the graduates' scores on the American Registry of Radiologic Technologists examination. The resulting modification of the radiologic technology program admission criteria and its effect upon the Registry examination results revealed a threefold reduction in failure rate after the revised admission criteria were implemented. The modified admission criteria implemented in 1982 was as follows: high school transcript evaluation, interview and ACT Composite Score. The major change in the admission criteria was that the ACT Composite Score was relied upon much more heavily than in the past for making admission decisions (Francis, 1990).

A study by Macomber and Sanders (1984) studied the effect of a mock Registry examination score and a student's grade point average on the student's performance on the actual Registry examination itself. The results of their research showed that the mock registry score and the student's grade point average were statistically significant in predicting success on the American Registry of Radiologic Technologists examination. A student's mock registry score was found to be the most reliable predictor of success on the American Registry of Radiologic Technologist's examination (Macomber, 1984).

Competency-based learning and clinical performance can also be related to cognitive criteria, such as grades and intellectual ability, but typically only negligible relationships have been established (Wingard, 1973). Therefore, the traditional admission predictors of grades and intellectual ability can be said to be ineffective measures of competency-based learning and clinical performance in the field of radiologic technology. Attention is now turned to a brief review of the literature of professional medical education, with emphasis on the non-cognitive and affective domains.

The Kegel-Flomm study (1975) investigated the performance rating of medical interns on four dimensions: knowledge of medical sciences, clinical effectiveness, interpersonal effectiveness, and overall competence/professional promise as a physician. In addition, the Kegel-Flomm study questioned the extent to which ratings of intern performance could be predicted from earlier measures of aptitude, achievement and personality. They found that when admission data, personality inventory measures, and medical school performance were considered together, (1) the supervisors' ratings of interns were best forecast by earlier medical school faculty ratings, (2) self-ratings

were forecast best by a combination of personality inventory measures and medical school grades, and (3) peer ratings were best predicted by a combination of personality inventory measures. Premedical grades, Medical College Admission Test scores, and admission interview ratings failed to predict ratings of intern performance. The performance of medical interns is apparently associated more with personal qualities and medical training than with relative levels of aptitude and undergraduate achievement (Kegel-Flomm, 1975).

Traditional admission predictors are cognitive in nature and have been proven to be ineffective in measuring clinical performance (Richards, 1962). Quality clinical performance requires not only cognition but also proficiency in the affective and psychomotor domains. It is in these latter domains that new predictors would be beneficial. Coupled with the traditional predictors, they would provide a more complete appraisal of the full potential of the applicants. Attention is now turned to a discussion of the research related to these non-cognitive predictors.

#### Non-Cognitive Predictors

The Carnegie Council on Policy Studies in Higher Education outlined a variety of admission considerations that should be taken into account as individuals responsible for professional education programs scrutinize their applicants (Carnegie Council, 1977). These criteria include special abilities of an affective or psychomotor type, special interests, special demographic personal identifications such as ethnicity or county of residence, special personal characteristics, contributions to diversity of the student community, potential



contribution to the profession, contribution to the identity of the institution and contribution to the political, economic, or community needs of the professional program. The majority of the commission's considerations can be considered to be non-cognitive variables (Dietrich, 1981).

Quantifying an applicant's affective characteristics is perhaps the most difficult task in student selection at any level of graded education. The rubric of the affective domain includes traits such as self-concept, self-esteem, values, motivation, attitudes, and interests. Those responsible for student selection should identify the importance of personality characteristics and their special attributes or traits (Dietrich, 1981). Because the maintenance of standards of excellence in radiologic technology admissions is necessary to assure accountability and quality care by program graduates, it is essential that reliable predictors, both cognitive and non-cognitive, be developed to assess the full potential for success of all individuals in the radiologic technology applicant pool (Blagg, 1985).

Research findings of the use of non-cognitive predictors in the allied health field of radiologic technology is very limited. In order to increase predictive efficiency, some investigators have added non-cognitive variables to their data bases (Blagg, 1985). Traditional admissions criteria, including previous academic performance and aptitude tests, have been researched to be effective cognitive predictors of academic success.

In a study by Murden (1978) the researcher examined admissions data, including both cognitive factors and interview ratings for five classes of University of Missouri at Columbia Medical School. The study revealed that each applicant was rated on the traits of maturity,

non-academic achievement, rapport, and motivation for medicine. Neither of the cognitive measures of grade point average (GPA) or Medical College Admissions Test scores were related significantly to internship scores. The authors concluded that had greater emphasis been placed on personal characteristics or non-cognitive variables in the admission criteria, the overall abilities of graduates of the classes would have been enhanced (Murden, 1978).

Keck (1979) utilized both cognitive and non-cognitive variables in an attempt to predict clinical performance of medical residents at the University of Missouri-Kansas City (UMKC) School of Medicine. The cognitive variables included undergraduate grade point average, scores obtained on a "Quarterly Profile Examination" (a multiple choice examination administered every three months throughout a student's matriculation taken prior to graduation from medical school) and scores on Parts I and II of the National Board of Medical Examiners. Non-cognitive variables included Holland's Self-Directed Search, the Omnibus Personality Inventory, and total scores received on an admissions interview. Clinical scores were obtained from a residency evaluation form filled out by clinical supervisors of their residents. The authors concluded that a combination of cognitive and non-cognitive predictor variables function much better than any individual variable, or even any specific class of variables, in predicting success in clinical performance (Keck, 1979).

Molidor and his associates (1978) investigated the effectiveness of non-cognitive measures of problem-solving ability as screening mechanisms for medical school admissions. The measures of problem-solving ability included the Pictorial Reasoning Test, the Remote Associations Test, the Watson-Glaser Critical Thinking Appraisal,

the State Trait Anxiety Inventory, the Anxiety Scale, and the Study Habits Inventory. The scores received on these measures were regressed on several measures of student performance in medical school, including appearance, health, ability to work with others, adaptability, attitude regarding supervision, nursing care, dependability, charting, care of property, interest in nursing, judgement, professional conduct, punctuality, planning ability, work relationship to patient, teaching interest and teaching ability. In the stepwise multiple regression, Molidor and associates entered Medical College Admission Test scores and previous grade point averages first, and then entered the six independent measures of problem solving ability, with only gain scores being reported. The highest gain was associated with Clinical Problem Scores (Molidor, 1978). The authors did not report which of the measures contributed most to the gain scores; therefore these results should be viewed with caution (Blagg, 1985).

Sheenan (1979) studied the relationship between moral judgement as a function of integrity and the clinical performance of medical students. Students were rated by faculty in eighteen areas of personal characteristics. Moral judgement was measured in relation to Kohlberg's six stage theory of moral development. Kohlberg identified three levels of moral reasoning: (1) preconventional, stages one and two (lowest levels); (2) conventional, stages three and four; and (3) principal, stages five and six (highest levels). These stages were measured by Kohlberg's Standard Moral Judgement Interview and by Rest's Defining Issues Test. These two measures of moral reasoning were correlated to the clinical performance scores. Results showed a significant correlation between Kohlberg's Standard Moral Judgement Interview score and clinical rating scores. Canonical correlation analysis, which

relates to the most significant forms or schemata to which general equations, statements, or expressions may be reduced without loss of generality, showed a statistically significant relationship existing between the Defining Issues Test scores and the 18 clinical performance characteristics measured by faculty ratings (Sheenan, 1979).

Finegan (1967) investigated the attribute of motivation as a contributing factor in clinical performance of nursing students. Motivation was measured with the Personal Values Inventory, while the student performance was measured by scores received on the Scholarship Aptitude Test, the National League of Nursing Achievement Test, grade point average in nursing courses, and scores received on the Clinical Raters Evaluation Sheet and Clinical Form Score. Students were evaluated using the Clinical Raters Evaluation Sheet (CRES) in areas of personal characteristics, technical performance, and relation to co-workers. The Clinical Form Score was based upon student performance in 17 clinical areas including appearance, health, adaptability, relationship to patient and teaching ability. The highest correlations to the Clinical Raters Evaluation Sheet scores were the Direction and Insight Scores of the Personal Values Inventory. The highest correlations to the Clinical Form Scores were Direction and Planning Scores of the Personal Values Inventory. The findings suggested that it might be possible to develop a standardized measure of motivation that could help to predict nursing student success (Finegan, 1967).

Ryden (1977) hypothesized that nursing students with higher interpersonal relationship scores would achieve higher scores in clinical rotations. Following this view, competencies developed by an allied health program should be supported by specific behavioral objectives documented throughout a clinical curriculum, and that the

student(s) should competently perform a full range of medical duties and procedures during the assigned rotations through a clinical education center hospital. The student's skills in interpersonal relations were evaluated via the Interpersonal Relationship Rating Scale (IRRS). The correlation between clinical examination scores and the mean cumulative rating of the students on the IRRS was significant, ( $r = 0.45$ ), supporting the Ryden's hypothesis (Ryden, 1977).

In another study of the relationship between self-concept and the clinical performance of nursing students, Burgess (1980) administered the Tennessee Self-Concept Scale to 100 students entering a baccalaureate nursing program. The collected data did not support the hypothesis that a significant relationship could be found between the self-concept of the undergraduate nursing students and their clinical performance (Burgess, 1980).

Jenssen (1969) studied the cognitive style variable of dogmatism, measured by the Rokeach Dogmatism Scale, positioning on the democratic-autocratic continuum measured by the Traditional Family Ideology Scale, and the relationship to successful nursing performance. Nursing students were administered both instruments upon entry into the four-year nursing program, at the end of their freshman year, and at the end of six months of clinical training. Senior and graduate nursing students were administered the instruments as well. The results showed that freshman students did not change in dogmatism but did exhibit less authoritativeness than did the graduate nursing students. There was no significant difference in dogmatism scores between graduate and senior nursing students. The author suggested that results of the study indicated a usefulness of the Rokeach Dogmatism Scale and the

Traditional Family Ideology Scale instruments for selection of students into the nursing program (Sheenan, 1979).

Gunning (1981) examined a cognitive style paradigm (field-independence-dependence), critical thinking ability, and clinical problem solving ability of baccalaureate nursing students. Field-independence-dependence was measured by the Group Embedded Figures Test. Critical thinking ability was measured by the Watson-Glaser Critical Thinking Appraisal, and clinical problem solving was measured by the Nursing Performance Simulation Instrument. The results showed a significant correlation between field independence and critical thinking ability, and between field independence and clinical problem-solving ability. There was no significant correlation found between critical thinking ability and clinical problem-solving ability (Gunning, 1981).

Bailey (1969) investigated the relationship between psychiatric clinical internship scores and scores on the Strong Vocational Interest Blank (SVIB), the Multiphasic Personality Inventory (MPI) and the Florida Placement Examination for female occupational therapists. The Strong Vocational Interest Blank employs 325 items to inquire about a respondent's interest in a wide range of occupations, occupational activities, hobbies, leisure activities, school subjects and types of people. The respondent is asked to indicate "Like", "Indifferent", or "Dislike" in response to the items; the answers then are analyzed by computer to derive scores on 264 scales. The results are reported on a sheet called a profile, which represents the scaled score in an organized format with interpretive information. The authors attributed the high effectiveness of the SVIB in predicting the performance rating component to the fact that the SVIB scales are not only a measure of interest but also a measure of various components of personality,

aptitude and perhaps even attitudes. Thus, adding the Strong Vocational Interest Blank may be a useful instrument for predicting performance ratings (Bailey, 1969).

Interpersonal communications is a factor that has been incorporated into admissions systems for medical technologists receiving a baccalaureate degree (Rifken, 1981). The medical technology programs admission system studied utilized both academic and nonacademic factors. Nonacademic factors included an overall impression score that "generates an overall positive response in interpersonal communications." This score was tabulated from scores received on an interview and from letters of reference. The authors found that this score correlated significantly with scores received by students on clinical ratings in microbiology, chemistry and hematology in their senior year but not with work experience ratings obtained from the first superiors of graduates in their first year of employment. The authors suggested that interpersonal communications may be a major component of what is actually being measured by clinical supervisors (Rifkin, 1981). An interview or letter(s) of reference can be classified as information sources of the affective domain, usually classified as a non-cognitive predictor.

Bork (1980) studied the role of cognitive style in the clinical evaluation performance of undergraduate physical therapy students in medical problem solving. The paradigm identified an individual's method of information gathering (perceptive or receptive mode) and information evaluation (systematic or intuitive mode). The results of the study provided evidence that individuals who scored high on patient history-taking and physical assessment were more likely to operate in the intuitive mode. Patient data omitted on a patient's medical chart

were mostly associated with a student's grade point average.

Information gathered by students in the perceptive mode differed from conclusions reached by physical therapy experts. This study indicated that cognitive styles as well as content knowledge influenced the ability of an individual to solve patient problems (Bork, 1980). Therefore, it was hypothesized that cognitive and non-cognitive variables could be used to evaluate an undergraduate allied health student's ability to solve patient problems.

In summary, cognitive as well as non-cognitive variables could explain the variance in a student's clinical performance score(s) for medical education as well as nursing and allied health education. Certain allied health professions, especially those dealing with patient assessment (which includes radiologic technology), demand a high level of the complex cognitive skills of analysis and synthesis. In a 1981 study, Wesolowski suggested that in clinical education, the student radiographer must be observed and evaluated in many different situations with respect to numerous psychomotor abilities. Wesolowski also argued that the evaluation could be used as one of many tools to impact knowledge and skills to the student (Wesolowski, 1981).

Quality clinical performance for graduates of community college nursing and allied health programs requires not only cognition but also proficiency in the affective and psychomotor domains. It is in these latter domains, especially the affective, that useful non-cognitive predictors of success would be most beneficial. When coupled with traditional predictors, they would provide a more complete appraisal of the full potential of applicants to radiologic technology programs. Given the high applicant rejection rates, the existence of these selective programs within open-access open door institutions, and the



need for the field to increase the number of underrepresented women and minorities, it is vital that the selection process be done with accuracy while accounting for sometimes diverse programs objectives and goals.

Quantifying applicant affective characteristics is perhaps the most difficult task in allied health student selection. The rubric of the affective domain includes such traits as self-concept, self-esteem, values, attitudes and interests. The four major information sources (essays, interviews, standardized personality tests [eg.: Myers Briggs Type Indicator], letters of recommendations) can be used in the affective assessment of applicants. The absence of a universally acceptable taxonomy makes precise measurements in the psychomotor domain much more complex. The major elements of the domain, namely fine and gross motor skills and perceptual-motor abilities, can be evaluated in terms of relative importance with respect to entry-level tasks analysis prior to use in student selection to aptitude testing for radiologic technology programs (Dietrich, 1981). Attention is now turned to the area of aptitude testing.

### Aptitude Testing

The content of the Psychological Services Bureau (PSB) Health Occupations Aptitude Examination is the result of an assessment of the requirements and needs expressed by those professionals having the responsibility in preparing qualified, competent practitioners for health careers in a variety of specialized fields such as nursing and radiologic technology.

The problem of selection, differentiation and guidance of candidates for admission concerns all involved with the education of individuals

for allied health professions. Programs functioning without comprehensive screening procedures may find a student's chances of success quite poor, and since allied health programs often cost three times to five times more than regular academic courses to deliver at community college, it is important to "match" students and programs in an efficient manner. The PSB Health Occupations Aptitude Examination is specifically designed to measure a conglomerate of abilities, skills, knowledge and attitudes which are crucial to what may be called "aptitude" for successful participation in the allied health programs at community colleges. The PSB Health Occupations Aptitude Examination has been revised, in part because of the extensive analysis of field test data and feedback from field test administration that has been conducted over the years. The revised PSB Health Occupations Aptitude Examination is especially designed for Allied Health Education Programs with demonstrated criterion-related (predictive) validity. The Revised PSB Health Occupations Aptitude Examination provides a relevant unbiased, culture-minimized assessment of thinking skills and essential functional information.

In 1983, and again in 1985, Reinking administered the PSB-Health Occupations Aptitude Examination to students in a junior college Surgical Technology program. The findings indicated a positive correlation between the PSB-Health Occupations Aptitude Examination student scores earned at the time of admission to the Surgical Technology Program and the student's subsequent cumulative grade point average at the time of completion of the program (Reinking, 1983 and 1985).

Miller (1985) used the PSB-Health Occupations Aptitude Examination to predict achievement (success or failure) in the completion of

academic and clinical work in radiologic technology. The use of the examination took place over a period of four years. The results obtained from the PSB-Health Occupations Aptitude examination, which was administered to students prior to admission to school, coincided with the subsequent earned score on the evaluative criterion connected with the student's completion of the educational program for radiologic technologists. The outcome of this study showed that the PSB-Health Occupations Aptitude Examination scores were predictive of earned scores on the National Registry Examination (Miller, 1985).

A study by Myers (1985) compared the relationship between scores earned by hospital-based radiologic technology students, at the time of admission to the program, on the PSB-Health Occupations Aptitude Examination with (1) the cumulative grade point average on the graduated classes of 1984 and 1985, (2) the final examination scores of the graduated classes of 1984 and 1985, (3) the cumulative grade point average of the class of 1986, and (4) the cumulative grade point average of the class of 1987 (two months in the program). This first part of the study involved comparing PSB-Health Occupations Aptitude Examination scores earned by students at the time of admission to the radiologic technology program with the student's subsequent cumulative grade point average. The question that was raised was did the scores from the five tests comprising the PSB-Health Occupations Aptitude Examination predict subsequent cumulative grade point averages for students in the classes described above? The second part of Myers study concerned the establishment of any relationship between the students' scores earned on the PSB-Health Occupations Aptitude Examination and the students' scores earned on the final examination. A review of Myers' findings indicated there existed a positive correlation between the PSB-Health Occupations

Aptitude Examination scores and subsequent student cumulative grade point averages, as well as scores earned on the programs final examination. Programs functioning without a comprehensive screening procedure may find a student's chances of success quite poor (Myers, 1985).

### The Registry Examination

The American Registry of Radiologic Technologists (ARRT) requires that candidates who plan to take its Registry Examination must have successfully completed a program of formal education which has been approved by the Committee on Allied Health Education and Accreditation. All applicants who have completed a program of formal education must have completed the eligibility requirements by the date of the examination take this 200-item objective test. The examinee is given three hours to complete the examination, which is administered March, July and October annually across the United States. The examination scores are reported as scale scores, with a scaled score of 75 constituting a passing grade. The examination is divided into five subject areas: radiation protection, equipment operation and maintenance, image production and evaluation, radiographic procedures, and patient care and management. The range of scores for the Registry examination is a low of/and a range of 99, according to the ARRT officials. The reliability of the ARRT examination varies from test date to test date, but the Kuder-Richardson (KR20) is reported to be in the range of .92 to .94 for the ARRT examinations given between 1979 and 1986. The Kuder-Richardson formula 20, a type of reliability coefficient, provides relatively conservative estimates of the

coefficient of equivalence. In terms of test theory, the coefficient of equivalence is the most desirable index of test reliability, since it involves two different representative samples of items.

The examination administered in 1991 was the second set assembled based upon the revised content specifications developed as a result of the ARRT Jobs Analysis Update Project. Approximately 15,000 examinations were administered in the three component parts of the radiologic technology profession--radiography, nuclear medicine technology, and radiation therapy technology--in the three separate 1991 testing sessions. Radiography examinations accounted for approximately 88 percent (n = 8016) of the total, nuclear medicine technology for about 5 percent (n = 561), and radiation therapy technology for about 7 percent (n = 685). There were a total of 9,352 first-time regular examinees who took the 1991 Registry. Table III, the "Performance of First-Time Examinees on the American Registry of Radiologic Technologists Examination, 1991," shows overall performance of the examinees in the three administrations made that year. According to the report of the percent passing, about 19 percent of all radiography examinees failed the test the first time.

TABLE III

PERFORMANCE OF FIRST-TIME EXAMINEES ON THE AMERICAN REGISTRY  
OF RADIOLOGIC TECHNOLOGISTS EXAMINATION, 1991

Test	Administration	Mean Scaled Score	Standard Deviation	Percent Passing
Radiography	March 1991	79.7	8.30	74.7
	July 1991	82.3	7.14	85.7
	October 1991	81.8	7.26	84.1
	Mean for 1991	81.9	7.32	84.1

TABLE IV

FIRST-TIME PERFORMANCE OF EXAMINEES, ON THE AMERICAN REGISTRY  
OF RADIOLOGIC TECHNOLOGISTS MARCH, JULY, AND  
OCTOBER EXAMINATIONS, BY REGIONS, 1991

REGION	DATA	RADIOGRAPHY		
		March	July	October
Northeast	$\bar{x}$ N	78 (79)	82 (895)	82 (1052)
Southeast	$\bar{x}$ N	82 (146)	83 (1033)	82 (858)
Central	$\bar{x}$ N	80 (96)	82 (111)	82 (789)
West	$\bar{x}$ N	80 (322)	82 (884)	81 (786)

Notes:  $\bar{x}$  = mean (average) scaled score for regular first-time examinees.

N = number of regular first-time examinees.

The examination scores are reported as scaled scores, with a scaled score of 75 constituting a passing grade.

Table IV, "First-Time Performance of Examinees on the American Registry of Radiologic Technologists March, July, and October Examinations by Regions, 1991," groups the performance data into four regions of the country. The mean performance is reported in terms of scaled scores. Scaled scores are not percentages, but rather are a statistically derived unit of measurement taking into account differences in the average difficulty of test forms. The forms of the examination used for the March, July and October administrations are made up of different sets of items; the use of scaled scores allows

direct comparison of scores on these forms. This would not be true if scores were reported as percentages.

### Summary

The absence of current information on radiologic technology selection procedures for programs based in community colleges provided the impetus for this national study. From the preceding review of the literature, including literature related to the student selection processes at medical schools, nursing programs and other health care programs, there appears to be a number of cognitive and non-cognitive variables that have been identified that can be used to predict didactic and clinical performance in the various allied health professions. It would appear then that radiologic technology program directors should maintain standards of excellence in admissions by use of cognitive as well as non-cognitive predictors to assess applicants more completely and accurately (Essentials, 1990).

Demographic studies show that the proportion of the U.S. population 18 to 23 years old has been declining and will continue to decline through the mid 1990s. This will make it difficult for all allied health programs, including radiologic technology programs, to attract traditional-aged qualified applicants. Many other opportunities will compete for this population's attention. Therefore, greater efforts will have to be made to maintain allied health's market share of perspective students. This was noted by the Institute of Medicine in 1989:

A key to the viability of allied health education is its capacity to maintain its share of qualified students from the traditional college-age applicant pool while tapping into less traditional pools of students particularly minority students (Institute of Medicine, 1989, p. 7).

Comprehensive data collection concerning applicants to allied health programs is not currently being performed. The Committee on Allied Health Education and Accreditation (CAHEA) does perform annual surveys in several allied health fields regarding whether the number of applications to programs are increasing, decreasing, or remaining the same. Unpublished survey data from the American Society of Allied Health Professions suggest that radiologic technology programs average only slightly more applicants than are needed to fill classes, despite consistently good long-term employment projections for radiologic program graduates, as shown by various Bureau of Labor Statistics labor market studies. Radiologic technology academic administrators are therefore concerned that with fewer applicants from which to select, the quality of the student will decline. For these above mentioned reasons, student selection presents one of the most perplexing problems for health care educators, including radiologic technology educators.

From the preceding review of literature, there was research of reliable predictors to use as selection criteria of perspective radiologic technology students (Ballinger, 1976; McCausland, 1974; Chission, 1985; Schimfhauer and Broski, 1976). Quantifying the radiologic technology applicants' affective characteristics increases predictive efficiency (Dietrich, 1981; Blagg, 1985; Murden, 1978; Keck, 1979; Finegan, 1967; Burgess, 1980). Aptitude testing should be used to measure aptitude for the educational process structure to produce proficient allied-health practitioners (Reinking, 1983, 1985). The



outcome of aptitude testing scores can be predictive of earned scores on the American Registry of Radiologic Technologist Examination (Miller, 1985; Myers, 1985).

Based on the review of the literature, it is clear that the field of radiologic technology is a relatively young field, that the community college should provide "equal opportunities for all persons," and that the cognitive and non-cognitive characteristics of entry-level radiologic technology students can be evaluated. The question remains as to which cognitive and non-cognitive variables will be predictive of success in community college radiologic technology educational programs, and how these variables can be best assessed.

## CHAPTER III

### METHODOLOGY

The primary purpose of this study was to assess and analyze perceptions of community college radiologic technology program directors and their usage of selection criteria for prospective students. The perceptions and opinions were quantified in terms of the participant's responses on The Survey of Recruitment, Admission and Selection Criteria for Radiologic Technology Programs, an instrument developed for this study.

This chapter includes the components of the design of research through which the purpose of the study was accomplished. This chapter is divided into the following sections: definition and selection of populations, a description of the research instrument and the procedures used in data collection, and the statistical methods used in manipulating the collected data.

#### The Definition and Selection of Populations

Due to the focused scope of this study, population of community college radiologic technology programs in the United States were included and comprised the 199 community college radiologic technology programs that awarded an Associate Degree in Radiologic Technology.

Community

college radiologic technology program directors familiar with and responsible for student assessment and selection were surveyed. Program directors were surveyed because program officials are most often directly responsible for establishing procedures for determining that prospective applicants meet academic and technical standards required for admission to community college radiologic technology programs. Program directors were also surveyed because radiologic technology program officers are knowledgeable of the Registry requirements and JRCERT accreditation guidelines.

Radiologic technology programs are generally two to four years in length depending on program design, objectives and the degree or certificate awarded. A high school diploma or its equivalent, with an educational background in basic sciences and mathematics, is generally required prior to entry. Additional admission requirements of the sponsoring educational institution also must be met (Allied Health Education Directory, 1990).

According to the Joint Review Committee on Education in Radiologic Technology (JRCERT), a structured curriculum with clearly written course syllabi which describes learning objectives and competencies to be achieved for both the didactic and supervised clinical education components should be provided for by the radiologic technology program. The curriculum should be based on clearly stated objectives that identify professional competencies and enhance cognitive and non-cognitive capabilities. Curriculum content to produce graduates who are both competent and compassionate should also be provided. Instilled professional values should be evidenced by affective domain objectives and evaluations (refer to page 6 in Appendix A, Essentials, 1990).

The evaluation system should be related to program philosophies, goals, and competencies, provide students with ongoing as well as terminal evaluations and serve as a reliable indicator of the effectiveness of instruction and course design criteria for successful performance. The evaluation system should be equitably applied without discrimination (Essentials, 1990). The American College of Radiology, the American Medical Association, and the American Society of Radiologic Technologists cooperate to establish, maintain and promote appropriate standards of quality for educational programs which meet or exceed the standards as outlined in the Essentials. Accreditation is a process of external peer review in which a private, non-governmental agency or association grants public recognition to an institution or specialized program of study that meets certain established qualifications and educational standards, as determined through initial and subsequent periodic evaluations. The purpose of the accreditation process, then, is to provide a professional judgement of the quality of the educational institution or program and to encourage its continued improvement. The maximum duration of accreditation for radiologic technology under JRCERT is five years.

#### Research Instrument

The Survey of Recruitment, Admission and Selection Criteria for Radiologic Technology Programs (Appendix D) was developed for use in assessing the perceptions of community college radiologic technology program directors and their use of selection criteria for prospective students. The questionnaire was designed as a mail survey to assess the opinions of community college radiologic program directors, but had

applicability to program faculty or others responsible for determining which prospective student applicants meet academic and technical standards required for admission to community college radiologic technology programs. The five point Likert-type questionnaire was intended to measure the general attitudes toward community college radiologic technology programs by measuring the general opinions of individuals toward three facets-cognitive and non-cognitive domains-which were deemed as most important in determining the overall attitude toward community college radiologic technology education (Essentials, 1990).

The cognitive domain includes all objectives which deal with the intellectual behaviors of the learner. The non-cognitive domain includes personality characteristics and their special attributes or traits with emphasis on some muscular or motor control.

#### Research Instrument Development

The development of the Survey of Recruitment, Admission and Selection Criteria for Radiologic Technology Programs involved the investigation of an expansive list of items found in the related literature and derived from opinion, attitudes and beliefs regarding community college radiologic technology student selection. This complete set of opinion ratings and general information questions was administered to five (5) nationally recognized program directors who determine which prospective student applicants meet academic and technical standards required for admission to radiologic technology programs. While attending the Fifty-Fifth Annual Convention of Kansas Society of Radiologic Technologists at Dodge City, Kansas in 1991.

Revisions of the survey were based upon the advice of these expert program directors employed by four-year college or university, vocational or technical schools, and hospital or medical centers radiologic technology programs. A 52 item, five scale ("strongly agree," "agree," "disagree," "strongly disagree," and "no opinion") Likert-type questionnaire was sent to the 199 community college radiology technology programs in the United States. The source utilized for selection of accredited community college radiologic technology programs was the Allied Health Education Directory (Allied Health Education Directory, 1991).

#### Data Collection Procedure

While the validity of a descriptive survey which utilizes a mail survey can be threatened by a low response rate, the survey was planned to mitigate against this by establishing credibility for the study through a request for the completed surveys to be returned within a two week timeframe. An introductory letter (Appendix E) accompanied the survey (Appendix D) explaining the object of the study. If the surveys were not returned within this timeframe, a follow up letter (Appendix F) and a copy of the survey were sent with a ten day deadline (Dillman, 1978). Postage paid return envelopes and the promise that all survey results were analyzed in strict confidence and also was assured.

The questionnaire was mailed in April, 1991, with a cover letter explaining the study's educational significance and the importance of their participation. In addition, a self-addressed stamped envelope was included for ease of response. The confidentiality of responses was assured in the cover letter as well as on the questionnaire. As

recommended by Dillman (1978), a second cover letter and questionnaire were mailed in July, 1991, to those failing to respond to the first mailing. It was anticipated that with this double request procedure, there would be a 50 percent response rate.

#### Statistical Procedure

Data were obtained from a descriptive survey that sought to determine the incidence and distribution of the characteristics and opinions of community college radiologic technology program directors. The purpose of this survey was not to be scientific, but to be action and policy oriented.

Frequency distribution and descriptive statistical analysis of the data were performed including numerical tabulations, the means, standard deviation, median and frequencies. Tables were constructed to show upper and lower limits, midpoint frequencies, relative frequency, cumulative frequency, and cumulative relative frequency.

Classifications were related to the opinions ratings: (0) no opinion; (1) strongly disagree; (2) disagree; (3) agree and; (4) strongly agree. Upper and lower limits were related to numerical values of .5 - 1.5 for the opinion - strongly disagree; 1.5 - 2.5 for the opinion - disagree; and 2.5 - 3.5 for the opinion - agree; and 3.5 - 4.5 for the opinion - strongly agree with midpoints for each opinion being 1.0 - 4.0, respectively. Frequency was the number of individuals in use of two or more categories or classes. The data were loaded into the Student Edition of Minitab Statistical Software for analysis. According to Kerlinger's survey methodology (1979), analysis consisted of the categorizing, ordering, manipulating, and summarizing of data. These

results are presented and interpreted in the following chapter, to which attention is now directed.



## CHAPTER IV

### ANALYSIS OF THE DATA

The primary purpose of this study was to assess and analyze perceptions of community college radiologic technology program directors throughout the United States and their usage of selection criteria for prospective students. The perceptions and opinions were quantified in terms of the participant's responses on The Survey of Recruitment Admission and Selection Criteria for Radiologic Technology Programs, an instrument developed for this study. Due to the fact that the field of radiologic technology is considered to be a relatively young allied health profession and due to the limited research on community college radiologic technology entrance assessment and student successes, it was decided that an investigation of selection criteria related to community college radiologic technology programs would be significant. The organization of this chapter begins with an introduction, the demographics of the populations, and the results of analysis of the survey items.

Surveys were mailed to 199 public community college radiologic technology programs in the United States in 1991, according to a list provided by the Allied Health Education Directory with appropriate instructions as well as the information regarding the purpose of the study (Appendix D). There were 1,126 members of the American Association of Community Colleges in 1991, thus about one in six

institutions possessed radiologic technology programs. Only 181 public community colleges sponsoring radiologic technology programs could be said to have received the survey; 18 surveys were returned due to the fact they were undeliverable.

Use of a double mailing procedure yielded eighty (80) respondents to the survey. The gender composition of the respondents was 41 female or 51.3 percent and 39 male or 48.8 percent as shown in Table V, "Gender of Respondents to the Survey of Recruitment, Admission and Selection Criteria for Radiologic Technology Programs, by Number and Percent."

TABLE V

GENDER OF RESPONDENTS TO THE SURVEY OF RECRUITMENT, ADMISSION AND SELECTION CRITERIA FOR RADIOLOGIC TECHNOLOGY PROGRAMS, BY NUMBER AND PERCENT

GENDER	NUMBER	PERCENT
Female	41	51.2
Male	39	48.8
Total	80	100.0

In this descriptive study, the perception of community college radiologic technology program directors were assessed and results were also reported in terms of number and percentage. Table VI, "Job Classification of Respondents to the Survey of Recruitment, Admission and Selection Criteria for Radiologic Technology Programs, by Number and Percent," indicated that 93.7 percent of the respondents classified themselves as community college radiologic technology program directors, while four (5.0 percent) were faculty and one (1.2 percent) was classified as other.

TABLE VI

JOB CLASSIFICATION OF RESPONDENTS TO THE SURVEY OF RECRUITMENT, ADMISSION AND SELECTION CRITERIA FOR RADIOLOGIC TECHNOLOGY PROGRAMS, BY NUMBER AND PERCENT

POSITION	NUMBER	PERCENT
Program Director	75	93.8
Faculty	4	5.0
Other	1	1.2
Total	80	100.0

Table VII, "Educational Level of Respondents to the Survey of Recruitment, Admission and Selection Criteria for Radiologic Technology Programs, by Number and Percent," shows that 97.5 percent of the survey respondents expressed their education level. The most commonly held degree among the respondents was the Master's degree. It is interesting to note that nearly 40 percent of the respondents held a Bachelor degree or below, which leads one to wonder whether there is a need for radiologic technologists program directors to expand their professional development to upgrade skill levels.

TABLE VII

EDUCATIONAL LEVEL OF RESPONDENTS TO THE SURVEY OF RECRUITMENT, ADMISSION AND SELECTION CRITERIA FOR RADIOLOGIC TECHNOLOGY PROGRAMS, BY NUMBER AND PERCENT

DEGREE	NUMBER	PERCENT
Associate	9	11.5
Bachelor	22	28.2
Master	41	52.6
Specialist	3	1.3
Doctorate	5	6.4
Total	80	100.0

Item 52 of the General Information section of the survey asked the location of your schools. Response options were:

- major metropolitan area (1,000,000 or more),
- large city or metropolitan (100,000 to 1,000,000),
- town or medium city (10,000 to 99,000),
- small town or rural center (fewer than 10,000).

The majority of survey respondents were from large cities as shown by Table VIII, "Location of Community Colleges of Respondents to the Survey of Recruitment, Admission and Selection Criteria for Radiologic Technology Programs by Number and Percent. Thirty-four of the respondents or 43 percent indicated that their school of radiologic technology was located in a large city, 26 of the respondents or 33 percent indicated that their school was located in a medium-sized city, 12 of the respondents or 15 percent indicated that their school was located in a major metropolitan area, and 7 of the respondents or 8.8 percent indicated their community college radiologic technology program was located in a small town or center. According to the American Association of Community Colleges (AACC), the location of the community college will determine if it is classified as suburban, urban or rural.

TABLE VIII

LOCATION OF COMMUNITY COLLEGES OF RESPONDENTS TO THE SURVEY OF  
RECRUITMENT, ADMISSION AND SELECTION CRITERIA  
FOR RADIOLOGIC TECHNOLOGY PROGRAMS  
BY NUMBER AND PERCENT

LOCATION	NUMBER	PERCENT
Major Metro Area	12	15.2
Large City	34	43.0
Medium City	26	33.0
Small Town	7	8.8
Non-response or omission	1	0.0
Total	80	100.0

Table IX, "American Registry of Radiologic Technologists Certification Examination First Time Pass Rate," presents data regarding the first time pass rate of the American Registry of Radiologic Technologist's (ARRT) Certification Examination. The ARRT examination total score is reported as a scaled score. The scaled score does not equal the number of questions answered correctly, nor is it the percent of the questions answered correctly. Total scores for all examinees are converted to a score ranging from 1 to 99, with a scaled score of 75 defined as passing. The number of correct answers necessary to achieve a scaled score of 75 is based upon the judgement of the Registry's advisory committee regarding what level of performance constituted a minimal passing score and based on examination of actual scores and historical data available.

TABLE IX  
 AMERICAN REGISTRY OF RADIOLOGIC TECHNOLOGISTS CERTIFICATION  
 EXAMINATION FIRST TIME PASS RATE, 1991

Class	Lower Limit	Upper Limit	Midpoint	Frequency
at or below		76.5		0
1	76.5	77.5	77.0	1
2	77.5	78.5	78.0	2
3	78.5	79.5	79.0	0
4	79.5	80.5	80.0	6
5	80.5	81.5	81.0	0
6	81.5	82.5	82.0	2
7	82.5	83.5	83.0	0
8	83.5	84.5	84.0	2
9	84.5	85.5	85.0	3
10	85.5	86.5	86.0	0
11	86.5	87.5	87.0	2
12	87.5	88.5	88.0	6
13	88.5	89.5	89.0	1
14	89.5	90.5	90.0	7
15	90.5	91.5	91.0	1
16	91.5	92.5	92.0	5
17	92.5	93.5	93.0	2
18	93.5	94.5	94.0	2
19	94.5	95.5	95.0	4
20	95.5	96.5	96.0	2
21	96.5	97.5	97.0	5
22	97.5	98.5	98.0	6
23	98.5	99.5	99.0	6
24	99.5	100.5	100.0	11
above	100.5			

Mean = 91.9    Median = 92.5

According to Table IX, "American Registry of Radiologic Technologists Certification Examination First Time Pass Rate, 1991," the surveyed radiologic technology programs' first time pass rate of the ARRT Certification Examination had a mean of 91.9 percent and a median of 92.5 percent. This pass rate indicated 57.9 percent (n = 44) of the community college radiologic technology program students passed the ARRT Examination the first time the student took the exam with an average score of 91.9 percent.

## Presentation of Data

Research Question One: What cognitive and non-cognitive selection criteria are currently being used? Tables X, XI, XII and XIII address Research Question One: What cognitive and non-cognitive selection criteria are currently being used, and contains the descriptive statistical analysis of items 41 and 42 of Part II, the General Information section of the survey (Appendix D).

TABLE X

RESPONDING RADIOLOGIC TECHNOLOGY PROGRAM DIRECTORS' USE OF STUDENT  
COGNITIVE SELECTION CRITERIA AND WEIGHTED INSTRUMENTS  
CURRENTLY BEING USED

	METRO		LARGE		MEDIUM		SMALL		TOTAL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
ACT	2	12.5	10	23.8	14	40.0	1	11.1	27	87.4
AHAT			1	2.3	2	5.7			3	8.1
AHQT			1	2.3					1	2.3
APST			1	2.3	1	2.8			2	5.2
APT	1	6.2	1	2.3					2	8.6
ASSET	4	25.0	7	16.6	2	5.7	2	22.2	15	69.6
CAT			1	2.3					1	2.3
CBAP							1	11.1	1	11.1
CBP	1	6.2							1	6.2
CGP			1	2.3	1	2.8	3	33.3	5	38.5
CGPE			1	2.3					1	2.3
CPE					1	2.8			1	2.8
CPP	1	6.2							1	6.2
CPT					1	2.3			1	2.3
ENGL					1	2.3			1	2.3
GPA	2	12.5	1	2.3	1	2.8			4	17.7
HGPA					1	2.8			1	2.8
HOBE			1	2.3	1	2.8			2	5.2
IAE			1	2.3					1	2.3
MAPS	1	6.2							1	6.2
MATH			1	2.3					1	2.3
NJBS			1	2.3					1	2.3
OPEN	1	6.2							1	6.2
OWN	1	6.2							1	6.2
PSB					1	2.8	1	11.1	2	13.9
SAT	2	12.5	7	16.6	7	20.0	1	11.1	17	60.2

TABLE X (continued)

	METRO		LARGE		MEDIUM		SMALL		TOTAL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
SCHL			1	2.3					1	2.3
SPT					1	2.8			1	2.8
TABE					1	2.8			1	2.8
TASP			2	4.7					2	4.7
TOTALS	16		39		36		9		100	

Note: Proper names for acronyms can be found in Appendix G.

Table X reveals that the most common cognitive selection criteria used by community college radiologic technology programs were the American College Test (87.4 percent), followed by the ACT Assessment (69.6 percent), and the Scholastic Aptitude Test (60.2 percent).

According to the descriptive statistical analysis of the responses of program directors' usage of student selection criteria and weighted instruments, it was found that rural community college radiologic technology programs relied more on ACT results than metro and large community college radiologic technology programs. It is also interesting to note that large community college radiologic technology programs had a higher reliance on the ACT Asset than rural and metro programs combined.

Table XI reveals the most common non-cognitive selection criteria used by community college radiologic technology programs were interview(s) (2.8 percent) and evaluation(s) (2.3 percent).



TABLE XI

RESPONDING RADIOLOGIC TECHNOLOGY PROGRAM DIRECTORS' USE OF STUDENT  
NON-COGNITIVE SELECTION CRITERIA AND WEIGHTED INSTRUMENTS  
CURRENTLY BEING USED

	METRO		LARGE		MEDIUM		SMALL		TOTAL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
EVAL					1	2.3			1	2.3
INTV					1	2.8			1	2.8
TOTALS					2				2	

Note: Proper names for acronyms can be found in Appendix G.

Table XII reveals that the cognitive selection criteria used by responding radiologic technology program directors were college grade point average (33 percent), interview (31.5 percent), high school grade point average (31.4 percent), and course grade point average (27.1 percent).

TABLE XII

RESPONDING RADIOLOGIC TECHNOLOGY PROGRAM DIRECTORS' OPINIONS  
REGARDING COGNITIVE SELECTION CRITERIA USED IN 1990-1991,  
BY TYPE OF COMMUNITY COLLEGE

	METRO		LARGE		MEDIUM		SMALL		TOTAL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
A & P			8	4.0	1	0.7			7	4.8
ACAD	1	2.1			1	0.7			2	2.9
ACT			7	4.7	6	4.7			13	9.4
ACTC					1	0.7			1	0.7
ACTM					1	0.7			1	0.7
ACTR					1	0.7			1	0.7
AMAT	1	2.1	1	0.8	1	0.7			3	3.6
ALGEBRA			10	6.7	2	1.5			12	8.2
APDT			2	1.3					2	1.3
APPL	1	2.1	5	3.3	1	0.7	1	3.1	8	9.4
APST					1	0.7			1	0.7
APT			1	0.6	1	0.7			4	2.8
ASSET	1	2.1	5	3.3	1	0.7	1	3.1	8	9.4
BIOLOGY			3	2.0	1	0.7			4	2.8
CGP							2	8.2	2	8.2
CGPA	8	10.8	10	8.7	8	5.3	2	8.2	28	33.0
*CGPC							1	3.1	1	3.1
CGPR							1	3.1	1	3.1
CGPV							1	3.1	1	3.1

TABLE XII (continued)

	METRO		LARGE		MEDIUM		SMALL		TOTAL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
CHEMIST			5	3.3					5	3.3
CHGP			1	0.8					1	0.6
COLLEGE			1	0.8					1	0.6
COMP					2	1.8			2	1.5
CPC			1	0.8					1	0.5
CPT					1	0.7			1	0.7
CRED					1	0.7			1	0.7
DEGREE	1	2.1	3	2.0	1	0.7			5	4.9
DMD					1	0.7			1	0.6
DOMI	1	2.1							1	2.1
ENGL			3	2.0	4	3.1			7	5.1
EXPR	2	4.3	2	1.3	2	1.5	1	3.1	7	10.3
GED	1	2.1	1	0.8	1	0.7	1	3.1	4	8.7
GEOM			1	0.8					1	0.6
GNEED	1	2.1	4	2.8	5	3.9			10	8.8
*GPA	8	13.0	7	4.7	8	6.3	1	3.1	24	27.1
GPC					1	0.7			1	0.7
*HGPA	5	10.8	11	7.3	13	10.2	1	3.1	30	31.4
HLEX					1	0.7			1	0.7
HS			2	1.3	2	1.5			6	9.1
HSA					2	1.5			2	1.5
HSBI			3	2.0					3	2.0
HSCM			1	0.8					1	0.8
HSMT			1	0.8					1	0.8
HSRANK			1	0.8	3	2.3			4	3.0
HSB					2	1.5			2	1.5
MAPS			1	0.8					1	0.8
MATH	2	4.3	5	3.3	4	3.1	3	9.3	14	20.2
MDTM			1	0.8					1	0.8
NIBS							1	3.1	1	3.1
ORNT			1	0.8					1	0.8
PHC			1	0.8	1	0.7			2	1.4
PREQ	4	8.7	1	0.8			1	3.1	8	12.4
PROF					1	0.7			1	0.7
PSB					1	0.7	1	3.1	2	3.9
QWE					1	0.7			1	0.7
READ			1	0.8					1	0.8
REME							1	3.1	1	3.1
SAT			3	2.0	2	1.5			5	3.5
SAT	2	4.3	7	4.7	7	5.5	1	3.1	17	17.6
SCNC	1	2.1	7	4.7	3	2.3	4	12.5	15	21.7
SCNS					1	0.7			1	0.7
SKET	1	2.1							1	2.1
SKILL	1	2.1							1	2.1
WOR					1	0.7			1	0.7
WRITING	1	2.1							1	2.1
TOTALS	43		125		99		25		317	

Note: Proper names for acronyms can be found in Appendix G.

Table XIII reveals that non-cognitive selection criteria used by responding radiologic technology program directors were interview(s) (31.5 percent), hospital visitations (12.6 percent) and references (5.0 percent).

According to the descriptive statistical analysis of the responses of program directors opinions regarding selection criteria used in 1990-1991, it was found that Metro community college radiologic technology programs relied more on college grade point, interview, high school grade point and grade point average, then the other types of community colleges. The medium community college radiologic technology program came within .6 percentage points of Metro community college radiologic technology programs in the usage of high school grade point average and interview as selection criteria used in 1990-1991.

TABLE XIII

RESPONDING RADIOLOGIC TECHNOLOGY PROGRAM DIRECTORS' OPINIONS REGARDING  
NON-COGNITIVE SELECTION CRITERIA USED IN 1990-1991,  
BY TYPE OF COMMUNITY COLLEGE

	METRO		LARGE		MEDIUM		SMALL		TOTAL	
	No.	Percent	No.	Percent	No.	Percent	No.	Percent	No.	Percent
FILE					1	0.7			1	0.7
GOAL					2	1.5			2	1.5
*INTV	5	10.8	12	8.0	13	10.2	4	2.5	34	31.5
PBK					1	0.7			1	0.7
PHYS			8	4.0	1	0.7			7	4.8
PICR					1	0.7			1	0.7
RECM							1	3.1	1	3.1
REFR			4	2.6	3	2.3			7	5.0
RESD					1	0.7			1	0.7
VISIT	2	4.3	3	2.0	4	3.1	1	3.1	10	12.6
WORKEXP	1	2.1	1	0.8					2	2.8
TOTALS	8		28		27		6		67	

Note: Proper names for acronyms can be found in Appendix G.

## Cognitive and Non-Cognitive Selection Criteria

Attention is now turned to Question Two: What are the opinions regarding the selection criteria that are used now? Table XIV, "Responding Radiologic Technology Program Directors' Opinions Regarding Cognitive Student Selection Criteria Currently Being Used Now, addresses the opinions of community college radiologic technology program director's regarding the selection criteria that are being used now and contains descriptive statistical analysis of specific item numbers found in Part I: Opinion Rating of the survey (Appendix D).

TABLE XIV

RESPONDING RADIOLOGIC TECHNOLOGY PROGRAM DIRECTORS' OPINIONS  
REGARDING COGNITIVE STUDENT SELECTION CRITERIA  
BEING USED NOW

	No <u>Opinion</u> 0 No. (%)	Strongly <u>Disagree</u> 1 No. (%)	<u>Disagree</u> 2 No. (%)	<u>Agree</u> 3 No. (%)	Strongly <u>Agree</u> 4 No. (%)
In your opinion ...					
(1)... there is a correlation between a student's pre-admission ACT composite score and the student's score on the post graduate certificate exam sponsored by the ARRT.	0 (0)	3 (6.2)	14 (29.1)	27 (56.2)	4 (8.3)
(2)... there is a correlation between a student's pre-admission individual selection scores on the ACT and the ARRT examination.	0 (0)	2 (4.5)	14 (31.8)	25 (56.2)	3 (6.8)
(3)... there is a significant relationship between grade in high school science subjects and radiography curriculum counterparts.	0 (0)	4 (5.2)	16 (21.0)	48 (63.1)	8 (10.5)

TABLE XIV (continued)

In your opinion ...	No <u>Opinion</u>	Strongly <u>Disagree</u>	<u>Disagree</u>	<u>Agree</u>	Strongly <u>Agree</u>
	0 No. (%)	1 No. (%)	2 No. (%)	3 No. (%)	4 No. (%)
(6)... the ACT is a valid predictor of college grades for students from low socioeconomic background.	0 (0)	10 (20.8)	20 (41.6)	16 (33.3)	2 (4.1)
(10)... a student's ACT scores combined with either HSGPA or high school ranking are highly predictive of radiologic technology program success.	0 (0)	3 (4.4)	20 (29.4)	37 (54.4)	8 (11.7)
(11)... ACT results are useful in counseling and guiding students.	0 (0)	4 (6.2)	7 (10.9)	42 (65.6)	11 (17.1)
(12)... the use of GPA as the only admission criteria limits admissions to only academic achievers and excludes others with less academic ability.	0 (0)	3 (3.8)	8 (10.2)	45 (51.6)	22 (28.2)
(13)... using the prediction of GPA as the only admission criteria excludes students with less academic ability but possibly great skills in leadership.	0 (0)	2 (2.6)	11 (14.6)	42 (56.0)	20 (26.6)
(15)... HSGPA combined with aptitude tests are more effective predictors of college grades than either one along.	0 (0)	2 (2.7)	10 (13.5)	44 (59.4)	18 (24.3)
(17)... are current radiologic technology programs, courses, policies, and procedures appropriate for adult learners.	0 (0)	2 (2.5)	14 (17.7)	49 (62.0)	14 (17.1)

TABLE XIV (continued)

In your opinion ...	No <u>Opinion</u>	Strongly <u>Disagree</u>	<u>Disagree</u>	<u>Agree</u>	Strongly <u>Agree</u>
	0 No. (%)	1 No. (%)	2 No. (%)	3 No. (%)	4 No. (%)
(20)... traditional admission criteria, previous academic performance and aptitude tests, have excluded large numbers of individuals, many of whom who had the motivation and the personality characteristics necessary to succeed.	0 (0)	4 (5.6)	25 (35.2)	35 (49.2)	7 (9.8)
(23)... the goals and objectives of the radiologic technology program and the sponsoring institution <u>should be related to cultivation of accepted applicant competencies so that an effective entry-level radiographer is a product of the two.</u>	0 (0)	1 (1.5)	4 (6.0)	43 (65.1)	18 (27.2)

Respondents agreed generally that cognitive selection criteria is being used to select prospective applicants and to predict their success. Table XIV addresses item 1, where 64.4 percent ( $n = 31$ ) of community college radiologic technology program directors agreed to strongly agreed that there is a correlation between a student's pre-admission American College Testing composite score and the student's score on the post graduate American Registry of Radiologic Technologists examination. However, of the total respondents, 32 did not express an opinion. The mean response had a value of 2.66 ( $s = 0.724$ ) implied that the average respondent to this item agreed with item number 1. This conclusion is strengthened by the median value of 3. In the opinion of

the responding radiologic technology program directors, there is a correlation between a student's pre-admission American College Testing (ACT) Composite Score and the student's score on the post-graduate Registry Examination.

Table XIV also shows the correlation between a student's sub-test scores on the ACT and the Registry Examination. Sixty-three point six percent ( $n = 28$ ) agreed to strongly agreed that there is a correlation between a student's pre-admission individual section scores on the ACT and the Registry Examination, with only 44 respondents, or 55.0 percent, addressed this item. The range of scores for the Registry examination is a low of/and a range of 99, according to the ARRT officials. The reliability of the ARRT examination varies from test date to test date, but the Kuder-Richardson (KR20) is reported to be in the range of .92 to .94 for the ARRT examinations given between 1979 and 1986. The Kuder-Richardson formula 20, a type of reliability coefficient, provides relatively conservative estimates of the coefficient of equivalence. In terms of test theory, the coefficient of equivalence is the most desirable index of test reliability, since it involves two different representative samples of items. Validity of the Registry examination is determined by content validity, and a numerical value for predictive validity is not calculated for the examination (Francis, 1990). This was item number 2 in the survey.

The correlation between grades in high school science subject(s) and radiography curriculum counterparts is also presented in Table XIV, item number 3 of the survey, where 73.3 percent ( $n = 56$ ) of the respondents agreed to strongly agreed that there is a significant relationship between grades in high school science subject(s) and radiography curriculum counterparts. Of the total respondents, 4 did not express an

opinion. The mean response had a value of 2.78 ( $s = 0.698$ ) which implied the average respondent to this item agreed with item number 3. This conclusion is strengthened by the median value of 3. This conclusion was also reached in Kavanaugh's study of selected high school courses and their relation to grades in selected courses in the radiography curriculum (Kavanaugh, 1981).

Table XIV also addresses item number 6 of the survey, where 37.5 percent ( $n = 18$ ) of respondents to this item agreed to strongly agreed that the American College Test is a valid predictor of college grades for students from low socioeconomic backgrounds. Only 48 (60 percent) of the total respondents to the survey addressed this item with a mean value of 2.20 ( $s = 0.82$ ) and a median value of 2. Forty percent ( $n = 20$ ) of the respondents disagreed with the statement that the ACT is a valid predictor of college grades for students from low socioeconomic backgrounds.

Table XIV addresses item number 10 of the survey, where 66.1 percent ( $n = 45$ ) of respondents to this item agreed to strongly agreed that a student's ACT scores combined with either high school grade point average or high school ranking are highly predictive of radiologic technology program success. Sixty-eight (85 percent) of the total respondents to the survey addressed this item. This same perspective was also reached by Ferguson (1979), who found that when the ACT scores were combined with either high school grade point averages or high school rank, the results were highly predictive of college success.

Table XIV addresses item number 11 of the survey, where 83 percent ( $n = 53$ ) of the respondents to this item agreed to strongly agreed that ACT results are useful in counseling and guiding students. Of the total respondents, 16 did not express an opinion.



Table XIV addresses item number 12 of the survey, where 76 percent ( $n = 67$ ) of respondents to this item agreed to strongly agreed that the use of grade point average as the only admission criteria limits admissions to only academic achievers and excludes others with less academic ability. Seventy-eight (97.5 percent) of the total respondents to the survey addressed this item. Academic achievers are those students who have, because of previous academic performance and achievement on aptitude tests, been academically successful.

Table XIV identifies item number 13 of the survey, which is the correlation between grade point averages and leadership skills. Of the respondents to this item, 82.7 percent ( $n = 62$ ) of the respondents to this item agreed to strongly agreed that using the prediction of grade point average as the only admission criteria excludes students with less academic ability but possibly greater skills in leadership. Of the total respondents, 5 did not express an opinion. The mean response had a value of 3.06 ( $s = 0.722$ ) which implied the average respondent to this item agreed with item number 13. This conclusion is strengthened by the median value of 3. Grade point average has been shown to be highly predictive of grade point average in medical school courses (cognitive traits) but hold little relationship to grade point average in clinical coursework or subsequent performance in non-cognitive work settings (Murden, et al, 1978). Analysis of these findings seem to indicate that while those who select radiography as a career appear to have identifiable personality types, these types are not related to previous performance in academic courses.

In item 15 of Table XIV, 83.8 percent ( $n = 62$ ) of the respondents to this item agreed to strongly agreed that high school grade point average combined with aptitude tests are more effective predictors of radiologic

technology students' grades in college grades than either one alone. Of the total respondents, 6 did not express an opinion. The mean response had a value of 3.054 ( $s = 0.700$ ) which implied that the average respondent to this item agreed with item number 15. This conclusion is strengthened by the median value of 3.

Table XIV identifies item number 17 of the survey, which dealt with opinions concerning the appropriateness of courses, policies and procedures for adult learners. Of the respondents to this item, 79.8 percent ( $n = 63$ ) agreed to strongly agreed that current radiologic technology programs, courses, policies and procedures are appropriate for adult learners. Of the total respondents, one did not express an opinion. The mean response had a value of 2.94 ( $s = 0.677$ ) which implied that the average respondent to this item agreed with item number 17. This conclusion is strengthened by the median value of 3.

Table XII addresses item number 20 of the survey, where 59.2 percent ( $n = 42$ ) of respondents to this item agreed to strongly agreed that traditional admissions criteria, previous academic performance, and aptitude tests have excluded large numbers of individuals, many of whom had the motivation and the personality characteristics necessary to succeed. Seventy-one (88.7 percent) of the total respondents to the survey addressed this item with a mean of 2.63 ( $s = 0.741$ ) and a median value of 3. The respondents agreed that traditional admission criteria, previous academic performance and aptitude tests have excluded large numbers of individuals, many of whom had motivation and the personality characteristics necessary to succeed.

Table XIV identifies item number 23 of the survey, where 92.4 percent ( $n = 61$ ) of the respondents to this item agreed to strongly agreed that "the goals and objectives of radiologic technology programs

and the sponsoring institutions should be related to the cultivation of accepted applicant competencies so that an effective entry-level radiographer is the product of the two." Of the total respondents, 14 did not express an opinion. The mean response had a value of 3.18 ( $s = 0.605$ ) which implied that the average respondent to this item agreed with item number 23. This conclusion is strengthened by the median value of 3. Therefore, the goals and objectives of community college radiologic technology programs and the sponsoring institutions (community colleges) should be related to knowledge, attitudes, skills and habits needed to be an effective entry level radiologic technology student. This is also emphasized in the Essentials and Guidelines of an Accredited Educational Program for the Radiographer (Appendix A).

Table XV, "Responding Radiologic Technology Program Directors' Opinions Regarding Non-Cognitive Student Selection Criteria Being Used Now," addresses the opinions of community college radiologic technology program directors regarding the selection criteria that are being used now and contains descriptive statistical analysis of specific item numbers found in Part I: Opinion Rating of the Survey (Appendix D).

TABLE XV

RESPONDING RADIOLOGIC TECHNOLOGY PROGRAM DIRECTORS' OPINIONS REGARDING  
NON-COGNITIVE STUDENT SELECTION CRITERIA BEING USED NOW

	No <u>Opinion</u> 0 No. (%)	Strongly <u>Disagree</u> 1 No. (%)	<u>Disagree</u> 2 No. (%)	<u>Agree</u> 3 No. (%)	Strongly <u>Agree</u> 4 No. (%)
(21)... there is a relationship between age, length of experience in an allied health setting prior to entry into a radiologic technology program, and academic success.	0 (0)	13 (3.8)	12 (18.3)	45 (57.6)	18 (23.0)

Table XV addresses item number 21 of the survey, where 81 percent (n = 63) of the respondents to this item agreed to strongly agreed that there is a relationship between age, length of experience in an allied setting prior to entry into a radiology technology program and academic success. Of the total respondents, 2 did not express an opinion. The mean response had a value of 3 (s = 0.738) which implied that the average respondent to this item agreed with item number 21. This conclusion is strengthened by the median value of 3.

Table XVI, "Responding Radiologic Technology Program Directors' Opinions Regarding What Cognitive Criteria Should Be Used and How Should Such Criteria Be Used" addresses Research Question Three: What cognitive and non-cognitive criteria should be used, and how should such criteria be used?

TABLE XVI

RESPONDING RADIOLOGIC TECHNOLOGY PROGRAM DIRECTORS' OPINIONS  
REGARDING WHAT COGNITIVE CRITERIA SHOULD BE USED  
AND HOW SHOULD SUCH CRITERIA BE USED

	No <u>Opinion</u> 0 No. (%)	Strongly <u>Disagree</u> 1 No. (%)	<u>Disagree</u> 2 No. (%)	<u>Agree</u> 3 No. (%)	Strongly <u>Agree</u> 4 No. (%)
(4)... high school grade point averages (HSGPA), algebra grades and biology grades be used in the selection of students for radiologic technology programs.	0 (0)	9 (11.7)	18 (23.4)	33 (42.9)	17 (22.1)
(5)... high school grade point averages (HSGPA) or grades in algebra or biology can be used to predict passing of the American Registry of Radiologic Technologist's Examination.	0 (0)	13 (17.8)	35 (47.9)	22 (30.1)	3 (4.1)

TABLE XVI (continued)

In your opinion ...	No <u>Opinion</u> 0 No. (%)	Strongly <u>Disagree</u> 1 No. (%)	<u>Disagree</u> 2 No. (%)	<u>Agree</u> 3 No. (%)	Strongly <u>Agree</u> 4 No. (%)
	(7)... ACT assessment should be used to decide a student's admission into a radiologic technology program.	0 (0)	12 (19.3)	22 (35.4)	24 (38.7)
(8)... ACT results should be used to reject radiologic technology student applicants.	0 (0)	17 (26.9)	31 (49.2)	14 (22.2)	1 (1.5)
(9)... ACT scores or SAT scores and high school rank should be used as admission criteria.	0 (0)	9 (13.2)	26 (38.2)	29 (42.6)	4 (5.8)
(16)... should standardized admission's criteria be <u>ranked or weighted</u> so that students with the highest accumulated score be admitted to radiologic technology programs.	0 (0)	5 (6.4)	17 (21.7)	39 (50.0)	17 (21.7)
(22)... cognitive, affective, and psychomotor domains of students should be weighted and used in selecting radiologic technology students.	0 (0)	5 (6.4)	15 (19.4)	49 (63.6)	8 (10.3)
(24)... valid and reliable behavior instruments should be used in the admissions process to radiologic technology programs.	0 (0)	1 (1.4)	13 (18.5)	45 (64.2)	11 (15.7)
(26)... <u>a legal review of selection policies</u> dealing with uniformity, as well as exceptions to such uniformity should be done every three years.	0 (0)	4 (5.5)	7 (9.7)	44 (61.1)	17 (23.6)

TABLE XVI (continued)

In your opinion ...	No <u>Opinion</u> 0 No. (%)	Strongly <u>Disagree</u> 1 No. (%)	<u>Disagree</u> 2 No. (%)	<u>Agree</u> 3 No. (%)	Strongly <u>Agree</u> 4 No. (%)
	(27)... a radiologic technology program should use the same admissions process for all applicants.	0 (0)	0 (0)	1 (1.2)	27 (34.1)
(28)... applicants should be provided an opportunity to show that certain criteria may be inappropriate for evaluating their qualifications.	0 (0)	6 (8.0)	24 (32.0)	40 (53.3)	5 (6.6)
(29)... considerable flexibility might have to be incorporated into radiologic technology student selection to attract individuals from under-represented groups in the applicant pool.	0 (0)	8 (10.3)	31 (40.26)	32 (41.5)	6 (7.7)
(30)... a program should describe its admission's criteria publicly so that potential applicants can obtain a reasonable estimate of their likelihood of meeting such standards.	0 (0)	1 (1.2)	2 (2.5)	22 (27.5)	55 (68.7)
(31)... rejected applicants should be given a statement of reasons for their rejection and a means of appeal if they want to challenge the explanation.	0 (0)	2 (2.6)	16 (21.3)	34 (45.3)	23 (30.6)
(32)... all those who participate in student selection should be instructed and competent in the process of multiple domain evaluation of radiologic technology applicants.	0 (0)	0 (0)	7 (9.8)	49 (69.0)	15 (21.1)

TABLE XVI (continued)

In your opinion ...	No <u>Opinion</u>	Strongly <u>Disagree</u>	<u>Disagree</u>	<u>Agree</u>	Strongly <u>Agree</u>
	0 No. (%)	1 No. (%)	2 No. (%)	3 No. (%)	4 No. (%)
(35)... research is essential to determine the relative importance of inappropriate selection process.	0 (0)	0 (0)	5 (6.7)	50 (67.5)	19 (25.68)
(37)... information network should be established to permit exchange of recruitment and selection policies in radiologic technology education.	0 (0)	0 (0)	7 (9.5)	45 (61.6)	21 (28.7)
(38)... radiologic technology programs should deemphasize technical and scientific training in favor of emphasis on the social sciences, the humanities, and training or problem solving skills.	0 (0)	14 (18.9)	42 (56.7)	13 (17.5)	5 (6.7)
(39)... radiologic technology programs should give more emphasis on training in scholastic skills such as writing and critical thinking as well as afford opportunities for the development of suitable values.	0 (0)	3 (3.9)	13 (16.8)	50 (64.9)	11 (14.2)
(40)... the current focus on scientific knowledge in radiologic technology admission decisions should be modified to allow for more emphasis in student's abilities to learn independently and acquire analytic skills and values appropriate to the field of radiologic technology.	0 (0)	0 (0)	17 (23.6)	48 (66.6)	7 (9.7)

Table XVI addresses whether high school grade point averages, algebra grades and biology grades should be used in the selection of radiologic technology students. Sixty-five percent ( $n = 50$ ) of respondents to the item agreed to strongly agreed that high school grade point averages, algebra grades and biology grades should be used in the selection of students for radiologic technology programs. Seventy-seven (96.2 percent) of the community college radiologic technology program directors responding to the survey addressed this item number 4 of the survey. With a mean value of 2.75 ( $s = 0.93$ ) and a median value of 3, the respondents agreed that high school grade point averages, algebra grades and biology grades should be used in the selection of radiologic technology students.

The perceived correlation between high school grade point averages, algebra and biology grades used to predict passing the American Registry of Radiologic Technologists is item 5 presented in Table XVI. Thirty-four point two percent ( $n = 25$ ) of the respondents to item 5 of the survey agreed to strongly agreed that high school grade point averages or grades in algebra or biology can be used to predict passing of the American Registry of Radiologic Technologists (ARRT) Examination. Sixty-five point seven percent ( $n = 48$ ) of the respondents to item 5 of the survey disagreed to strongly disagreed that high school grade point averages or grades in algebra or biology can be used to predict passing of the Registry Examination. Of the total respondents, seven did not express an opinion. The mean response had a value of 2.20 ( $s = 0.78$ ) which implied that the average respondent to this item disagreed with item number 5. This conclusion is strengthened by the median value of 2.

Table XVI addresses item number 7 of the survey, where 45.1 percent



(n = 28) of the respondents to this item agreed that American College Test asset which involves Reading, English, Math and Science Reasoning should be used to decide a student's admission into a radiologic technology program. Of the total respondents, 18 did not express an opinion. The mean response had a value of 2.32 (s = 0.86) which implied that the average respondent to this item agreed with item number 7. Thirty-five percent (n = 27) disagreed with item 7. This conclusion is strengthened by the median value of 2.

Table XVI addresses item number 8 of the survey, where 24 percent (n = 15) of the respondents to this item agreed to strongly agreed that American College Test (ACT) results should be used to reject radiologic technology student applicants. Only 63 (78.7 percent) of the total respondents to the survey addressed this item. Forty-nine percent of the respondents disagreed that ACT results should be used to reject radiologic technology student applicants. This conclusion is supported by a mean value of 1.98 (s = 0.75) and a median value of 2.

Table XVI also addresses item number 9 of the survey, where 49 percent (n = 33) of the respondents to this item agreed to strongly agreed that American College Test or Scholastic Aptitude Test scores and high school rank should be used as admission criteria. Of the total respondents, 12 did not express an opinion. The mean response had a value of 2.41 (s = 0.796) which implied that the average respondent to this item agreed with item number 9. Thirty-eight percent (n = 26) of the respondents disagreed with item 9. This conclusion is strengthened by the median value of 2. The fact that thirty-eight percent of the respondents disagreed implies that a significant percentage of the nation's community college radiologic technology program directors have problems and concerns with standardized tests.

Table XVI addresses item number 16 of the survey, where 71.8 percent ( $n = 56$ ) of respondents to this item agreed to strongly agreed that standardized admission's criteria should be ranked or weighted, so that students with the highest accumulated score should be admitted to community college radiologic technology programs. Seventy-eight (97.5 percent) of the total respondents to the survey addressed this item. With a mean value of 2.87 ( $s = 0.827$ ) and a median value of 3, the respondents agreed that standardized admission's criteria should be ranked or weighted, so that students with the highest accumulated score be admitted to community college radiologic technology programs.

The respondents were asked to check which weighted instruments were used as part of their selection criteria. This general information item will be found in question 41 of the survey. The respondents were not asked which instrument should get the most weight.

Table XVI addresses item number 22 of the survey, where 74.0 percent ( $n = 57$ ) of respondents to this item agreed to strongly agreed that cognitive and non-cognitive domains of students should be weighted and used in selecting radiologic technology students. Seventy-seven (96.2 percent) of the total respondents to the survey addressed this item with a mean value of 2.77 ( $s = 0.718$ ) and a median of 3. The respondents, thus agreed to strongly agreed that cognitive and non-cognitive domains of students should be weighted and used in selecting radiologic technology students.

Table XVI addresses item number 24 of the survey, where 80 percent ( $n = 56$ ) of respondents to this item agreed to strongly agreed that valid and reliable behavior measurements should be used in the admission's process to radiologic technology programs. Seventy (87.5 percent) of the total respondents to the survey addressed this item

with a mean value of 2.94 ( $s = 0.634$ ) and a median value of 3. The respondents agreed that valid and reliable behavior measurements should be used in the admissions process to radiologic technology programs.

Table XVI addresses item 26 of the survey, where 84.7 percent ( $n = 61$ ) of respondents to this item agreed to strongly agreed that there should be a legal review of selection policies dealing with uniformity while exceptions to such uniformity should be done every three years. The mean response had a value of 3.02 ( $s = 0.750$ ), which implied that the average respondent to this item agreed with item 26. The conclusion is strengthened by the median of 3. Therefore, it appears there is strong support for a legal review of selection criteria and policies should be done every three years with uniformity among community college radiologic technology program directors.

Table XVI addresses item number 27 of the survey, where 98.7 percent ( $n = 78$ ) of the respondents to this item agreed to strongly agreed that a radiologic technology program should use the same admissions process for all applicants. Of the total respondents, one did not express an opinion. The mean response had a value of 3.63 ( $s = 0.510$ ) which implied that the average respondent to this item agreed with item number 27. The conclusion is strengthened by the median value of 4. The fact that the respondents agreed to strongly agreed to item number 27 supports the respondents' agreements to uniformity and legal review of selection criteria found in item number 26.

Table XVI addresses item number 28 of the survey, where 56.2 percent ( $n = 45$ ) of respondents to this item agreed to strongly agreed that applicants should be provided an opportunity to show that certain criteria may be inappropriate for evaluating their qualifications. Seventy-five (93.7 percent) of the total respondents to the survey

addressed this item with a mean value of 2.58 ( $s = 0.736$ ) and a median value of 3. The respondents agreed that applicants should be provided an opportunity to show that certain criteria may be inappropriate for evaluating their qualifications. This also likely indicates commitment to the traditional open door policy on part of the respondents.

Table XVI addresses item number 29 of the survey, where 49.3 percent ( $n = 38$ ) of the respondents to this item agreed to strongly agreed that "considerable flexibility might have to be incorporated into radiologic technology student selection to attract individuals from minority groups in the applicant pool." Of the total respondents, 5 did not express an opinion. The mean response had a value of 2.46 ( $s = 0.787$ ) which implied that the average respondent to this item generally agreed. Forty percent ( $n = 31$ ) of the respondents disagreed with item 29. This conclusion is strengthened by the median of 2. Some of the respondents to item number 29, therefore, indicated that uniformity in selection should exist for all applicants to community college radiologic technology programs whereas some respondents felt that considerable flexibility be incorporated into student selection to accommodate the minority applicant pool. This reflects a lack of uncertainty by community college radiologic technology program directors as to what to incorporate into radiologic technology selection criteria that would not distract or eliminate minority groups from the applicant pool.

Table XVI addresses item number 30 of the survey, where 96.2 percent ( $n = 77$ ) of respondents to this item agreed to strongly agreed that "a program should describe its admission's criteria publicly so that potential applicants can obtain a reasonable estimate of their likelihood of meeting such standards." Eighty (100 percent) of the total respondents to the survey addressed this item. With a mean value

of 3.63 ( $s = 0.600$ ) and a median value of 4, the respondents agreed a program should describe its admissions criteria publicly so that potential applicants can obtain a reasonable estimate of their likelihood of meeting such standards.

Table XVI identifies item number 31 of the survey, where 76 percent ( $n = 57$ ) of the respondents to this item agreed to strongly agreed that rejected applicants should be given a statement of reasons for their rejection and a means of appeal if they wish to challenge the explanation. Thirty-three point nine percent ( $n = 18$ ) disagreed to strongly disagreed that rejected applicants should be given a statement of reasons for their rejection and a means of appeal if they wish to challenge the explanation. Of the total respondents, 5 did not express an opinion. The mean response had a value of 3.04 ( $s = 0.795$ ) which implied that the average respondents to this item agreed with item number 31. This conclusion is strengthened by the median value of 3. Thus, the majority of community college radiologic technology program directors believed that if applicants are not selected, a statement of reasons for their rejection should be given along with a means of appeal if they want to challenge the rejection. This indicates that most program directors are aware of Essential V.A.7 which states "appropriate due process and appeal mechanisms shall be available and made known to all students." (Essentials, 1991).

Table XVI addresses item number 32 of the survey, where 90.1 percent ( $n = 64$ ) of respondents to this item agreed or strongly agreed that all those who participate in student selection should be instructed and competent in the process of multiple domain evaluation of radiologic technology student applicants. Seventy-one (88.7 percent) of the total respondents to the survey addressed this item. With a mean value of

3.11 ( $s = 0.549$ ) and a median value of 3, the respondents agreed that all those who participate in student selection should be instructed and competent in the process of multiple domain evaluation of radiologic technology applicants. Multiple domain evaluation is defined here to mean incorporating the understanding of the cognitive and non-cognitive behavioral domains. By drawing on the educational expertise and materials of peers, academic institutes, professional organizations and government, there shall be an assurance that information pertaining to allied health especially, radiologic technology, is current, authentic, unbiased and educational. Information networks are becoming more and more important in the area of technical education especially in the fields related to allied health. Programs have a responsibility to produce graduates with an appropriate mix of cognitive, affective, and psychomotor skills (Essentials, 1991).

Table XVI addresses item number 35 of the survey, where 92.3 percent ( $n = 69$ ) of the respondents to this item agreed to strongly agreed that research is essential to determine the relative importance of appropriate as well as inappropriate selection processes. Of the total respondents, 6 did not express an opinion. The mean response had a value of 3.18 ( $s = 0.540$ ) which implied that the average respondent to this item agreed with item number 35. This conclusion is strengthened by the median value of 3. If community college radiologic technology programs are to maintain integrity, research is essential to determine the relative importance of inappropriate selection processes.

Table XVI addresses item number 37 of the survey, where 93.3 percent ( $n = 66$ ) of the respondents to this item agreed to strongly agreed that information networks should be established to permit change of recruitment and selection policies in radiologic technology education.

Of the total respondents, 7 did not express an opinion. The mean response had a value of 3.19 ( $s = 0.892$ ) which implied that the average respondent to this item agreed with item number 37. This conclusion is strengthened by a median value of 3. Although we can make certain generalizations about students and how they learn, the rate at which they learn, and the interested that they manifest, learning is for each person a highly individual process. Students are very much a product of their learning experience(s). Therefore, program directors who participate in student selection must consider this and be aware of the cognitive and non-cognitive domain criteria that are used in the student selection process.

Table XVI addresses item number 38 of the survey, where 23.3 percent ( $n = 18$ ) of respondents to this item agreed to strongly agreed that radiologic technology programs should deemphasize technical and scientific training in favor of emphasis on the social sciences, the humanities, and training in thinking or problem solving skills. Seventy-five point six percent ( $n = 56$ ) disagreed or strongly disagreed that radiologic technology programs should deemphasize technical and scientific training in favor of emphasis on the social sciences, the humanities, and training in thinking or problem solving skills. Of the total respondents, 6 did not express an opinion. The mean response had a value of 2.12 which implied that the average respondent to this item disagreed with item number 38. This conclusion is strengthened by a median value of 2. The response to this item indicates that in the program directors opinion, technical and scientific training should be employed over social sciences, humanities, and training in thinking or problem-solving. The concern here is that failure to identify a persons basic needs or to make a decision could undermine ones ability to

respond to allied health service needs and demands. Attention is now turned to a comparison of a sample of non-respondents (18) to respondents (80).

Table XVI addresses item number 39 of the survey, where 79.3 percent ( $n = 61$ ) of the respondents to this item agreed to strongly agreed that radiologic technology programs should give more emphasis on training in scholastic skills such as writing and critical thinking as well as afford opportunities for the development of suitable values. Of the total respondents, 3 did not express an opinion. The mean response had a value of 2.89 ( $s = 0.680$ ) which implied that the average respondent to this item agreed with item number 39. This conclusion is strengthened by the median value of 3. This indicates that there exists a need to teach critical thinking skills.

Table XVI addresses item number 40 of the survey, where 76.4 percent ( $n = 55$ ) of respondents to this item agreed to strongly agreed that the current focus on scientific knowledge in radiologic technology admission decisions should be modified to allow for greater emphasis on a student's ability to learn independently and acquire analytic skills and values appropriate to the field of radiologic technology. Seventy-two (90 percent) of the total respondents to the survey addressed this item with a mean value of 2.86 ( $s = 0.564$ ) and a median value of 3. The respondents agreed that current focus on scientific knowledge in radiologic technology admission decisions should be modified to allow for more emphasis in student's abilities to learn independently and acquire analytic skills and values appropriate to radiologic technology.

Table XVII, "Responding Radiologic Technology Program Directors' Opinions Regarding What Non-Cognitive Criteria Should Be Used and How Should Such Criteria be Used in Student Selection," addresses opinions



of what non-cognitive criteria should be used and how should such criteria be used in student selection.

TABLE XVII

RESPONDING RADIOLOGIC TECHNOLOGY PROGRAM DIRECTORS' OPINIONS  
REGARDING WHAT NON-COGNITIVE CRITERIA SHOULD BE USED AND  
HOW SHOULD SUCH CRITERIA BE USED IN STUDENT SELECTION

	No Opinion 0 No. No. (%)	Strongly Disagree 1 No. (%)	Disagree 2 No. (%)	Agree 3 No. (%)	Strongly Agree 4 (%)
In your opinion ...					
(14)... predictors of student success must be chosen which are appropriate to the goals of the radiologic technology program.	0 (0)	0 (0)	1 (1.3)	36 (47.3)	39 (51.3)
(18)... should students, facts and impressions obtained by the interviewer be correlated to the academic/clinical situations, <u>to predict a student's success in radiologic technology.</u>	0 (0)	3 (4.3)	20 (28.9)	33 (47.8)	13 (18.8)
(19)... information obtained in a student interview enables the interviewer to assess an applicant's vocabulary and ability to be concise and explicit in conveying thoughts.	0 (0)	2 (2.6)	15 (19.4)	49 (63.6)	11 (14.6)
(25)... an array of relevant criteria should be used to assure applicant equity.	0 (0)	2 (2.6)	3 (3.9)	47 (61.0)	25 (32.4)

In your opinion ...	No Opinion	Strongly Disagree	Disagree	Agree	Strongly Agree
	0 No. No.	1 No.	2 No.	3 No.	4 No.
	(%)	(%)	(%)	(%)	(%)
(33)... an <u>internal audit</u> should be done in the form of selection evaluation as well as external screening of the selection policies and procedures to assure consumer and governmental funding agencies that the admission process has been actually implemented according to stated protocols should be done each year.	0 (0)	6 (8.3)	21 (29.1)	35 (48.6)	10 (13.8)
(34)... foresight is critical in the student selection process if radiologic technology programs are to survive the challenge of declining number of college-age applicant's in the 1990's.	0 (0)	3 (3.9)	3 (3.9)	57 (75.0)	13 (17.1)
(36)... effective recruitment strategies must be coupled with rationale, humane and equitable selection policies.	0 (0)	0 (0)	1 (1.3)	43 (55.8)	33 (42.8)

Table XVII addresses item number 14 of the survey, where 98.7 percent (n = 75) of respondents to this item agreed to strongly agreed that predictors of student success must be chosen which are appropriate to the goals of the radiologic technology program. Seventy-six (95 percent) of the total respondents to the survey addressed this item. With a mean value of 3.5 (s = 0.529) and a median value of 4, the respondents agreed that predictors of student success must be chosen

which are appropriate to the goals of the radiologic technology program.

Table XVII addresses item number 18 of the survey, where 66.6 percent ( $n = 46$ ) of the respondents to the item agreed to strongly agreed that students, facts and impressions obtained by the interviewer should be correlated to the academic/clinical situations to predict a student's success in radiologic technology. Sixty-nine (86.2 percent) of the total respondents to the survey addressed this item with a mean value of 2.81 ( $s = 0.791$ ) and a median value of 3. This means that the respondents agreed that students, facts and impressions should be obtained by the interviewer and correlated to the academic/clinical settings to predict a student's success in radiologic technology.

Table XVII identifies item number 19 of the survey, where 78 percent ( $n = 60$ ) of the respondents to this item agreed to strongly agreed that information obtained in a student's interview enables the interviewer to assess an applicant's vocabulary and ability to be concise and explicit in conveying thoughts. Of the respondents, three did not express an opinion. The mean response had a value of 2.89 ( $s = 0.660$ ) which implied that the average respondent to this item agreed with number 19. This conclusion is strengthened by the median value of 3. Therefore, it appears that survey respondents believe that information obtained in a student's interview can enable the interviewer to assess the affective behavioral domain of the applicant.

Table XVII addresses item number 25 of the survey, where 93.5 percent ( $n = 72$ ) of the respondents to this item agreed to strongly agreed that an array of relevant criteria should be used to assure applicant equity. Of the total respondents, 3 did not express an opinion. The mean response had a value of 3.23 ( $s = 0.646$ ) which implied that the average respondents to this item agreed with item

number 25. This conclusion is strengthened by the median value of 3. Therefore, cognitive as well as non-cognitive selection criteria should be used so that all applicants will be evaluated equally, whether the applicant is traditional or non-traditional in student status.

Table XVII addresses item number 33 of the survey, where 61.5 percent ( $n = 45$ ) of the respondents to this item agreed to strongly agreed that "an internal audit should be done in the form of selection evaluation as well as external screening of the selection policies and procedures to assure consumers and governmental funding agencies that the admission's process has been actually implemented according to stated protocols and that this internal audit should be done each year." Of the total respondents, 8 did not express an opinion. The mean response had a value of 2.68 ( $s = 0.819$ ) which implied that the average respondent to the item agreed with item number 33. This conclusion is strengthened by the median value of 3. It thus appears that community college radiologic technology program directors should perform an internal audit yearly of selection policies and procedures to assure consumer and governmental funding agencies that the admission process has been implemented according to stated protocols.

Table XVII addresses item number 34 of the survey, where 92.1 percent ( $n = 70$ ) of respondents to this item agreed to strongly agreed that foresight is critical in the student selection process if radiologic technology programs are to survive the challenge of declining numbers of college-age applicants in the 1990's. Seventy-six (95 percent) of the total respondents to the survey addressed this item. With a mean value of 3.05 ( $s = 0.608$ ) and a median value of 3, the respondents agreed that foresight is critical in the student selection process if radiologic technology programs are to survive the challenge

of declining numbers of college-age applicants in the 1990's.

Table XVI addresses item number 36 of the survey, where 97.7 percent ( $n = 76$ ) of respondents to this item agreed to strongly agreed that program directors must couple effective recruitment strategies with rational, humane and equitable selection policies. Seventy-seven (96.2 percent) of the total respondents to the survey addressed this item. With a mean value of 3.41 ( $s = 0.521$ ) and a median value of 3, the respondents agreed that program directors must couple effective recruitment strategies with rational, humane and equitable selection policies.

Descriptive surveys seek to determine the incidence and distribution of the characteristics and opinions of populations of people by obtaining and studying the characteristics and opinions of relatively small and presumably representative samples of such people. For practical purposes, it is highly desirable that samples studied be representative. If the sample is indeed representative, then the results obtained from it can be generalized to the whole population. If 50 percent of a sample responds favorably to a question about use of college grade point average as selection criteria, for instance, one wants to believe that if all the program directors in the United States, were asked the same question, close to 50 percent of them would be favorable.

## CHAPTER V

### FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

#### Introduction

This chapter contains a summary of procedures used in this study, discussion of the findings and recommendations for further study. The purpose of this study was to assess and analyze perceptions of community college radiologic technology program directors throughout the United States and their usage of selection criteria for prospective students. The Survey of Recruitment, Admission and Selection Criteria for Radiologic Technology Programs was developed and used as a means to identify what selective admission criteria are used to emphasize an applicant's academic performances, to assess cognitive and non-cognitive capabilities and what strategies were used to evaluate the applicants cognitive and non-cognitive traits in predicting student success.

The first line of analysis was to review the literature related to selection criteria in medical education, including nursing and allied health, with special emphasis on the literature relating to community college radiologic technology programs. This review was presented in Chapter 2 of this study. The second line of analysis was the development of the Survey of Recruitment, Admission and Selection Criteria for Radiologic Technology Programs which involved the investigation of an expansive list of items found in the related

literature and derived from opinions, attitudes and beliefs regarding community college radiologic technology student selection. The third focus of analysis was to survey program directors of 181 Committee on Allied Health Education and Accreditation-identified community college radiologic technology programs, with a request for the completed survey to be returned in a self-addressed envelope. If the surveys were not returned, a followup letter (Appendix F) and a copy of the survey was sent with a ten-day deadline in accordance with the methodology of Dillman, who suggested that repeated follow-ups were the single most powerful stimulator of high response: "a successful assessment cannot be done without them" (1978). It was anticipated that with this double request procedure, there would be a 50 percent response rate.

The 52 item survey had the following specific purposes:

1. Obtain a profile of the selection criteria that are used to select radiologic technology students.
2. Obtain opinions of community college radiologic technology program director's regarding the selection criteria that are being used now.
3. Determine what cognitive and non-cognitive selection criteria to use in selecting radiologic technology students.
4. Determine the importance of selection criteria used to assure applicant equity.

In large measure, the quality of health care ultimately delivered is dependent upon the competence of those providing care. In turn, the competence of health care personnel is largely determined by the quality of educational preparation for health service roles; study after study dating from the (Study of Accreditation of Selected Health Educational Programs in 1972) has found this. Quality clinical performance requires

not only cognition but also proficiency in the non-cognitive domains. It is in these latter domains, especially the affective, for which non-cognitive predictors of success would be beneficial. Coupled with traditional predictors, they would provide a more complete appraisal of the full potential of applicants.

Changes in the types and characteristics of allied health manpower including the field of radiologic technology in the 20th century have been dramatic. Health professions requiring a college education or professional preparation account for approximately 200,000 persons in 1900; 692,00 in 1940; 914,000 in 1960; and 4.9 million in 1990 (Kissick, 1968; U.S. Department of Health, Education and Welfare, 1970; and Genzberg, 1990).

Employment in the allied health care industry has grown more rapidly than overall employment. In 1900, persons employed in health occupations accounted for 1.2 percent of the labor force. The preparation increased to 2.1 percent in 1940, 3.0 percent in 1960, and 7.6 percent in 1990 (Freudenheim, 1990; U.S. Department of Labor, 1990).

If President Bill Clinton's National Health Care Plan is enacted, most people predict there will be an increase in allied health professionals as the nation shifts from an acute care illness base to one based on health promotion, and preventive medicine. How will students in the allied health professions be selected? Who will make up the future health care worker? Within the rise of open access, open door, higher education; how can allied health programs including the field of radiologic technology, promote access and equity, existing as selective programs in non-selective institutions? This is a problem that has gained the attention of community college radiologic technology



program directors, practitioners and other allied health program directors for a number of years.

### Cognitive and Non-Cognitive

Research Question One: What selection criteria are currently being used? was addressed in Table X, XI, XII and XIII and statistical analysis of items 41 and 42 in Part II, the General Information section of the survey, provided the findings used to develop Tables X, XI, XII and XIII. The cognitive selection criteria most used by community college radiologic technology programs to screen prospective applicants were the American College Test (87.4 percent), followed by the ACT Assessment (69.6 percent) and the Scholastic Aptitude Test (60.2 percent). The most common non-cognitive selection criteria used by community college radiologic technology programs were interview(s) (2.8 percent) and evaluation(s) (2.3 percent).

Table XII, "Responding Radiologic Technology Program Directors' Opinions Regarding Cognitive Selection Criteria Used in 1990-1991, By Type of Community College," relates to Research Question One and revealed that in the 1990-91 academic year that of all the cognitive selection criteria employed by community college radiologic technology program directors. The cognitive selection criteria most frequently used were college grade point average (33 percent); interviews (31.5 percent); high school grade point average (31.4 percent); and course grade point average (27.1 percent). Table XIII, "Responding Radiologic Technology Program Directors' Opinions Regarding Non-Cognitive Selection Criteria Used In 1990-1991, By Type of Community College," also relates to Research Question One and revealed that the non-cognitive selection

criteria used by responding radiologic technology program directors were interviews (31.5 percent), hospital visitations (12.6 percent) and references (5.0 percent). Thus, a standardized test-most often the ACT-in combination with, cognitive and non-cognitive criteria, were most frequently used to select radiologic technology students at community colleges.

Research Question Two: What are the opinions regarding the selection criteria that are being used now?

Table XIV, "Responding Radiologic Technology Program Directors' Opinions Regarding Cognitive Student Selection Criteria Being Used Now," relates to Research Question Two. Item number 23 of the survey revealed that 92.4 percent (n = 61) of the respondents to this item agreed to strongly agreed that the goals and objectives of radiologic technology programs and the sponsoring institutions should be related to the cultivation of accepted applicant competencies, so that an effective entry-level radiographer is the product of the two. Therefore, the goals and objectives of community college radiologic technology programs should be related to knowledge, attitudes, skills and habits needed to be an effective entry-level radiologic technology student. This strong agreement (92.6 percent) indicates that community college radiologic technology program directors believe that non-cognitive aptitudes and values are also important to success in the field.

Item 15 revealed that 83.8 percent (n = 62) of the respondents agreed to strongly agreed that high school grade point averages, when combined with aptitude tests, are more effective predictors of radiologic technology students' grades in college than either one alone. This answer is consistent with the research literature: Ferguson (1979) noted that when ACT composite scores were combined with

either high school grade point averages or high school ranking, the results were highly predictions of college success. This item would also indicate the need to use broader selection criteria for student entry into radiologic technology programs.

Item number 13 of the survey revealed that 82.7 percent ( $n = 62$ ) of the respondents to this item agreed to strongly agreed that using the prediction of grade point average as the only admission criteria excluded students with less academic ability but possibly greater skills in leadership. Grade point average has been shown to be highly predictive of grade point average in academic professional courses but is not highly predictive of grade point average in clinical coursework or subsequent performance in work settings (Murden, et al, 1978).

Item number 12 of the survey revealed that 76 percent ( $n = 67$ ) of respondents agreed to strongly agreed that the use of grade point average as the only admission criteria limits admissions to only academic achievers. It is clear that radiologic technology program directors believe that non-cognitive selection criteria should be used to select those students who were not academic achievers, but probably would possess better clinical application skills. Consistent with research, according to Gurley, cognitive learning refers to lectures and demonstrations of theories, and to facts necessary to understand a specifics of knowledge. Once this fundamental information has been learned, the student has the opportunity to participate in the clinical setting. It is in the clinical setting that the student has the opportunity to apply knowledge gained from the classroom setting. The clinical environment provides opportunity to develop pride in work, and feelings of self worth, skills in interpersonal relationships, and

personal, moral, and ethical beliefs for daily practice (Gurley, 1992, p. 84).

Item number 11 of the survey revealed that 83 percent ( $n = 53$ ) of the respondents agreed to strongly agreed that the American College Test results were useful in counseling and guiding students. Bello (1977) concluded that valid factors predictive of success or failure were best determined by a comparative placement and guidance program (Bello, 1977).

Item number 17 of the survey revealed that 79.8 percent ( $n = 63$ ) of the respondents to this item agreed to strongly agreed that current radiologic technology programs, courses, policies and procedures are appropriate for adult learners. Adult education affects varied miscellaneous opportunities for adults to understand the problems of their world, to try to keep up with the rapid social changes, to prepare for new jobs, to remedy deficiencies in their own background, and to engage in education simply for the love of learning something new (VanTil, 1974).

The correlation between grades in high school science coursework and radiography curriculum counterparts was item 3 of the survey. Of the respondents 73.3 percent ( $n = 56$ ) agreed to strongly agreed that there was a significant relationship between grades in high school science and radiography curriculum coursework. This conclusion was also reached in Kavanaugh's study of selected high school courses and their relation to grades in selected courses in the radiography curriculum (Kavanaugh, 1981).

Sixty-four point four percent ( $n = 31$ ) of the respondents to item 1 of the survey agreed to strongly agreed that there was a correlation between a student's pre-admission ACT composite score and the student's

score on the post-graduate Registry Examination. Sixty-three point six percent ( $n = 28$ ) of respondents to item 2 of the survey agreed to strongly agreed that there was a correlation between a student's pre-admission sub-test scores on the ACT Examination and the Registry. A study by Schimfhauer and Broski (1976) revealed that the math subtest of the ACT outranked preprofessional grade point averages in predicting success (Schimfhauer and Broski, 1976). When all allied health programs were combined, grade point average was again the strongest predictor variable followed by the mathematics subtest of the ACT, and the Allied Health Profession's Admission Test (AHPAT) verbal subtest score. Francis (1990) investigated the relationship between pre-admission ACT composite scores and the Registry Examination for two-year technical college programs. Results showed that only one item appeared to be related, and that was failing students had ACT composite scores of 14 or lower (Francis, 1990). Therefore, there appears to be a correlation between a student's pre-admission ACT composite score, individual section score, and the student's score on the post-graduate Registry Examination.

Sixty-six point one percent ( $n = 45$ ) of respondents agreed to strongly agreed with item number 10 of the survey where a student's ACT composite score, when combined with either high school grade point average or high school ranking, was highly predictive of radiologic technology program success (Table XIV). Ferguson (1975) noted that when ACT composite scores were combined with either high school grade point averages or high school ranking, the results were highly predictive of college success (Ferguson, 1979).

Item number 20, revealed that 59.2 percent ( $n = 42$ ) of respondents to this item agreed to strongly agreed that traditional admissions

criteria, previous academic performance and aptitude tests have excluded large numbers of individuals, many of whom had the motivation and the personality characteristics necessary to succeed. According to VanTil, no matter how we try to group people, we eventually have to acknowledge individuality. "Whatever the measurements we use - whether they be anatomical, biological, physiological, mental, or social - we find that human beings differ, from each other (1974)."

Table XV, "Responding Radiologic Technology Program Directors' Opinions Regarding Non-Cognitive Student Selection Criteria Being Used Now," also relates to Research Question Two, and revealed the non-cognitive selection criteria that are being used now.

Analysis of these findings seems to indicate that while those who select radiography as a career have identifiable personality types, these types are not related to performance in academic courses. Friendliness, impulsiveness, apathy, aggressiveness, shyness are present in different individuals in different degrees and blend into a continuum. Item number 21 revealed that 81 percent ( $n = 63$ ) of the respondents to this item agreed to strongly agreed that there was a relationship between age, length of experience in an allied setting prior to entry into a radiology technology program and academic success. Consistent with research, according to Gurley you can evaluate yourself only by understanding, valuing, and helping yourself. Every person has a unique mind, body, and emotions that each must learn to understand, accept, and respect before a person can begin to meet others needs. The learning process can be enhanced by understanding the conflicts that occur as a part of maturing. Making a vocational choice is an explicit statement of the kind of person a student is or hopes to

be. Professional satisfaction will depend on the extent to which the student uses abilities in a productive manner (Gurley, 1992, p. 22).

Research Question Three: What cognitive and non-cognitive criteria should be used, and how should such criteria be used?

Table XVI, "Responding Radiologic Technology Program Directors' Opinions Regarding What Cognitive Criteria Should Be Used and How Should Such Criteria Be Used," relates to Research Question Three. Table XVI revealed the cognitive student selection criteria that should be used and how should such criteria be used.

Community college radiologic technology program directors were asked to provide opinion on issues related to fairness in the application of process including describing the admissions criteria publicly, giving statements of reasons for rejection and a means of appeal if rejected. In item number 27 of the survey 98.7 percent (n = 78) of the respondents agreed to strongly agreed that a radiologic technology program should use the same admissions process for all applicants. The fact that the respondents agreed to strongly agreed to item number 27 supports the respondents' agreements to uniformity and legal review of selection criteria found in item number 26.

White students constituted the majority (79 percent) of 1990-91 enrollments in all accredited allied health programs which included radiologic technology. African-American students made up 11 percent, Hispanic students including Mexican Americans (3 percent), Puerto Ricans (1 percent) and other Hispanics (2 percent), Asians or Pacific Islanders (4 percent), and American Indians or Alaska Natives, less than one percent. Between 1989-90 and 1990-91 there was a one percent enrollment decrease for Africian-Americans in all accredited allied health programs. Otherwise, enrollment distributions for whites, Mexican

Americans, Puerto Ricans, other Hispanics, Asians or Pacific Islander, and American Indians or Alaskan Natives were consistent between the academic years (Allied Health Education Fact Sheet, 1992). The number of women in the labor force is projected to increase more than twice as fast as the number of men, and in the year 2000 women will constitute nearly half the labor force. The number of African-American workers is projected to increase twice as fast, Asian workers to increase five times as fast, and Hispanic workers more than five times as fast as the number of white workers. Thus, by the year 2000, the economy will be more dependent on women workers (who have always been prominent in the allied health profession) and on minority workers (Institute of Medicine, 1989). Allied health programs at community colleges, including radiologic technology, ignore these demographic realities at their peril.

Item number 30 of the survey revealed that 96.2 percent ( $n = 77$ ) of respondents agreed to strongly agreed that a program should describe its admissions criteria publicly so that potential applicants can obtain a reasonable estimate of their likelihood of meeting such standards. Taken together, items 2, 27, 30, and 31 of the survey indicate that community college radiologic technology program directors are concerned with equity in the application and selection process of prospective students.

Community college radiologic technology program directors were also asked to respond to a number of issues related to the selection process, including the understanding of the behavioral domains and the importance of research and information networks. Item number 37 of the survey, revealed that 93.3 percent ( $n = 66$ ) of the respondents to this item agreed to strongly agreed that information networks should be



established to permit change of recruitment and selection policies in radiologic technology education. Information networks are becoming more and more important in the area of technical education, especially in the fields related to allied health. Of the respondents to item number 35, 92.3 percent (n = 69) of respondents to this item agreed to strongly agreed that research is essential to determine the relative importance of inappropriate selection processes. If community college radiologic technology programs are to maintain integrity, research is essential to determine the relative importance of inappropriate selection processes. Item number 32 of the survey, revealed that 90.1 percent (n = 64) of respondents to this item agreed to strongly agreed that all those who participate in student selection should be instructed and competent in the process of multiple domain evaluation of radiologic technology student applicants. Multiple domain evaluation is defined here to mean incorporating the understanding of the cognitive and non-cognitive behavioral domains.

Item 26 of the survey, revealed that 84.7 percent (n = 61) of respondents to this item agreed to strongly agreed that there should be a legal review of selection policies dealing with uniformity while exceptions to such uniformity should be reviewed every three years. In item number 27 of the survey, 98.7 percent (n = 78) of the respondents agreed to strongly agreed that a radiologic technology program should use the same admissions process for all applicants. To assure that all applicants are evaluated equitably in the selection process, a legal review of selection criteria and policies should be performed every three years with uniformity.

Item number 5 of the survey disclosed that 83 percent (n = 62) of the respondents agreed to strongly agreed that high school grade point

averages or grades in algebra or biology can be used to predict passing of the Registry Examination. It is clear that radiologic technology program directors at community colleges believe that cognitive measurements should be used in student selection to assess overall results.

Item number 24 of the survey, disclosed that 80 percent ( $n = 56$ ) of respondents to this item agreed to strongly agreed that valid and reliable behavior measurements should be used in the admissions process to radiologic technology programs. Measurement is only part of the total process of evaluation and tests are one way of measuring. Evaluation is a process of determining the value or worth of something through examining, judging, appraising, estimating, and measuring (VanTil, 1974).

Item number 39 of the survey, disclosed that 79.3 percent ( $n = 61$ ) of the respondents to this item agreed to strongly agreed that radiologic technology programs should give more emphasis on training in scholastic skills such as writing and critical thinking as well as afford opportunities for the development of suitable values. In this era, we must deal with real and urgent problems of our times. The challenge is to help the student develop skills so that the student can cope with the social realities of our time, to develop commitment to humane values based on mankind's reconstructed experiences.

Item number 40 of the survey, revealed that 76.4 percent ( $n = 55$ ) of respondents to this item agreed to strongly agreed that the current focus on scientific knowledge in radiologic technology admission decisions should be modified to allow for more emphasis in student's abilities to learn independently (self-actualization) and acquire analytic skills and values appropriate to the field of radiologic

technology. The respondents agreed that current focus on scientific knowledge in radiologic technology admission decisions should be modified to allow for more emphasis in student's abilities to learn independently and acquire analytic skills and values appropriate to radiologic technology. This means greater emphasis on non-cognitive student selection criteria.

Item number 31 of the survey, revealed that 76 percent ( $n = 57$ ) of the respondents agreed to strongly agreed that rejected applicants should be given a statement of reasons for their rejection and a means of appeal if they wish to challenge the explanation. Therefore, the majority of community college program directors believed that if applicants are not selected, a statement of reasons for their rejection should be given along with a means of appeal if they want to challenge the rejection.

Item number 22 of the survey, revealed that 74.0 percent ( $n = 57$ ) of respondents to this item agreed to strongly agreed that cognitive, affective and psychomotor domains of students should be evaluated, weighted and used in selecting radiologic technology students. The cognitive domain includes all objectives which deal with the intellectual behaviors of the learner. The psychomotor domain covers all those objectives in which the learner is engaged in some physical, kinesthetic behavior. The affective domain is concerned with attitudes, feelings, interests, and values of the learner. Therefore, it is important that reliable predictors, both cognitive and non-cognitive, are developed to assess the full potential for success of all individuals in the radiologic technology applicant pool (Blagg, 1975). Item number 18 of the survey, revealed that 66.6 percent ( $n = 46$ ) of the respondents to the item agreed to strongly agreed that students, facts

and impressions obtained by the interviewer should be correlated to the academic/clinical situations to predict a student's success in radiologic technology. The cognitive and psychomotor domains are concerned with the question: What can the learner do? The affective domain is concerned with the question: What will the learner do?

Item number 16 of the survey, revealed that 71.8 percent (n = 56) of respondents agreed to strongly agreed that standardized test results should be ranked or weighted. In the selection process, objective and/or subjective evaluation of the student is usually performed. In the objective evaluation of a student, references, transcripts and evaluations are normally utilized. According to the respondents objective selection criteria, such standardized tests results should be weighted or ranked. Students with the highest accumulated score can be admitted to community college radiologic technology programs. The profession of radiography demands that entering students become highly skilled technically, qualified by education to perform imaging procedures as well as to be compassionate health care providers (Essentials, 1990). The maintenance of standards of excellence in radiologic technology admissions is therefore necessary to assure accountability and quality care by program graduates. The respondents were asked to check which weighted instruments were used as part of their selection criteria. This general information item was found in question 41. The respondents were not asked which instrument should get the most weight. It is important that reliable predictors-both cognitive and non-cognitive-are developed, and that these predictors be ranked or weighted to assess the full potential for success of all individuals in the radiologic technology applicant pool.

Item 4 of the survey revealed that 65 percent (n = 50) of the

respondents agreed to strongly agreed that high school grade point averages, algebra grades and biology grades should be used in the selection of students for radiologic technology programs. Kavanaugh (1981) made no statistical comparison between high school grade point average or grades in biology or algebra and the Registry examination results, although reference was made to five first-time program failures on the Registry examination and their high school grade point averages, as well as algebra and biology grades. Therefore, it appears that community college radiologic technology program directors believe in weighing the values of high school grade point averages, algebra grades and biology grades when selecting students for radiologic technology programs. Weighing these values can help to predict passing of the American Registry of Radiologic Technologists Examination, as was pointed out in item number 5 of the survey.

Table XVII, "Responding Radiologic Technology Program Directors' Opinions Regarding What Non-Cognitive Criteria Should Be Used and How Should Such Criteria Be Used," also relates to Research Question Three. Table XVII revealed the non-cognitive student selection criteria that should be used and how should such criteria be used.

According to the Essentials, graduates of radiologic technology programs should be both competent and compassionate. Instilled professional values should be evidenced by affective domain objectives and evaluations. The radiologic technology curriculum should purposefully identify professional competencies and include cognitive, affective and psychomotor capabilities (Essentials, 1990). Therefore, facts and impressions obtained during an interview can be correlated to the academic/clinical settings and could assist in predicting a student's success in a radiologic technology program.

Item number 14 of the survey, revealed that 98.7 percent (n = 75) of the respondents agreed to strongly agreed that predictors of student success must be chosen which are appropriate to the goals of the radiologic technology program, the high percentage is not surprising, given the competency based nature of radiologic technology programs. According to the Essentials, standards and guidelines of the Joint Review Committee on Education in Radiologic Technology, the evaluation system should be related to program philosophies, goals, and competencies, provide students with ongoing as well as terminal evaluations and serve as a reliable indicator of the effectiveness of instruction and course design criteria for successful performance (Essentials, 1990).

Item number 36 of the survey revealed that 97.7 percent (n = 76) of respondents to this item agreed to strongly agreed that program directors must couple effective recruitment strategies with rational, humane and equitable selection policies. Faced with increased competition for students, program directors and educational institutions must become creative in their approaches to recruitment. The Committee to Study the Role of Allied Health Personnel recommended in 1989 that educational institutions, in close collaboration with employers and professional associations, purposefully organize to recruit students from groups traditionally underrepresented in allied health fields, especially minorities, older students, career changers, those already in health care, men for fields in which they were underrepresented, and individuals with handicapping conditions (Institute of Medicine, 1989).

Item number 25 of the survey revealed that 93.5 percent (n = 72) of the respondents to this item agreed to strongly agreed that an array of relevant criteria should be used to assure overall equity among and

between applicant groups. Community college radiologic technology program directors clearly believe that cognitive as well as non-cognitive selection criteria should be used, so that all applicants will be evaluated equally whether the applicant is from a traditional or non-traditional student group.

Item number 34 of the survey revealed that 92.1 percent ( $n = 70$ ) of respondents to this item agreed to strongly agreed that foresight is critical in the student selection process if radiologic technology programs are to survive the challenge of declining numbers of traditional college-age applicants in the 1990's. Major economic, demographic, and social forces must be taken into account to assess the directions and magnitude of changes in the U.S. health care system and the implications of these changes for allied health employment (Institute of Medicine, 1989). This finding is consistent with concerns consistently raised at national and state allied health profession meetings, especially with regards to equity and access.

Item number 19 of the survey, revealed that 78 percent ( $n = 60$ ) of the respondents to this item agreed to strongly agreed that information obtained in a student's interview enables the interviewer to assess an applicant's vocabulary and ability to be concise and explicit in conveying thoughts. Therefore, information obtained in a student's interview if solicited in a purposeful way will enable the interviewer to assess the affective behavioral domain of the applicant.

Item number 33 of the survey, revealed that 61.5 percent ( $n = 45$ ) of the respondents to this item agreed to strongly agreed that an internal audit should be performed in the form of selection evaluation as well as external screening of the selection policies and procedures, to assure consumers and governmental funding agencies that the admission process

has been actually implemented according to stated protocols. Further, community college program directors believe that this internal audit should be done each year so as to prove that procedures and policies have been implemented according to stated protocols.

### Conclusions

On the basis of the previous findings, the following conclusions can be reached:

(1) The perceptions of community college radiologic technology program directors were consistent with prior research of reliable predictors used as selection criteria of prospective radiologic technology students (McCausland, 1974; Ballinger, 1976; Schimfhauer and Broski, 1976; Stankovich, 1977; Chission, 1985). Quantifying the radiologic technology applicants' affective characteristics increases predictive efficiency (Finegan, 1967; Murden, 1978; Keck, 1979; Burgess, 1980; Dietrich, 1981; Blagg, 1985). Aptitude testing should be used to measure aptitude for the educational process structure to produce proficient allied-health practitioners (Merritt, 1972; Reinking, 1983, 1985; Macomber, 1984; Wesolowski, 1988; Francis, 1990). The outcome of aptitude testing scores can be predictive of earned scores on the American Registry of Radiologic Technologist Examination (Lauer, 1981; Miller, 1985; Myers, 1985). Therefore, cognitive selection criteria are used more often than non-cognitive selection criteria to select prospective radiologic technology students.

(2) Responses to the survey reflected actual perceptions of program directors toward the various facets of selection criteria used in community college radiologic technology programs throughout the United



States, because community college radiologic technology program directors are being asked to be accountable or responsible for the educational product, the student. Further, while what constitutes a well educated person is open to subjective interpretation, radiologic technology program directors have a very clear benchmark by which to measure success: passage of their graduates on the Registry Examination. Therefore, community college radiologic technology program directors appear to be concerned with the aptitude, interests, personality, and values all part of the non-cognitive domain, as well as with objective and other evaluations of academic (cognitive) achievement in their application and selection process of prospective radiologic technology students. The problem exists that the Registry does not measure or assess non-cognitive achievements, interests, personality or values.

(3) There are a number of cognitive and non-cognitive selection criteria used by community college radiologic technology programs and program directors. The most common instruments used by community college radiologic technology programs were cognitive in nature and were the American College Test (87.4 percent) followed by the ACT Assessment (69.6 percent) and the Scholastic Aptitude Test (60.2 percent).

(4) According to the descriptive statistical analysis of the responses of program directors usage of student selection criteria and weighted instruments, it was found that rural community college radiologic technology programs relied on ACT results more than metro and large community college radiologic technology programs. It was also found that large community college radiologic technology programs relied on ACT Asset more than rural and metro combined. This standard testing is more prevalent in urban areas.

(5) Table XII showed that of all the selection criteria used in the 1990-91 academic year, community college radiologic technology program directors used college grade point average (33 percent), interviews (31.5 percent), high school grade point average (31.4 percent), and grade point average (27.1 percent) the most as cognitive and non-cognitive selection criteria. These conclusions correlate to the literature, which has shown that traditional admissions criteria, including previous academic performance and aptitude tests, have been effective cognitive predictors of academic success, while interview(s) were considered to be effective non-cognitive predictors.

(6) It was found that urban metropolitan community college radiologic technology programs relied more on college grade point, interview, high school grade point and grade point averages, than the other types of community colleges. The medium community college radiologic technology program came within .6 percentage points of metro community college radiologic technology programs in the usage of urban high school grade point average and interview as selection criteria used. Therefore, the findings revealed that high school grade point averages which are recognized as a cognitive selection criteria and interview(s) which are recognized as non-cognitive selection criteria are used, despite the size and location of the community college radiologic technology program and educational backgrounds of community college radiologic technology program directors. The findings of the use of non-cognitive predictors, with the notable exception of the interview(s) performed in radiologic technology student selection, unfortunately, could not be determined. Non-cognitive predictors when combined with cognitive selection criteria could assess the full potential for success of all individuals in the applicant pool.

(7) Community college radiologic technology program directors who responded to the survey did have a significant impact on student selection process, and their believed values and perceptions played a role in producing a radiologic technologist with an appropriate array of cognitive as well as non-cognitive traits. Item number 23, found in Table XIV, revealed that 92.4 percent (n = 61) of the respondents agreed to strongly agreed that the goals and objectives of radiologic technology programs and the sponsoring institutions should be related to the cultivation of accepted applicant competencies, so that an entry-level radiographer is the product of the two. Item number 14 of the survey, found in Table XVII, revealed that 98.7 percent (n = 75) of the respondents agreed to strongly agreed that predictors of student success must be chosen which are appropriate to the goals of the radiologic technology program. Therefore, it appears that community college program directors are satisfied with the view of evaluation identified in the Essentials, that the evaluation system should be related to program philosophies, goals, and competencies, providing students with ongoing as well as terminal evaluations and serve as a reliable indicator of the effectiveness of instruction and course design criteria for successful performance (Essentials, 1990).

(8) Analysis of the items showed no consensus among radiologic technology program directors regarding how to deal with minority students and the use of testing in selecting minority students to community college radiologic technology programs. Item 6 of the survey, the ACT is a valid predictor of college grades for students from low socioeconomic backgrounds; revealed that program directors doubted that ACT is a valid predictor of college grades for students from low socioeconomic backgrounds. Suggesting that program directors have

problems and concerns with standardized tests and think other criterion can be used for minority applicant review. According to the Institute of Medicine, linkages among colleges and high schools are playing an increasingly important role in encouraging the training of minority allied health professionals. No strategy for significant increases in minority participation in the allied health professions will be successful unless it directs resources toward the major barriers to minority participation and involves the complete spectrum of interested parties, both in government and in the private sector. To succeed in the long term, efforts that can be assessed must be integrated into the mission of the educational institution (Institute of Medicine, 1989). That minimal preparatory courses or testing exists is a challenge the field of radiologic technology must address if it is to deal with rapidly changing demographics.

(9) The profession of radiologic technology demands that graduating students be highly skilled and technically qualified by education to perform imaging procedures, as well as to be compassionate health care providers. Program directors appeared to adhere to a belief that cognitive as well as non-cognitive traits were necessary to maintain standards of excellence in radiologic technology.

(10) The use of cognitive admission criteria limits admission to only academic achievers and excludes those students with less academic ability. Item 12 of the survey, the use of GPA as the only admission criteria limits admissions to only academic achievers and excludes others with less academic ability revealed that program directors agreed the use of GPA as the only admission criteria limits admission to only academic achievers. Therefore, this reveals, in an implied way, that community college program directors want to give students with less

academic ability but professional motivation and personality as much a chance to be selected as academic achievers.

(11) Due to the fact that radiologic technology is a relatively young allied health profession that emerged at community colleges during the 1960s and 1970s, research in the area of community college radiologic technology program entrance assessment and student success was limited, especially in the area of non-cognitive predictors of success. This conclusion is particularly important in light of the high value radiologic technology program directors attached to non-cognitive skills and aptitudes.

(12) Due to the significant differences between rural, suburban, and inner city community college radiologic technology program directors in their degree attainment, it would appear that lesser prepared (AA or BA) community college radiologic technology program directors would not understand how to use multifaceted selection criteria.

(13) Community college radiologic technology program directors have a responsibility to produce graduates with an appropriate mix of cognitive, affective and psychomotor skills (Essentials and Guidelines of an Accredited Educational Program for the Radiographer, hereafter "Essentials", 1990). Many allied health professional educators freely admit that the written certification test, The American Registry of Radiologic Technologists examination, is primarily slanted toward the academic or cognitive achievement of the student in the curriculum, rather than the clinical performance of the non-cognitive aspects of the profession which do not rely upon many of the academic skills in the daily delivery of health care services (Kavanaugh, 1981). Therefore, to assure quality patient care, reliable selection criteria should be

developed not only in the cognitive domain, but also in the non-cognitive domain.

### Recommendations

The following recommendations are made based on the findings and conclusions of the study.

Recommendation 1: The profession of radiography demands that graduating students be highly skilled and technically qualified by education to perform imaging procedures as well as to be compassionate health care providers. The maintenance of standards of excellence in radiologic technology is necessary to assure accountability and quality care by program graduates. For this reason, it is important that reliable predictors, both cognitive and non-cognitive, are developed to assess the full potential of all individuals in the radiologic technology applicant pool (Blagg, 1985).

No strategy for significant increases in minority participation in the allied health professions will be successful unless it directs resources toward the major barriers to preclude full minority participation. Ethnic minorities are far better represented among adult full-time students than among younger students. Whereas whites constitute 90 percent of the college students of traditional age, they now make up only about 70 percent of those over 21. The growth finding may provide a partial explanation for the alarming figures showing that African-Americans are falling further and further behind whites in their participation in adult education (Boaz, 1978). Such delayed education probably is connected to poor academic performance in high school and this overreliance upon cognitive criteria, especially dated cognitive

criteria more than five years old is inappropriate and will exclude this issue. Community college radiologic technology programs must not shrink, but rather boldly address this diversity challenge and opportunity. What is called for is a national study of cognitive and non-cognitive selection criteria that should be used in selecting prospective students. The selection criteria used should be found to be applicable to all people. This should be done through the collaborations of professional organizations associated with radiologic technology, such as the Association of Educators in Radiological Sciences (AERS), the American Society of Radiologic Technologists (ASRT), and the American Registry of Radiologic Technologists (ARRT).

Recommendation 2: Community college radiologic technology programs, with the advice and counsel of professional associates and practitioners, should evaluate student selection procedures to determine whether more reliable predictors of probable success than those presently in use can be found. Such a study would: (a) refine selection criteria by which prospective applicants are to be evaluated, (b) identify information sources whose data can be quantified, and (c) transform data from information sources into measurable forms. Evaluations of community college radiologic technology student selection criteria should constitute an internal and external quality control mechanism essential to demonstrate accountability in the program. Experts familiar with community colleges and psychometric testing should be consulted to provide advice on admissions evaluation activities. Community college radiologic technology program directors responsible for student admissions should develop a plan to gather selection criteria, perform analyses, and evaluate the outcomes so that reliable cognitive and non-cognitive predictors of success can be used in

community college radiologic technology student selection. Such a group could be organized in cooperation with the Association of Educators in Radiological Science (AERS). Issues that the AERS group should address might include, but are not limited to professional development training in the areas of both cognitive and non-cognitive selection criteria, judicial, ethnicity, minority access and future availability of allied health workers and larger trends in the U.S. labor force. The labor force is growing more slowly than in the past, and the participation rates and roles of various groups within it is changing. The labor force is becoming older; it also includes more women and more racial and ethnic minorities than in the past (Saunders, 1987).

Recommendation 3: Student selection policies should be investigated to see if the policies identify candidates who have actual and latent abilities who could meet community college radiologic technology program goals and objectives. The profession of radiography requires the ability to provide appropriate health care services. Radiographers are highly skilled professionals qualified by education and certifying examinations to perform imaging examinations and accompanying responsibilities at the request of physicians qualified to prescribe and/or perform radiologic procedures. The radiologic technology curriculum should be based on clearly stated objectives that identify professional competencies that include cognitive and non-cognitive capabilities. The objectives should guide the development and use of effective teaching strategies that take into consideration the patterns of radiography health care delivery and make optimum use of clinical education opportunities (Essentials, 1990). Such curricula should take into consideration information on the demographic shifts and changing epidemiological patterns of disease and disabilities, the biological and



psychologic aspects of chronic illness and aging, the common medical problems seen in patients, legal and ethical dilemmas, the medical and psychological aspects of death and dying, health promotion and disease and disability prevention, interdisciplinary team participation, the evaluation and assessment of patients' needs, the roles of related health professionals, administrative and management techniques, and communication and supervising skills (Institute of Medicine, 1989).

Although allied health students gain technical expertise in particular areas of concentration during their education, many have only limited exposure to chronically ill and disabled persons. The students may also have only a superficial understanding of the complexity of the physical, mental, emotional, and social problems of patients. Therefore radiologic technology professional organizations should identify non-cognitive selection criteria that can be used to evaluate how students will react to common medical problems seen in patients' legal and ethical dilemmas. These might include the medical and psychological aspects of death and dying, and the evaluation and assessment of other patient needs (Institute of Medicine, 1989). Non-cognitive selection criteria for entry into radiologic technology should then be tied to such dates.

Recommendation 4: Community college radiologic technology programs should evaluate the applicants' existing knowledge base in subject areas such as mathematics and science. Applicants lacking competence in these areas should be counseled to allow for remediation prior to program acceptance to reduce potential attrition and to permit program concentration on the didactic and clinical education required by the curriculum. Objective testing or standardized evaluations should be utilized to provide program officials assurance that applicants can be

expected to achieve stated competencies as outlined in the Essentials. These objective tests should be regularly and periodically evaluated by professional testing evaluators to assure validity and reliability.

Recommendation 5: To assure quality patient care, reliable predictors should be developed by educational researchers not only in the cognitive domain but also in the non-cognitive domain. Crucial to the effectiveness of any health care delivery system is the availability of a sufficient quantity of competent health care personnel. In large measure, the quality of health care ultimately delivered is dependent upon the competence of those providing care. In turn, the competence of health care personnel is largely determined by the quality of educational preparation for health service roles; study after study dating from the Study of Accreditation of Selected Health Educational Programs in 1972 has found this. Quality clinical performance requires not only cognition but also proficiency in the affective and psychomotor domains. It is in these latter domains, especially the affective, for which non-cognitive predictors of success would be beneficial. Coupled with traditional predictors, they would provide a more complete appraisal of the full potential of applicants. Given the great need for more radiologic technology students from historically underrepresented student groups, and the documented larger variance in the standardized tests in math, science achievement and delayed educational affects, good assessment of non-cognitive selection criteria would be particularly helpful. If we learned how to test non-cognitively in radiologic technology we could dramatically change the mix of radiologic technology program graduates by "reserving a percentage" of allied health entries after developmental education competencies are achieved.

The Pew Health Professions Commission, a 1991 initiative of the Pew

Charitable Trusts administered through the Duke University Medical Center, was inspired by the belief that education and training of health care professionals is out of step with the evolving health needs of the American people. The Pew Commission suggested that the nation's health professions' schools must play a more active leadership role both in the preparation of practitioners for the twenty-first century and in shaping the values and direction of the entire health care system (1991). In its Agenda for Action, the commission established that the nation must have practitioners with expanded abilities and new attitudes to meet society's evolving health care needs. These competencies included:

- caring for the community's health
- expanding access to effective care
- providing contemporary clinical care
- emphasizing privacy care
- participating in coordinated care
- ensuring cost-effective and appropriate care
- practicing prevention
- involving patients and families in decision-making process
- promoting healthy lifestyles
- assessing and using technology appropriately
- improving the health care system
- managing information
- understanding the role of the physical environment
- providing counseling on ethical issues
- accommodating expanded accountability
- participating in a racially and culturally diverse society
- continuing to learn.

The Pew Commission recognized challenges that health care

professional educators face in their attempts to institute substantive and lasting change in response to the trends shaping health care. The challenges to change come from inside and outside the schools that educate health professionals (Pew Health Professions Commission, 1991). Therefore, the quality of health care delivery will depend upon the competencies of those providing care; the competence of radiologic technology personnel is in turn largely determined by the quality of education preparation for health service roles. Thus, the tie between selection criteria for radiologic education programs at community colleges and the Registry exam to effectiveness as a practitioner in the field needs to be more direct. The time is now ripe for a national effort by radiologic technology programs to develop such assessments. Private foundations in particular should support such efforts.

Recommendation 6: Because the field of radiologic technology is a relatively young profession within the family of allied health professions (only 98 years old), research in the area of entrance assessment and student success should be further explored. The Carnegie Council on Policy Studies in Higher Education (1977) outlined a number of admission considerations that should be taken into account as individuals responsible for professional education programs scrutinize their applicants. These criteria included special academic interests and abilities, special interests, prior scholastic grades and rank in class, test scores (aptitude and achievement), special abilities of the non-cognitive type, special demographic personal identification such as county of residence or ethnicity, special personal characteristics, contributions to the profession, contributions to the diversity of the student community and contributions to the identity of the institution and contribution to the political, economic or community needs of the

professional program (Carnegie Council, 1977). The Carnegie Council's admission considerations can be said to include cognitive as well as non-cognitive (affective) predictors. How can community college radiologic technology program directors responsible for student selection incorporate these factors into their admissions process? How can program directors design a selection process that is equitable and objective? Research in the area of entrance assessment and student success in radiologic technology should be further explored to answer these questions.

Recommendation 7: Students preparing to begin formal education in the allied health occupation should be administered the Health Occupations Basic Entrance Test (HOBET) which was designed primarily as a diagnostic instrument to assist health occupation educators evaluate the academic and social skills of new applicants to their programs. Based upon the profile generated by this new test, first introduced in 1991, a program can more objectively screen applicants for admission. The HOBET which is produced by Educational Resources of Shawnee Mission, Kansas, provides thirty-two diagnostic scores generated by each examinee; the academic program is provided with a group profile, consisting of computer generated means for seven subtest areas: essential math skills, reading comprehension for science textbooks, reading rate placement, testtaking skills, stress level profile, social interaction profile and the learning styles inventory. In the profiles, the radiologic technology program can be provided with valuable information helpful in meeting individual, student needs and providing for an objective screening of applicants for admission to community college radiologic technology programs.

Community college radiologic technology program directors should

look to logical and systematic development, applicant equity and humanistic administration in review of their selection policies. Techniques such as task analysis, critical incidents and/or opinions of professional experts can assist in the identification and rating of prospective students. The statistical tool of discriminant analysis can aid in the choice of desirable applicants. Regression statistics can assist in determining cutoff points on scored applicant data. Upon completion of a stepwise regression analysis of the equations the appropriate criterion value based on the accepted predictors will be produced. Multiple R computations can be used to establish any significant correlation information among the various independent variables and in predicting the criterion at an  $\alpha = 0.05$  (Appendix H). This descriptive statistical analysis equation when using the HOBET composite, high school grade point average, college grade point average, the HOBET Index, the radiography program core grade point average and the Terminal Profile Score could establish any significant correlation among the independent variables, and better assess the combining of cognitive and non-cognitive selection criteria for students entering community college radiologic technology programs.

Recommendation 8: Community college radiologic technology programs should make their selection criteria flexible enough to permit counseling, and to place reliance upon professional judgement of radiologic technology educators. A program's selection policies should highlight admission of students with latent or real characteristics of the cognitive and non-cognitive domains (Dietrich, 1982). This can be done through assessment because the key purposes of assessment are to ask important questions about student learning, to get some meaningful

information on these questions, and to use the information for academic improvement (Rossman, 1987).

Recommendation 9: The Registry only measures cognitive traits of radiologic technology students and not the non-cognitive domains. Therefore, the criteria of the Registry needs to reflect the Essentials criteria. According to the Essentials and Guidelines, assessment of the graduate outcomes should be of knowledge, skills, values, and beliefs and interactions and relationships.

Recommendation 10: Further analysis of selection criteria used should be done, especially as they relate to community college radiologic technology traditional and non-traditional student selection. In this analysis, a question needs to be addressed: If traditional and non-traditional students meet either cognitive or non-cognitive selection criteria should they be selected to a radiologic technology program?

Recommendation 11: An investigation should be undertaken to assess whether or not a change needs to be made to allied health radiologic technology program classifications, especially in the areas of vocational, technical, and community college radiologic technology programs. Due to classification used by accrediting bodies, professional organizations and professional societies, radiologic technology programs should be classified uniformly, especially in the areas of vocational, technical, and community colleges.

Recommendation 12: Due to the findings of the study, the American College Test (ACT) and high school grade point average (HSGPA) which are regarded as cognitive and interviews which are regarded as non-cognitive should be used as selection criteria, respectively.

Recommendation 13: Community college radiologic technology programs

should provide for an ongoing process and systematic review of program effectiveness. Ongoing, systematic program self-evaluation should consider outcomes related to the radiologic technology students, the institution and society. Program evaluations should focus on behavioral changes in students as a result of their educational experiences and should include assessment of the students outcome. Institutional and program missions should be considered as a radiologic technology program evaluates its goals and objectives, especially as they relate to access, equity and the value-added concept.

#### Commentary

The results of this study indicate that uniform selection criteria need to be developed to assess the potential for success of prospective radiologic technology students. Community college radiologic technology program directors need to reasonably be certain that their student selection policies identify candidates who will exhibit actual and latent cognitive and non-cognitive traits to provide adequate patient care. Community college radiologic technology program directors should: (a) refine the criteria by which prospective applicants are to be evaluated, (b) identify information sources whose data can be quantified, (c) transform data from information sources into measurable form or forms, and (d) conduct evaluation of community college radiologic technology admissions criteria for validity and reliability.

Accountability in health care extends to the education of the professionals who deliver and community college radiologic technology programs. Directors should assure themselves that the best applicants are being chosen to enter radiologic technology as a profession.



Therefore, community college radiologic technology program directors should initiate an internal review of their prospective student selection processes to ready themselves for an external review, as suggested by Dietrich (1981). When community college radiologic technology program directors meet at local, state, national and international meetings, a plan to gather selection criteria should be initiated so that analyses and evaluation can be effectuated to obtain reliable predictors of success in order to promote uniformity in community college radiologic technology student selection. Despite the withdrawal of most direct federal support for allied health education in the 1980's, allied health leaders have convinced Congress that the health care work force should not continue to go unmonitored and unstudied, especially when so much about the health care system is undergoing change. To maintain standards, it is imperative that reliable non-cognitive predictors are developed to assess the full potential for success of community college radiologic technology students. Traditional admission criteria such as high school academic performance and the result of scores on aptitude tests, which are cognitive in nature, have been used as reliable predictors of academic success. While use of these admission criteria are appropriate, over-reliance upon them has excluded large numbers of students who have had the motivation and personality characteristics necessary to succeed (Morgan, 1974). These cognitive community college radiologic technology admissions predictors are particularly weak in effectively measuring clinical performance (Kegel-Flomm, 1975).

Quality clinical performance requires not only cognition but also proficiency in the affective and psychomotor domains (Blagg, 1985). It is in these latter domains that assessment of non-cognitive predictors

would be beneficial. Cognitive predictors coupled with non-cognitive predictors would provide a more complete evaluation of the potential of community college radiologic technology applicants (Appendix I - Weighting Mechanism for Radiologic Technology Applicant Data).

Higher education attempts to give a student more than just an education. It develops talents and "adds value" to the student. In higher education circles, this concept is referred to as "value added." In his book Four Critical Years, Alexander W. Astin (1977) discussed the "value added" effects of going to college. Later, in Minorities in American Higher Education (1982), Astin wrote:

If an institution exists to educate students, its mission is to produce certain desirable changes in students or, more simply, to make a difference in the student's life (Astin, 1982).

The "value-added" approach to the goals of higher education suggests that admissions procedures should be designed to select students who are likely to be influenced by the educational process (Astin, 1982). In the simplest of terms, the measure of an institution's success in educating its students is the difference between the students' performance or abilities upon leaving the institution and that upon entry (Astin, 1982). Therefore, the value-added concept should be accepted by allied health educators, including those responsible for admissions to radiologic technology programs, as perhaps the most important indication of educational quality and institutional effectiveness. Astin (1983) noted that:

"in value-added terms, the quality of an institution is based not on the performance level of the students it admits, but on the changes or improvements in performance that the institution is able to effect in its students" (Astin, 1983).

Radiologic technology students--the personnel of tomorrow--will need

to begin to develop special skills in order to deal with future changes. Because of the dynamic nature of health service delivery, flexibility in the education processes for preparing students to meet future allied health care demands will become more important in promoting growth, motivation and progress. To meet these new service demands, community college radiologic technology programs will have to be aware that the future availability of allied workers cannot be separated from larger trends in the U.S. labor force. The participation rates of various groups such as women and racial ethnic minorities will have to be more prevalent than in the past, and community college radiologic technology programs will have to include the study of human values, illness prevention and health promotion methods, as well as the study of delivery systems, including roles and functions of allied health personnel, patient's rights, legal risks, cost-effectiveness and quality control. Clinical and didactic education will have to be integrated with the range and types of clinical education centers used and modality training expanded to meet increased health service demands. Health care professionals and educators should consider programming activities for all students to promote a positive academic climate. The opportunity to increase minority enrollment in radiologic technology distinguishes mentoring as a strategy to accomplish this goal. Second to recruitment is the retention of minority students in radiologic technology programs. The perceptions and issues raised throughout this survey take on a special significance in the nation's struggle to provide optimal patient care.

Employment in the field of radiologic technology is expected to grow much faster than the average for all allied health occupations through the year 2000, reflecting the importance of radiologic technology in the

diagnosis and treatment of disease. The prevention diagnosis and treatment of disease will rely on sound clinical skills, effective communication skills, accurate information, and effective intervention. Each area can be enhanced by appropriate medical technological support. This support can include a broad spectrum of devices, techniques, agents and information systems that can be brought to be in the health care setting (Pew Health Professions Commission, 1991). Long-term prospects for radiologic technologists will continue to be influenced by future trends in enrollments in formal training programs.

This "value-added" approach to the goals of higher education suggests that admissions procedures should be designed to select students who are likely to be influenced by the educational process (Astin, 1982). The increase in medical imaging technology has affected the delivery of health care in the United States and has created an environment that demands a competent as well as a multiskilled radiologic technologist. Machiavelli said, "there is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success than to take the lead of thinking." Multiskilling is a new order of thinking about how to change the way we educate and employ our health care workforce. It is this challenge that community college radiologic technology program directors will need to address as they re-evaluate recruitment, admission and selection criteria for community college radiologic technology programs. The objective will be to tie selection criteria to program curricula to the Registry to success in the field and a means to accomplish this will be to examine community college radiologic technology cognitive and non-cognitive selection criteria.

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**APPENDICES**



**APPENDIX A**

**ESSENTIALS AND GUIDELINES OF AN ACCREDITED EDUCATIONAL  
PROGRAM FOR THE RADIOGRAPHER**

# Essentials and Guidelines

of an Accredited Educational Program for the Radiographer

Essentials initially adopted 1944; revised in 1955, 1969, 1978, 1983, and 1990 by the

American College of Radiology

American Medical Association

American Society of Radiologic Technologists

The Committee on Allied Health Education and Accreditation (CAHEA) accredits programs upon the recommendation of the Joint Review Committee on Education in Radiologic Technology.

Essentials are the standards for accrediting educational programs that prepare individuals to enter an allied health profession recognized by the American Medical Association. The extent to which a program complies with these standards determines its accreditation status; the Essentials, therefore, include all requirements for which an accredited program is held accountable. Essentials are printed in regular typeface in outline form.

Guidelines assist programs in complying with the Essentials by providing examples of how general statements in Essentials may be interpreted. Guidelines are printed in italic typeface in narrative form.

## Preamble

### Objective

The American College of Radiology, the American Medical Association, and the American Society of Radiologic Technologists cooperate to establish, maintain, and promote appropriate standards of quality for educational programs in radiography and to provide recognition for educational programs which meet or exceed the standards outlined in the Essentials.

These standards are to be used for the development and self-evaluation of radiography programs. Site visit teams assist in the evaluation of a program's compliance with the Essentials. Lists of accredited programs are published for the information of students, employers, and the public.

### Description of the Profession

The profession of radiography requires the ability to provide appropriate healthcare services. Radiographers are highly skilled professionals qualified by education to perform imaging examinations and accompanying responsibilities at the request of physicians qualified to prescribe and/or perform radiologic procedures. The radiographer is able to:

1. Apply knowledge of anatomy, physiology, positioning, and radiographic techniques to

accurately demonstrate anatomical structures on a radiograph or other imaging receptor.

2. Determine exposure factors to achieve optimum radiographic techniques with minimum radiation exposure to the patient.

3. Evaluate radiographic images for appropriate positioning and image quality.

4. Apply the principles of radiation protection to the patient, self, and others.

5. Provide patient care and comfort.

6. Recognize emergency patient conditions and initiate lifesaving first aid and basic life-support procedures.

7. Detect equipment malfunctions, report same to the proper authority and know the safe limits of equipment operation.

8. Exercise independent judgment and discretion in the technical performance of medical imaging procedures.

9. Participate in radiologic quality assurance programs.

10. Provide patient/public education related to radiologic procedures and radiation protection/safety.

## Requirements for Accreditation

### 1. Sponsorship

A. The sponsoring institution and affiliates, if any, must be accredited by recognized agencies or meet equivalent standards.

Programs in which academic and clinical education are provided by two or more institutions must ensure that responsibilities, including

program administration, instruction, student supervision, evaluation, and other educationally related functions, are clearly described in written documents, such as an affiliation agreement or memorandum of understanding.

## Requirements for Accreditation

*continued*

*Institutional accreditation establishes evidence that the program sponsor meets recognized professional standards for its primary mission. This same evidence should also be the basis for determining whether or not an institution meets equivalent standards.*

*Sponsoring institutions utilizing affiliate clinical education centers are expected to ensure that these health care facilities are appropriately accredited.*

*Hospitals involved in an educational program must maintain current accreditation through the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) or maintain equivalent standards. Equivalent standards include accreditation by the American Osteopathic Association (AOA). Hospitals without JCAHO or AOA accreditation will be considered individually.*

*The written affiliation agreement, signed by the appropriate officers, should include a clear delineation of responsibilities with regard to program administration, instruction, student supervision, evaluation, liability, and appropriate financial arrangements. This agreement should include a termination clause with sufficient notice to protect enrolled students and ensure an orderly revision of the educational program. Affiliation agreements should be periodically reviewed and revised as necessary. Each institution should maintain a copy of the affiliation agreement.*

**B.** Educational programs may be established in:

1. Community and junior colleges, senior colleges, and universities;
2. Hospitals;
3. Medical schools;
4. Postsecondary vocational/technical schools and institutions;
5. Military/governmental facilities;
6. Proprietary schools;
7. Other institutions or consortia which meet comparable standards for education in radiography.

*A consortium is defined as two or more academic or clinical institutions that have formally agreed to sponsor the development and continuation of an educational program. The consortium must be structured to recognize and perform the responsibilities and functions of a sponsoring institution.*

**C.** Accreditation is granted to the institution that assumes primary responsibility for curriculum planning and selection of course content, coordinates classroom teaching and supervised clinical education, appoints faculty to the program, receives and processes applications for admission, and grants the certificate or degree

documenting completion of the program. The sponsoring institution shall also be responsible for providing assurance that the activities assigned to students in the clinical setting are educational.

*Should program discontinuation become necessary, an orderly plan to protect the rights of enrolled students to complete their education should be provided. Minimally, the sponsor should assist students in placement for completion of education.*

## II. Resources

### A. General Resources

Resources must be adequate to support the number of students admitted to the program. The instructor/student ratio shall be adequate to achieve the stated objectives of the curriculum.

An appropriate variety of modern imaging equipment, to include computed tomography and ultrasound, shall be available.

Clinical facilities shall provide students with an ample variety and volume of radiologic procedures for competency achievement in head/neck, abdominal/gastrointestinal/genitourinary, musculoskeletal, chest, and breast categories involving children and adults. Trauma, bedside, and surgical procedures shall be provided.

Educational opportunities in neuroradiological, cardiovascular, and interventional procedures shall be provided.

*Student awareness and experience in state of the art imaging modalities should be assured.*

### B. Personnel

#### 1. Program Officials

The program shall have a program director and a medical director/advisor; other program officials may be necessary. In accordance with institutional policies and practices, these officials shall assume the responsibilities and possess the qualifications described below.

##### a. Program Director

###### (1) Responsibilities

The director shall be full-time and shall be responsible for the organization, administration, periodic review, continued development, and general effectiveness of the program. The director shall be responsible for evaluating and assuring clinical education

effectiveness through a schedule of regular visits to the clinical education center(s). These responsibilities shall not be adversely affected by educationally unrelated functions. The director shall maintain current knowledge of imaging techniques and educational methodology through continuing professional development.

**(2) Qualifications**

- (a) Shall possess proficiency in, but not limited to, the areas of curriculum design, program administration/evaluation, instruction, and counseling.
- (b) Shall be credentialed, in good standing, in radiography by the American Registry of Radiologic Technologists or possess suitable equivalent qualifications.
- (c) Shall document the equivalent of three years full-time professional experience as a radiographer.
- (d) Shall document a baccalaureate degree or suitable educational equivalent.
- (e) Shall document a minimum of two years experience as an instructor in an accredited radiography program.
- (f) Shall meet the criteria for the position as established by the sponsoring institution.

*The instructor experience may have been attained concurrently with the professional experience requirement.*

*A position description for the director should delineate the specific tasks to fulfill program responsibilities. The program director should assume a leadership role in the continued development of the program, including procedures required by the accreditation review process.*

*The program director should be knowledgeable of program-related revenue and costs.*

*Documentation of all visits to clinical education centers should be maintained.*

**b. Clinical Coordinator**

Programs with four or more clinical education centers shall have a full-time faculty member designated as clinical coordinator.

**(1) Responsibilities**

The clinical coordinator shall be responsible for coordinating clinical education with didactic education as assigned by the program director. Clinical education effectiveness shall be evaluated and assured through a schedule of regular visits to the clinical education centers. The clinical coordinator's responsibilities shall include coordination, instruction, and evaluation. The clinical coordinator shall maintain current knowledge of imaging techniques and educational methodology through continuing professional development.

**(2) Qualifications**

- (a) Shall possess proficiency in curriculum development, supervision, instruction, evaluation, and counseling.
- (b) Shall be credentialed, in good standing, in radiography by the American Registry of Radiologic Technologists or possess suitable equivalent qualifications.
- (c) Shall document the equivalent of two years full-time professional experience as a radiographer.
- (d) Shall document a minimum of one year of experience as an instructor in an accredited radiography program.
- (e) Shall meet the criteria for the position as established by the sponsoring institution.

*The instructor experience may have been attained concurrently with the professional experience requirement.*

*A position description for the clinical coordinator should specify the tasks related to these responsibilities. Tasks may include didactic instruction.*

**c. Clinical Instructor**

A clinical instructor shall be designated at each clinical education center.

The number of clinical instructors at any clinical facility is determined by designation of one full-time equivalent clinical instructor for every ten students on-site involved in the competency-based clinical education process.

**(1) Responsibilities**

The clinical instructor(s) shall be knowledgeable of the program goals, clinical objectives, and clinical evaluation system. The clinical instructor(s) shall provide students with appropriate and adequate clinical instruction/supervision and shall evaluate student clinical competence. Performance of these responsibilities shall not be adversely affected by educationally unrelated functions. The clinical instructor(s) shall maintain competency in imaging, instructional, and evaluative techniques through continuing professional development.

*A position description for the clinical instructor(s) should specify the tasks related to these responsibilities and allocate adequate released time for accomplishment. The clinical instructor(s) should meet regularly with the program director and if appropriate, with the clinical coordinator.*

**(2) Qualifications**

- (a) Shall be a radiographer competent in instructional and evaluative techniques.

**Requirements  
for Accreditation**  
*continued*

**Requirements  
for Accreditation**  
*continued*

(b) Shall be credentialed, in good standing, in radiography by the American Registry of Radiologic Technologists or possess suitable equivalent qualifications.

(c) Shall document the equivalent of two years full-time professional experience as a radiographer.

(d) Shall meet the criteria for the position as established by the sponsoring institution.

**d. Medical Director/Advisor**

**(1) Responsibilities**

The medical director/advisor shall work in consultation with the program director in developing program goals and objectives and in implementing and assuring standards for achievement.

**(2) Qualifications**

The medical director/advisor shall be a radiologist certified by the American Board of Radiology or possess suitable equivalent certification.

*The medical director/advisor should be associated with a recognized clinical education center for the program.*

**2. Didactic Faculty (Professional/Technical Curriculum Related)**

**a. Responsibilities**

Didactic faculty shall be responsible for submitting outlines for each course assigned by the program director; evaluating students and reporting progress, as required by the sponsoring institution; and cooperating with the program director in periodic review and revision of course materials. Didactic faculty shall maintain appropriate expertise and competencies through continuing professional development.

**b. Qualifications**

Didactic faculty must be individually qualified, must be effective in teaching the subject(s) assigned, and must meet the standards defined by the sponsoring institution.

**c. Didactic Faculty/Student Ratio**

The didactic faculty/student ratio shall be adequate to achieve the stated objectives of the curriculum.

**3. Clinical Staff**

**a. Responsibilities**

Clinical staff having responsibilities for student education and supervision shall understand the competency-based clinical education plan and shall be supportive of the educational process.

**b. Qualifications**

Clinical staff shall be credentialed, in good standing, in radiography by the American Registry of Radiologic Technologists or possess suitable equivalent qualifications.

*Program sponsors should establish policies governing academic preparation and experiences required to fulfill instructional responsibilities. All faculty should be familiar with the goals of the program and should have the ability to develop an organized plan of instruction and evaluation. Clinical staff should meet regularly with appropriate program officials to maintain current knowledge of program policies/procedures and student progress. All personnel related to the educational program should document their competence to contribute to the education of the students. Important criteria that should be considered include: knowledge of subject matter, ability to organize and present the subject, a positive attitude toward teaching, and participation in continuing education to improve instructional skills and maintain professional competence. Policies for faculty should be consistent with policies for other comparable program faculty at the institution.*

**C. Professional Development**

Programs shall demonstrate encouragement of continuing professional growth to provide assurance that program faculty and officials can fulfill the responsibilities delineated in the Essentials.

*The program should provide for the continued development of instructors and should include requirements for demonstrating and maintaining knowledge of current trends in clinical radiography as well as teaching proficiency.*

*The program should establish a method for evaluating the means by which instructional expertise is assessed and the means available to the faculty to augment that expertise. Program outcomes, such as meeting institutional and program goals, preparing competent radiographers and maintaining professional and teaching competence, should be utilized for faculty and curriculum evaluation.*

*In college-sponsored programs, policies relating to faculty teaching loads should be consistent with institutional policy.*

*In hospital and similarly sponsored programs, faculty should be granted sufficient released time from other responsibilities for preparation of instructional material.*

**D. Financial Resources**

Financial resources shall be ensured to fulfill obligations to enrolled students.

*The sponsoring institution should show financial responsibility to the program by developing a program budget or by showing financial commitment to the program within the institutional budget. Budget planning should be the responsibility of the program director, in*

*cooperation with the medical director/advisor, appropriate faculty, and administrative officers.*

*Adequate identifiable financial resources should be allocated to ensure a sound educational program.*

*The budget should reflect sound educational priorities. Priority should be given to the improvement of the educational process.*

#### **E. Physical Resources**

##### **1. General**

Adequate classrooms, laboratories, administrative offices, and other facilities shall be provided. All affiliated institutions shall provide adequate and appropriate space to assure achievement of program goals and educational objectives.

Documentation that energized laboratories meet federal and/or local radiation safety regulations shall be posted or otherwise readily available for inspection.

*The instructional facilities should be compatible with the instructional strategies employed by the program and aid the achievement of program goals and curricular objectives. The facilities provided for instruction are one measure of institutional commitment to the program and the achievement of its goals.*

*Laboratory equipment should aid and support development of clinical competencies. The objectives and evaluation methods for the use of this equipment should be made available to the students. Laboratory experiences should be supervised.*

*Offices for administrative and instructional staff should be reasonably accessible and suitably private to be conducive to planning, research, evaluation, and counseling activities. Security for student records, instructional materials, and other appropriate program-related materials should be provided.*

##### **2. Clinical**

Appropriate facilities for supervised clinical education shall be available. The sponsoring institution shall assure that all clinical education centers and minor affiliates conform to the radiation safety standards as defined by federal, state, and local regulations.

Characteristics of clinical education centers shall be reviewed by the JRCERT to ensure that they meet the criteria to provide appropriate clinical education opportunities. Clinical education centers require JRCERT recognition.

The program sponsor shall assure formalization of minor affiliations through documentation.

- a. Student capacity is determined for each clinical education center. The maximum number of students admitted per year shall

not exceed the approved total clinical student capacity for the program.

- b. Maximum student enrollment shall not exceed the capacity determined according to personnel available for appropriate student clinical supervision. The ratio of staff to students prior to student competency achievement in a given examination or procedure shall not exceed 1:1.

*Hospitals, physician offices, and imaging centers may be utilized as clinical education centers or minor affiliates.*

*A minor affiliate is an institution that enhances the curriculum by providing specialized clinical education opportunities. A minor affiliate should meet the criteria established for a clinical education center, except for the availability of specific varieties of radiologic procedures. The total duration of minor affiliation involvement for any student should comprise no more than eight weeks of the total curriculum. Minor affiliates do not require JRCERT recognition.*

*A memorandum of understanding between the sponsoring institution and each minor affiliate should exist, signed by appropriate administrative representatives. The memorandum should minimally include the purpose and extent of the affiliation and delineation of responsibilities for instruction, student supervision, evaluation, and liability.*

*One first-year clinically involved student may be admitted for each qualified staff radiographer, certified by the American Registry of Radiologic Technologists or possessing suitable equivalent qualifications, employed during daytime clinical education hours. Part-time personnel may be considered on the basis of full-time equivalents. Technical personnel with primary responsibilities for management/supervision, radiation oncology, nuclear medicine, medical ultrasound, and magnetic resonance imaging are not considered in determining student capacity.*

##### **3. Equipment and Supplies**

Appropriate modern equipment and supplies, with adequate storage space, shall be provided in sufficient quantities for both didactic and supervised clinical education facilities. Instructional aids shall be provided as required by the types of learning experiences delineated in the curriculum for didactic and supervised clinical education.

*A variety of teaching aids and audiovisual equipment to support and enhance the curriculum should be available.*

## **Requirements for Accreditation**

*continued*

## Requirements for Accreditation

*continued*

### 4. Library

Students shall have ready access to an adequate supply of up-to-date books, periodicals, and other reference materials related to the curriculum.

*The library owned and maintained by the program sponsor should contain enough printed and other media holdings to accommodate required study, to promote independent study and research, and to aid faculty in delivering and improving the program. Clinical education centers should provide access to reference materials to support the clinical assignments; these and/or supplementary materials may be supplied at the sponsoring institution.*

*Holdings related to the radiography program should be indexed and available to students and faculty.*

*The sponsoring institution should provide funds on a continuing basis for purchase of periodicals and publications pertinent to radiography. Faculty should provide guidance and direction in the purchase of such resources.*

### III. Curriculum

Instruction shall follow a master plan that documents:

**A.** A structured curriculum with clearly written course syllabi which describes learning objectives and competencies to be achieved for both the didactic and supervised clinical education components. The structure of the professional curriculum shall be based on didactic content of appropriate scope and depth, as well as on integrated, supervised clinical education of sufficient volume and variety to assure adequate opportunity to acquire needed knowledge and skills.

*The curriculum should be based on clearly stated objectives that identify professional competencies and include cognitive, affective, and psychomotor capabilities. The objectives should guide the development and use of effective teaching strategies that take into consideration the patterns of radiography healthcare delivery and make optimum use of clinical education opportunities.*

The curriculum shall be based on two years of full-time study. A program shall be recognized through the accreditation/continuing accreditation process as encompassing a specific educational period. Changes in the length of the educational period must be evaluated by the JRCERT. Any program, regardless of duration, shall comply with all Essentials.

Curriculum content to produce graduates who are both competent and compassionate shall be provided. Instilled professional values shall be evidenced by affective domain objectives and evaluations.

*Each program should establish and maintain a master plan for education, available for student and faculty review, to include:*

*Institution and program philosophies and goals*

*Curriculum sequence*

*Course descriptions, course outlines, and performance (behavioral) objectives*

*Textbooks assigned by course*

*Competency-based clinical education demonstrating integration and correlation with the didactic component*

*Performance objectives for clinical education*

*Graduate competencies*

*Strategies and instruments utilized for evaluation of student behaviors in the cognitive, psychomotor, and affective domains*

*Grading policy/derivation*

*Program policies*

*Outcomes assessment process, conducted on a regular basis, utilizing internal and external indicators to include:*

*Advisory committee or equivalent*

*Student and faculty evaluations*

*Exit interviews with graduating students*

*Postgraduate and employer follow-ups*

*Ongoing program evaluation*

*Graduate credentialing*

*Examination results*

**B.** Appropriate learning experiences and curriculum sequencing to develop the competencies necessary for graduation. Curriculum design shall include appropriate instructional materials, classroom presentations, discussions, demonstrations, and supervised clinical assignments to support the curriculum. Appropriate prerequisite knowledge shall be identified. The maximum hours of clinical and academic involvement required by the program shall not exceed 40 hours per week. The curriculum shall include, but not be limited to, the following content areas:

Introduction to radiography

Medical ethics and law

Medical terminology

Methods of patient care

Human structure and function

Radiographic procedures

Principles of radiographic exposure

Imaging equipment

Radiographic film processing

Evaluation of radiographs

Radiation Physics  
 Principles of radiation protection  
 Principles of radiation biology  
 Radiographic pathology  
 Introduction to quality assurance  
 Introduction to computer literacy  
 Structured competency-based clinical education

*The requirements for degree or certificate of completion should be consistent with the requirements for other degrees or certificates awarded by the institution.*

Competencies developed by the program shall be supported by specific behavioral objectives documented throughout the didactic and clinical curriculum and shall include, but not be limited to, the following knowledge areas:

#### 1. Patient Care and Management

##### Goals:

- a. The graduate will provide basic patient care and comfort and anticipate patient needs.
- b. The graduate will provide appropriate patient education.

#### 2. Radiation Protection

##### Goal:

The graduate will practice radiation protection.

#### 3. Imaging Procedures

##### Goals:

- a. The graduate will understand basic x-ray production and interactions.
- b. The graduate will operate medical imaging equipment and accessory devices.
- c. The graduate will position the patient and medical imaging system to perform examinations and procedures.
- d. The graduate will exercise independent judgment and discretion in the technical performance of medical imaging procedures.
- e. The graduate will demonstrate knowledge of human structure, function, and pathology.

#### 4. Quality Assurance

##### Goals:

- a. The graduate will demonstrate knowledge and skills relating to quality assurance activities.
- b. The graduate will evaluate the performance of medical imaging systems.
- c. The graduate will evaluate medical images for technical quality.

#### 5. Recording Media Processing

##### Goal:

The graduate will demonstrate knowledge and skills relating to medical image processing.

#### 6. Equipment Maintenance

##### Goals:

- a. The graduate will understand the safe limits of equipment operation.

- b. The graduate will recognize equipment malfunctions and report them to the proper authority.

#### 7. Interpersonal Communication

##### Goal:

The graduate will demonstrate knowledge and skills relating to verbal, nonverbal, and written medical communication in patient care intervention and professional relationships.

#### 8. Professional Responsibility

##### Goal:

The graduate will support the profession's code of ethics and comply with the profession's scope of practice.

#### 9. Clinical Education

##### Goal:

The graduate will competently perform a full range of radiologic procedures on children and adults in the following categories:

Head/neck  
 Abdominal/gastrointestinal/genitourinary  
 Musculoskeletal  
 Chest and breast  
 Trauma  
 Bedside  
 Surgical

The policies and processes by which students receive clinical education shall be published and made known to all concerned.

*Planned and structured clinical education should include the following:*

*Documented student prerequisite knowledge in:*

*basic radiation protection  
 basic patient care and clinical skills  
 principles and procedures related to image quality*

*Competency-based clinical evaluations, based on actual radiographic examination performance. Simulation may be utilized for infrequent or limited volume examinations. Simulation should comprise a minor component of clinical evaluations.*

*Sponsor support for the As Low As Reasonably Achievable Concept (ALARA) Opportunities for elective rotations may be provided in areas such as specialized imaging, radiation oncology, nuclear medicine, and medical ultrasound.*

Until a student achieves and documents competency in any given procedure, all clinical assignments shall be carried out under the direct supervision of qualified radiographers. The parameters of direct supervision are:

1. A qualified radiographer reviews the request for examination in relation to the student's achievement;

**Requirements  
 for Accreditation**  
*continued*



## Requirements for Accreditation *continued*

2. A qualified radiographer evaluates the condition of the patient in relation to the student's knowledge;
3. A qualified radiographer is present during the conduct of the examination; and
4. A qualified radiographer reviews and approves the radiographs.

In support of professional responsibility for provision of quality patient care and radiation protection, unsatisfactory radiographs shall be repeated only in the presence of a qualified radiographer, regardless of the student's level of competency.

*After demonstrating competency, students may perform procedures with indirect supervision.*

*Indirect supervision is defined as that supervision provided by a qualified radiographer immediately available to assist students regardless of the level of student achievement.*

*"Immediately available" is interpreted as the presence of a qualified radiographer adjacent to the room or location where a radiographic procedure is being performed. This availability applies to all areas where ionizing radiation equipment is in use.*

**C.** Periodic didactic and clinical evaluation of students to assess cognitive, psychomotor, and affective domains; problem solving skills; and psychomotor, affective, and clinical competencies.

*The evaluation system should relate to the program philosophies, goals, and competencies; provide students with ongoing as well as terminal evaluations, and serve as a reliable indicator of the effectiveness of instruction and course design. Periodic evaluation should be conducted at appropriate intervals. Criteria for successful performance should be equitably applied without discrimination. Students who do not make satisfactory progress according to these criteria should be provided with developmental assistance or, following due process, should be dismissed from the program.*

*Programs should provide reasonable time requirements for completion of the curriculum by all students. Program completion should depend on documented achievement of defined objectives and competencies as required by the curriculum. Transfer and advanced placement students should be defined by policy.*

*On the basis of student achievement of published program requirements in advance of the established time frame, the program may establish a policy for individual student early release. To assure that this early release is not an arbitrary decision and to establish program accountability, the following documentation should be available:*

1. *The program master plan of education should include the availability of an early release option for eligible students as well as the possibility of program length extension for students unable to complete program requirements in the established time frame.*

2. *Individual student records should include evidence of the successful completion of didactic and clinical courses and achievement of all competencies as required by the program.*

*Students should not be released to meet geographical or institutional manpower needs.*

*Implementation of an early release option is subject to prevailing local laws and institutional policy. Programs are responsible for maintaining documentation to substantiate early student release actions.*

## IV. Students

### A. Program Description

Students shall be provided with a well-defined, accurate and complete published description of the program and its content, including learning goals, course objectives, clinical education requirements, competencies to be achieved, student evaluation processes, and the criteria for successful program completion.

*In addition, the following items or information should be available:*

*Certification information, state licensure information, if appropriate*

*Absences/compensatory time policies and procedures*

*Policy for student reporting of exposure to or contraction of communicable disease*

*Clinical infection control procedures*

*Standards of conduct and performance*

*Disciplinary policies and procedures*

*Financial information*

*Essentials and Guidelines of an*

*Accredited Educational Program for the Radiographer*

### B. Admission

Admission of students, including advanced placement, shall be made in accordance with generally accepted criteria and procedures of the institution. These criteria and procedures shall be clearly defined and published.

Academic and technical standards required for admission to the program shall be clearly defined and published.

Program officials shall be responsible for establishing a procedure for determining that applicants and students meet the technical standards of the program.

As a minimum, sponsors shall insure that:

1. Applicants are high school graduates, or equivalent, with an appropriate educational background in mathematics and science.
2. For academic program sponsors, students meet the admission criteria of the sponsoring institution.
3. For hospital program sponsors, an admission committee is established and standard criteria for student selection are developed and utilized.

*Programs should carefully evaluate applicants' existing knowledge base in subject areas such as mathematics and science. Applicants lacking prerequisite competence in these areas should be counseled for appropriate remediation prior to program acceptance, to reduce potential attrition and to permit program concentration on the didactic and clinical education required by the curriculum.*

*Programs accommodating open admission philosophies should establish clear policies defining the criteria for admission to the program. Objective testing or standardized evaluations should be utilized to provide program officials assurance that applicants can reasonably be expected to achieve graduate competencies. If pre-professional periods of study are involved, the policies should guarantee suitable clinical education opportunities for all students successfully completing the pre-professional period. Programs should evaluate the selection criteria periodically to assess the effect on student performance or attrition.*

*Reasonable accommodation should be provided to applicants with disabling conditions. Technical standards, based on tasks performed by a graduate radiographer, should provide applicants with a clear understanding of physical demands required by the program.*

#### C. Evaluation

Criteria for successful completion of each segment of the curriculum and for graduation shall be given in advance to each student. Evaluation systems shall include content related to the objectives and competencies described in the curriculum for both didactic and supervised clinical education components. Documented evaluation shall be employed frequently enough to provide both students and program officials with timely indications of academic standing and progress and to serve as a reliable indicator of the effectiveness of instruction and course design.

#### D. Health Services

Students shall be informed of, and have access to, student healthcare services if provided by the institution. Fees associated with healthcare services shall be published. The health and safety of students, faculty, and patients associated with educational activities must be ade-

quately safeguarded through documented policies and procedures.

#### E. Guidance

Student guidance shall be available, to include assisting students in understanding and observing program policies and practices, and providing counseling or referral for personal problems that may interfere with progress in the program.

Documentation of regular and timely discussions with qualified faculty of student strengths, weaknesses, and progress shall be maintained.

*Students should have access to faculty and professional counseling.*

### V. Operational Policies

#### A. Fair Practices

1. Radiation protection monitoring practices for students shall conform to appropriate state and federal regulations.

2. A policy related to the provisions made for student pregnancy shall be published and made known to female applicants.

*Program officials should consult with institutional radiation safety officers to assure that the policy reflects current radiation protection philosophy. Considerations related to sound educational principles regarding appropriate leave and student reinstatement should be included in the policy. Student counseling should be available.*

3. Announcements and advertising must accurately reflect the program offered.

*Information should be available to all persons involved with the program and to all who demonstrate intent to apply for program admission. Information for applicants should include program length and describe required travel to clinical education centers, if appropriate.*

4. Student recruitment and admission practices and faculty recruitment and employment practices shall be non-discriminatory with respect to race, color, creed, sex, age, handicap(s), or national origin.

5. Academic credit and costs to the student shall be accurately stated, published, and made known to all applicants.

6. Policies and processes for student withdrawal, and refunds of tuition and fees, shall be published and made known to all applicants.

7. Appropriate due process and appeal mechanisms shall be available and made known to all students.

### Requirements for Accreditation

*continued*

**Requirements  
for Accreditation**  
*continued*

*Evidence should be available that students are informed of due process and appeal mechanisms with regard to unfavorable evaluations, disciplinary actions, suspensions, and dismissals.*

8. Policies and processes by which students may perform related work while enrolled in the program must be published and made known to all concerned in order to avoid practices in which students are substituted for regular staff. Students shall not take the responsibility or the place of qualified staff. However, after demonstrating competency, students may be permitted to perform procedures with appropriate supervision.

Programs in states requiring licensure of radiographers must comply with appropriate regulations applicable to students.

**B. Student Records**

Satisfactory records shall be maintained for student admission, attendance, and evaluation. Grades and credits for courses shall be recorded on the student transcript and permanently maintained by the sponsoring institution.

Students shall have access to personal radiation monitoring records. Radiation monitoring records shall be maintained, as required by state or federal regulations.

*Records should be maintained for all courses attempted and/or completed by all students.*

*The master plan for education should include a system for maintaining records in order to document achievement of program goals and objectives; to indicate compliance with accrediting and program policies; and to provide a database for program self-evaluation. Provisions for availability and security of records should comply with the "Family Educational Rights and Privacy Act of 1974" (Buckley Amendment). The system should be sufficiently detailed to provide for the continuity, delivery, and evaluation of the program in the event of staff changes.*

**VI. Continuing Program Evaluation**

**A.** The program shall have an ongoing process for periodic and systematic review of program effectiveness. The self-study report required by the accreditation review is one element of this process.

**B.** The results of program evaluation must be appropriately reflected in review and revision of the curriculum and other program elements.

*Ongoing, systematic program self-evaluation should consider outcomes related to the student, the institution, and society. Self-evaluation should assist the program in decision making, enhancing input, and improving processes. All staff and faculty should be involved in program self-evaluation efforts.*

*Institutional and program missions should be considered as a program evaluates its goals and considers revisions based on curriculum review and other elements of the evaluation process.*

*Program evaluation should focus on behavioral changes in students as a result of the educational experience and should include assessment of the following graduate outcomes:*

- 1. Knowledge—Understanding of general and specific facts, processes, theories, and methodologies.*
- 2. Skills—Attainment of competencies to include academic, clinical, communicative, interpersonal, and leadership.*
- 3. Values and Beliefs—Development of appropriate professional attributes.*
- 4. Interactions and Relationships—Acceptance by the institution, community, and profession as a practitioner.*

*Ongoing program evaluation should include, but is not limited to, assessment of items such as:*

- 1. Attrition/retention/academic delinquency rates and reasons.*
- 2. Average length of time to program completion.*
- 3. Student characteristics in comparison with other students enrolled in the institution in areas such as grade distribution, membership in professional societies, honors, and awards.*
- 4. Number of graduates in specified employment settings or in other types of education.*
- 5. Relevance of employment setting to the educational program.*
- 6. Percent of graduates passing credentialing exams (with number of attempts) and mean exam scores.*
- 7. Follow-up studies of alumni and employer satisfaction.*

**C.** Input from various groups, such as admission, curriculum, and advisory committees, and from other channels of communication shall be documented.

### A. Program/Sponsoring Institution Responsibilities

#### 1. Applying for Accreditation

The accreditation review process conducted by the Committee on Allied Health Education and Accreditation (CAHEA) can be initiated only at the written request of the chief executive officer or an officially designated representative of the sponsoring institution.

This process is initiated by requesting an application form from and returning it to:

Division of Allied Health Education and Accreditation  
American Medical Association  
515 North State Street  
Chicago, IL 60610

The Joint Review Committee on Education in Radiologic Technology, 20 North Wacker Drive, Suite 900, Chicago, IL 60606, requests additional application materials prior to guiding the program through completion of a self-study and preparation of the Self-Study Report.

A program or sponsoring institution may at any time prior to the final accreditation action withdraw its request for initial or continuing accreditation.

#### 2. Administrative Requirements for Maintaining Accreditation

Programs are required to comply with administrative requirements for maintaining accreditation, which include:

- a. Submitting the Self-Study Report or a required progress report within a reasonable period of time, as determined by the JRCERT.
- b. Agreeing to a reasonable site visit date before the end of the period for which accreditation was awarded.
- c. Informing the JRCERT within a reasonable period of time of changes in the positions of program director, medical director/advisor, clinical coordinator, and clinical instructor(s). If any position remains vacant for 30 days, the program shall send the JRCERT a description of the actions taken to maintain the continuity and effectiveness of the program.
- d. Submitting requests for recognition of new clinical education centers and increases in student capacities to the JRCERT prior to utilization or acceptance of students over the capacity authorized.
- e. Paying JRCERT accreditation fees within a reasonable period of time.
- f. Completing and returning by the established deadline the Annual Report provided by CAHEA.

Failure to meet these administrative requirements for maintaining accreditation may lead to being placed on Administrative Probation and ultimately to Withdrawal of Accreditation.

### Maintaining and Administering Accreditation

### B. CAHEA/Review Committee Responsibilities

#### 1. Administering the Accreditation Review Process

At the written request of the chief executive officer or an officially designated representative, CAHEA and the JRCERT review educational programs to assess compliance with the Essentials.

The accreditation review process includes a site visit. If the performance of a site visit team is unacceptable, the institution may request a second site visit. Responsibility for the cost of a second visit is determined by the JRCERT.

Before the JRCERT formulates its accreditation recommendation to CAHEA, the sponsoring institution is given an opportunity to comment in writing on the report of the site visit team and to correct factual errors.

Before transmitting a recommendation for Probationary Accreditation to CAHEA, the JRCERT provides the sponsoring institution with an opportunity to request reconsideration of the recommendation. Reconsideration is based on conditions existing when the JRCERT arrived at its recommendation to CAHEA and on subsequent documented evidence of corrected deficiencies provided by the applicant.

CAHEA awards of Probationary Accreditation are final and are not subject to further appeal.

#### 2. Withholding or Withdrawing Accreditation

Prior to recommending Accreditation Withheld or Accreditation Withdrawn to CAHEA, the JRCERT provides the sponsoring institution with an opportunity to request reconsideration. CAHEA decisions to withhold or withdraw accreditation are final unless appealed to CAHEA. A copy of the CAHEA Appeals Procedures for Accreditation Withheld or Withdrawn is included in the letter notifying the program of one of these actions.

When accreditation is withdrawn, the appropriate official is provided with a clear statement of each deficiency and is informed that application for accreditation as a new applicant may be made whenever the program is believed to be in substantial compliance with the Essentials.

All students successfully completing a program granted any accreditation category at any point during their tenure as students are regarded as graduates of a CAHEA-accredited program.

**Maintaining and  
Administering  
Accreditation**  
*continued*

**3. Inactive Programs**

The sponsoring institution may request inactive status for a program that does not enroll students for up to two years. Such programs must continue to pay annual fees to the JRCERT. After being inactive for two years, the program will be considered discontinued, and accreditation may be withdrawn.

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**Appendix**

The following materials are available to guide educators in program development:

The Curriculum Guide for Radiography Programs

Clinical Competency Evaluation Guide for Radiography

For information contact:

The American Society of Radiologic Technologists  
15000 Central Avenue SE  
Albuquerque, NM 87123  
(505) 298-4500

**APPENDIX B**

**ACT EXAMINATION SITES**

ACT Test Centers

Enter the correct codes for your first and second choice of test center in block T on page 4 of your registration folder and blacken the correct ovals. \*Non-Saturday test centers are available only to students whose religious faith prohibits taking the test on Saturday. Non-Saturday test centers are listed at the end of each state. The date in the test date column is the date the test center will give the examination. X = Test Center is open for that test date. O = See your counselor for the test date.

Table with columns for City, Code, Test Center, and Test Dates (Oct 23, 1993; Dec 11, 1993; Feb 5, 1994; Apr 8, 1994; Jun 11, 1994) for ALABAMA, ALASKA, ARIZONA, and ARKANSAS.

ACT Test Centers

\*Non-Saturday test centers are listed at the end of each state. See page 11 for eligibility.

X - Test Center is open for that test date. O - See your counselor for the test date.

Table listing ACT Test Centers across various states including Arkansas, California, Colorado, Connecticut, Delaware, and Florida. The table includes columns for City, Code, Test Center, and dates from Oct 23, 1993 to Jun 11, 1994.



ACT Test Centers

\*Non-Saturday test centers are listed at the end of each state. See page 11 for eligibility.

X = Test Center is open for that test date. O = See your counselor for the test date.

Table with columns for State, City, Code, Test Center, and dates (Dec. 21, 1993; Dec. 11, 1994; Feb. 5, 1994; Apr. 5, 1994; Jun. 11, 1994). It lists test centers for Florida, Georgia, Hawaii, Idaho, and Illinois.

**ACT Test Centers**

\*Non-Saturday test centers are listed at the end of each state. See page 11 for eligibility.

X = Test Center is open for that test date. O = See your counselor for the test date.

City	Code	Test Center	Oct. 23, 1993	Dec. 11, 1993	Feb. 5, 1994	Apr. 8, 1994	Jun. 11, 1994	City	Code	Test Center	Oct. 23, 1993	Dec. 11, 1993	Feb. 5, 1994	Apr. 8, 1994	Jun. 11, 1994	City	Code	Test Center	Oct. 23, 1993	Dec. 11, 1993	Feb. 5, 1994	Apr. 8, 1994	Jun. 11, 1994
<b>Illinois, cont.</b>								<b>Decatur</b>	7371	Douglas MacArthur H S	X	X	X	X	<b>Northlake</b>	7449	West Leyden H S	X	X	X	X	X	
Arlington Hts	9532	Hersey H S	X	X	X	X		Deerfield	7392	Deerfield H S	X	X	X	X	O'Fallon	7428	O'Fallon Township H S	X	X	X	X	X	
Aurora	7342	Aurora H S	X	X	X	X		Oes Planes	7394	Maene Twp H S West	X	X	X	X	Oak Lawn	7460	Harold L Richards H S	X	X	X	X	X	
	7344	Aurora Cent Catholic H S	X	X	X	X		Dixon	6829	Dixon H S	X	X	X	X	Oak Park	7451	Oak Park River Forest H S	X	X	X	X	X	
	8655	East H S	X	X	X	X		Dotson	7396	Thornridge H S	X	X	X	X	Oglesby	1056	Illinois Valley C C	X	X	X	X	X	
	7346	Marmion Military Academy	X	X	X	X		Downers Grove	9707	Donovan Sr H S	X	X	X	X	Orney	7452	East Richmond H S	X	X	X	X	X	
	7363	Waubesa Valley H S	X	X	X	X		Downers Grove	7397	Downers Grove North H S	X	X	X	X	Olympia Fields	7453	Rich Central H S	X	X	X	X	X	
	7345	West H S	X	X	X	X		Du Quoin	8743	Du Quoin H S	X	X	X	X	Orland Park	7454	Carl Sandburg H S	X	X	X	X	X	
Barrington	7348	Barrington H S	X	X	X	X		Dwight	6205	Dwight Township H S	X	X	X	X	Ottawa	7455	Ottawa Twp H S	X	X	X	X	X	
Bartonville	9475	Limestone Comm H S	X	X	X	X		East Peoria	7420	East Peoria Comm H S	X	X	X	X	Palatine	7384	Palatine H S	X	X	X	X	X	
Batavia	7349	Batavia Sr H S	X	X	X	X		East St. Louis	7376	East St. Louis H S	X	X	X	X	Palos Heights	7166	Alan B Shepard H S	X	X	X	X	X	
Beardstown	7526	Beardstown H S	X	X	X	X		Edwardsville	7422	Edwardsville H S	X	X	X	X	Palos Hills	1165	Trinity Christian Coll	X	X	X	X	X	
Beecher	7340	Beecher H S	X	X	X	X		Elgin	1147	S U Edwardsville Cam	X	X	X	X	Paris	7456	Paris H S	X	X	X	X	X	
Bellevue	7474	Alhoni Catholic H S	X	X	X	X		Elgin	1018	Elgin Comm Coll	X	X	X	X	Park Forest	7457	Rich Twp H S East Campus	X	X	X	X	X	
	0954	Illinois Wesleyan Univ	X	X	X	X		Elmhurst	6193	Elmhurst H S	X	X	X	X	Park Ridge	7458	Maene Twp H S East	X	X	X	X	X	
	7334	Bellevue West H S	X	X	X	X		Elmhurst	6851	Harold County H S	X	X	X	X	Pekin	7461	Pekin Comm H S	X	X	X	X	X	
Belvidere	7352	Belvidere H S	X	X	X	X		Elmwood Park	7503	Elk Grove H S	X	X	X	X	Peoria	7462	Peoria H S	X	X	X	X	X	
Bensenville	9144	Fenton H S	X	X	X	X		Eureka	1022	Eureka Coll	X	X	X	X	Peru	7501	St Beke Academy	X	X	X	X	X	
Berwyn	7354	J S Monroe H S West	X	X	X	X		Evergreen Park	7425	Evergreen Park H S	X	X	X	X	Petersburg	6942	Peter J R H S	X	X	X	X	X	
Bethalto	9594	Civic Memorial H S	X	X	X	X		Farfield	9547	Farfield Comm H S	X	X	X	X	Piaa	7744	Southwestern Sr H S	X	X	X	X	X	
Bloomington	7355	Bloomington H S	X	X	X	X		Farmer City	0995	Farmer Comm Coll	X	X	X	X	Pittsfield	7464	Pittsfield H S	X	X	X	X	X	
	1244	Illinois Wesleyan Univ	X	X	X	X		Fora	8254	Blue Ridge H S	X	X	X	X	Plainfield	7561	Plainfield H S	X	X	X	X	X	
Blue Island	7357	D D Eisenhower H S	X	X	X	X		Franklin Park	7426	East Leyden H S	X	X	X	X	Portia	7523	Portia Township H S	X	X	X	X	X	
Buff	6197	Buffs H S	X	X	X	X		Freeport	1078	Freeport Comm Coll	X	X	X	X	Princeton	6303	Princeton H S No 500	X	X	X	X	X	
Bourbonnais	9236	Bourbonnais H S	X	X	X	X		Galesburg	7410	Galesburg Sr H S	X	X	X	X	Quincy	7456	Quincy Sr H S	X	X	X	X	X	
Bradley	7358	Bradley Bourbonnais H S	X	X	X	X		Galesburg	7410	Galesburg Sr H S	X	X	X	X	Rantoul	7467	Rantoul Twp H S	X	X	X	X	X	
Brazilwood	6155	Reed Custer H S	X	X	X	X		Galesburg	6798	Gaena H S	X	X	X	X	Richton Park	9116	Rich South H S	X	X	X	X	X	
Briarwood	7528	Midway H S	X	X	X	X		Galesburg	1170	Carl Sandburg Coll	X	X	X	X	River Forest	8549	Trinity H S	X	X	X	X	X	
Bunker Hill	6636	Bunker Hill H S	X	X	X	X		Galesburg	7410	Galesburg Sr H S	X	X	X	X	River Grove	7454	Holy Cross H S	X	X	X	X	X	
Burbank	9044	Queen of Peace H S	X	X	X	X		Genaeva	7332	Genaeva Comm H S	X	X	X	X	Riverdale	7469	Riverside Brookfield Twp H S	X	X	X	X	X	
	7450	Reavis H S	X	X	X	X		Gilman	7548	Inquos West H S	X	X	X	X	Rock Island	7472	Albany H S	X	X	X	X	X	
	9210	St. Lawrence H S	X	X	X	X		Glen Ellyn	7411	Glenbrook West H S	X	X	X	X	Rock Island	7473	Rock Island H S	X	X	X	X	X	
Calhoun	6187	Calhoun H S	X	X	X	X		Glenview	9313	Glenbrook South H S	X	X	X	X	Rockford	7367	Bryan Catholic H S	X	X	X	X	X	
Carleton	0961	Spoon River Coll	X	X	X	X		Glenview	1038	Lewis & Clark Comm Coll	X	X	X	X	Rockford	7476	Rockford West Middle School	X	X	X	X	X	
Carlinville	1144	Southern Illinois Univ	X	X	X	X		Glenview	8390	Goreville H S	X	X	X	X	Rockford	7478	Rockford Comm H S	X	X	X	X	X	
Carlinville	7361	Carlinville H S	X	X	X	X		Glenview	7412	Glenview City Sr H S	X	X	X	X	Rockford	9314	Rolling Meadows H S	X	X	X	X	X	
Carlyle	6136	Carlyle H S	X	X	X	X		Glenview	7246	Bone County Comm Unit 2 H S	X	X	X	X	Romeoville	9065	Romeoville H S	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	
Carrollton	7362	Carrollton H S	X	X	X	X		Glenview	1032	Glenview Coll	X	X	X	X	Roselle	7479	Lake Park H S West	X	X	X	X	X	

**ACT Test Centers**

\*Non-Saturday test centers are listed at the end of each state. See page 11 for eligibility.

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City	Code	Test Center	Oct. 23, 1993	Dec. 11, 1993	Feb. 5, 1994	Apr. 5, 1994	Jun. 11, 1994	City	Code	Test Center	Oct. 23, 1993	Dec. 11, 1993	Feb. 5, 1994	Apr. 5, 1994	Jun. 11, 1994	City	Code	Test Center	Oct. 23, 1993	Dec. 11, 1993	Feb. 5, 1994	Apr. 5, 1994	Jun. 11, 1994
<b>Indiana, con't.</b>																							
Brownsville	6257	Brownsville H S	X	X	X	X	X	Creston	7539	Lincoln H S	X	X	X	X	Garnett	7581	Garnett H S	X	X	X	X	X	
Carmel	8040	Carmel H S	X	X	X	X	X	Creston	7538	Thomas Jefferson H S	X	X	X	X	Goodland	7585	Goodland H S	X	X	X	X	X	
Columbus	7535	Columbus East H S	X	X	X	X	X	Davenport	7541	Central H S	X	X	X	X	Great Bend	7586	Great Bend H S	X	X	X	X	X	
Connersville	7727	Connersville H S	X	X	X	X	X	Davenport	7542	Davenport West H S	X	X	X	X	Hays	1408	Fort Hays St Univ	X	X	X	X	X	
Crown Point	9318	Crown Point H S	X	X	X	X	X	De Witt	9224	Central H S	X	X	X	X	Hessport	7047	Hessport H S	X	X	X	X	X	
Culver	7514	Culver Academics	X	X	X	X	X	De Witt	1352	St Ambrose Univ	X	X	X	X	Highland	1418	Highland Comm Coll	X	X	X	X	X	
Danville	9654	Danville Comm H S	X	X	X	X	X	Decora	1330	Luther C	X	X	X	X	Hill City	7587	Hill City H S	X	X	X	X	X	
Decatur	8942	Belmont H S	X	X	X	X	X	Deionson	7543	Deionson Comm H S	X	X	X	X	Hiloboro	1468	Tabor Coll	X	X	X	X	X	
Edinburgh	8612	Edinburgh H S	X	X	X	X	X	Des Moines	9081	Dowling H S	X	X	X	X	Holton	6853	Holton H S	X	X	X	X	X	
Ellettsville	9356	Concord H S	X	X	X	X	X	Drake Univ	1302	Drake Univ	X	X	X	X	Humboldt	7588	Humboldt H S	X	X	X	X	X	
Elwood	9883	Elwood Comm H S	X	X	X	X	X	East H S	7544	East H S	X	X	X	X	Hutchinson	1420	Hutchinson Comm Coll	X	X	X	X	X	
Evansville	6504	Evansville Central H S	X	X	X	X	X	Grand View Coll	1316	Grand View Coll	X	X	X	X	Independence	1422	Independence Comm Coll	X	X	X	X	X	
	3225	Reitz H S	X	X	X	X	X	Herbert Hoover H S	9512	Herbert Hoover H S	X	X	X	X	Iola	1424	Allen Comm Coll	X	X	X	X	X	
	1188	Univ of Evansville	X	X	X	X	X	Lincoln H S	7545	Lincoln H S	X	X	X	X	Jennings	8196	Jennings H S	X	X	X	X	X	
	1207	Univ of Southern Indiana	X	X	X	X	X	North H S	7546	North H S	X	X	X	X	Jimtown	8719	Jimtown H S	O	X	X	X	X	
Fort Wayne	9317	Homestead H S	X	X	X	X	X	Roosevelt H S	7547	Roosevelt H S	X	X	X	X	Johnson	8345	Stanton County H S	X	X	X	X	X	
	7520	North Side H S	X	X	X	X	X	South H S	7548	South H S	X	X	X	X	Junction City	7595	Junction City H S	X	X	X	X	X	
	9293	R Nelson Snider H S	X	X	X	X	X	Wabash H S	7549	Wabash H S	X	X	X	X	Kansas City	7590	Washington H S	X	X	X	X	X	
Franklin	9033	Franklin Comm H S	X	X	X	X	X	Dubuque	1328	Dubuque	X	X	X	X	Kansas City	7591	Wyandotte H S	X	X	X	X	X	
Frankfort	9616	Claton Prange Jr Sr H S	X	X	X	X	X	Erldridge	9179	North H S	X	X	X	X	Kingman	7593	Kingman H S	X	X	X	X	X	
Gary	7515	West Side H S	X	X	X	X	X	Erldridge	1308	IA Lakes C C Emmetsburg	X	X	X	X	La Crosse	7594	Knobley H S	X	X	X	X	X	
Greenfield	9395	William A Wirt School	X	X	X	X	X	Erldridge	9627	Western Dubuque H S	X	X	X	X	Lawrence	7596	Lawrence H S	X	X	X	X	X	
Greenwood	8614	Greenwood Central H S	X	X	X	X	X	Estimote	9110	Iowa Lakes State Coll	X	X	X	X	Leavenworth	7598	Leavenworth Sr H S	X	X	X	X	X	
	9378	Center Grove H S	X	X	X	X	X	Fairfield	1317	Manahat Int'l Univ	X	X	X	X	Leavenworth	7599	Saint Mary Coll	X	X	X	X	X	
	6227	Greenwood Comm H S	X	X	X	X	X	Fayette	1360	Upper Iowa Univ	X	X	X	X	Lebanon	7599	Lawrence H S	X	X	X	X	X	
Hammont	6429	Bishop Noll Institute	X	X	X	X	X	Forrest City	1362	Walcott Coll	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	9325	Mohr Univ Calumet	X	X	X	X	X	Fort Dodge	9653	Fort Dodge Sr H S	X	X	X	X	Lebanon	7599	Saint Mary Coll	X	X	X	X	X	
	1233	Mohr Univ Calumet	X	X	X	X	X	Fort Dodge	1312	Iowa Central Comm Coll	X	X	X	X	Lebanon	7599	Lawrence H S	X	X	X	X	X	
Highland	7726	Highland H S	X	X	X	X	X	Fort Madison	9199	Fort Madison H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Hove	7516	Hove Military School	X	X	X	X	X	Gowrie	7544	East H S	X	X	X	X	Lebanon	7599	Lawrence H S	X	X	X	X	X	
Indianapolis	8974	Ben Davis H S	X	X	X	X	X	Grennell	7552	Grennell Comm H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	6879	Broad Ripple H S	X	X	X	X	X	Hampton	7553	Hampton Comm H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	1214	Indiana Purdue Univ	X	X	X	X	X	Hartsville	7554	Hartsville Comm H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	9659	Lawrence Central H S	X	X	X	X	X	Harris	6247	Independence H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	9313	Lawrence North H S	X	X	X	X	X	Indianapolis	7555	Indiana Sr H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	9382	North Central H S	X	X	X	X	X	Iowa City	9648	Regina H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	8582	Pike H S	X	X	X	X	X	Iowa Falls	1356	Univ of Iowa	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	9316	Ronald H S	X	X	X	X	X	Johnston	1306	Elkworth Coll	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	9690	Southport H S	X	X	X	X	X	Johnston	7584	Johnston H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	6440	Thomas Carr Howe H S	X	X	X	X	X	Keokuk	1328	Southwestern C C So Coll	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	8906	Warren Central H S	X	X	X	X	X	Lake Park	6171	Harris Lake Park H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	9726	Jasper H S	X	X	X	X	X	Lamoni	1314	Graceland Coll	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Jasper	9540	Jasperville H S	X	X	X	X	X	La Mars	1370	Tellico Westmar Univ	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Kendallville	8082	East Noble H S	X	X	X	X	X	Manchester	7557	West Delaware H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Kokomo	6334	Kokomo H S South C	X	X	X	X	X	Mapleton	7558	Maple Valley H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
La Porte	9339	La Porte H S	X	X	X	X	X	Maquoketa	7559	Maquoketa Comm H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Lafayette	1221	Indiana Vocational Tech Coll	X	X	X	X	X	Marion	9731	Linn Mar H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	9271	Jefferson H S	X	X	X	X	X	Marion	9732	Marshalltown Comm Coll	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	7730	McCluskey H S	X	X	X	X	X	Mason City	1336	North Iowa Area C C	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	9377	Prarie Heights H S	X	X	X	X	X	McGregor	9240	Mar Mac H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Lawrenceburg	7054	Lawrenceburg H S	X	X	X	X	X	Missouri Valley	9754	Missouri Valley H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Laurens	8334	Laurens H S	X	X	X	X	X	Monticello	7560	Monticello H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Laurens	9633	Perry Central H S	X	X	X	X	X	MT Pleasant	1324	Iowa Wesleyan Coll	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Lincoln City	6808	Hartage H S	X	X	X	X	X	Muscatare	1344	Muscatare Comm Coll	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Logansport	9649	Logansport H S	X	X	X	X	X	Newtown	7562	Newtown H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Madison	7421	Madison Consolidated H S	X	X	X	X	X	Newton	9787	Newton H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Marion	1226	Indiana Wesleyan Univ	X	X	X	X	X	Norwalk	1346	Northwestern Coll	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	8567	Marion H S	X	X	X	X	X	Osage	9600	Osage Sr H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Marionville	8779	Marionville H S	X	X	X	X	X	Oscarville	7563	Clairmont Comm H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Marionville	9331	Merriam H S	X	X	X	X	X	Ottumwa	1372	William Penn Coll	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Michigan City	7556	Robert H S	X	X	X	X	X	Ottumwa	1269	Indian Hills C C Ottumwa Cam	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Montezuma	9253	Robert Parke H S	X	X	X	X	X	Paulina	1284	Central Coll	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Monticello	9315	Tenn Lakes H S	X	X	X	X	X	Pella	7565	Red Oak Comm H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Morocco	6615	North Newton Jr Sr H S	X	X	X	X	X	Red Oak	9711	Southwest Park H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Mt Vernon	8433	Mt Vernon H S	X	X	X	X	X	Rumrider	7569	Shelton Comm H S	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
Muncie	7517	Muncie Central H S	X	X	X	X	X	Sheldon	1301	Dorn Coll	X	X	X	X	Lebanon	7599	Lebanon Sr H S	X	X	X	X	X	
	9890	Muncie Southeast H S	X	X	X	X	X	Shelton	1276	Shelton Coll	X	X	X										

ACT Test Centers

\*Non-Saturday test centers are listed at the end of each state. See page 11 for eligibility.

X - Test Center is open for that test date. O - See your counselor for the test date.

Table listing ACT Test Centers for Kentucky, Maine, Maryland, Massachusetts, and Michigan. Columns include City, Code, Test Center, and dates for Oct. 22, 1993; Dec. 11, 1993; Feb. 5, 1994; Apr. 9, 1994; and Jun. 11, 1994. The table is organized into sections for each state, with sub-sections for 'Non-Saturday Test Centers'.

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ACT Test Centers

\*Non-Saturday test centers are listed at the end of each state. See page 11 for eligibility.

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Table listing ACT Test Centers for Minnesota, Mississippi, Missouri, and Montana. Columns include State, City, Code, Test Center, and test dates (Oct 23, 1993; Dec 11, 1993; Feb 5, 1994; Apr 5, 1994; Jun 11, 1994). Rows list various schools and centers across the states.

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**ACT Test Centers**

\*Non-Saturday test centers are listed at the end of each state. See page 11 for eligibility.

X = Test Center is open for that test date. O = See your counselor for the test date.

City	Code	Test Center	Oct. 23, 1993	Dec. 11, 1993	Feb. 5, 1994	Apr. 9, 1994	Jun. 11, 1994	City	Code	Test Center	Oct. 23, 1993	Dec. 11, 1993	Feb. 5, 1994	Apr. 9, 1994	Jun. 11, 1994
<b>Montana, cont.</b>								<b>NEW MEXICO</b>							
MONTANA Non-Saturday Test Centers*								NEW MEXICO Non-Saturday Test Centers*							
Bozeman	7874	Mt. Ellis Academy						Alamogordo	8976	Alamogordo H.S.	X	X	X	X	X
<b>NEBRASKA</b>								<b>NEW YORK</b>							
Albion	7977	Albion H.S.	X	X	X	X	X	Albany	5502	Albion Central H.S.	X	X	X	X	X
Albion	7978	Albion H.S.	X	X	X	X	X	Albany	5503	Albion H.S.	X	X	X	X	X
Albion	7979	Albion H.S.	X	X	X	X	X	Albany	7155	Albion Central H.S.	X	X	X	X	X
Albion	7980	Albion H.S.	X	X	X	X	X	Albany	8116	Allard Almond Central H.S.	X	X	X	X	X
Albion	7981	Albion H.S.	X	X	X	X	X	Albany	9552	Sweet Home H.S.	X	X	X	X	X
Albion	7982	Albion H.S.	X	X	X	X	X	Albany	9624	Amsterdam H.S.	X	X	X	X	X
Albion	7983	Albion H.S.	X	X	X	X	X	Albany	9627	Angela Central School	X	X	X	X	X
Albion	7984	Albion H.S.	X	X	X	X	X	Albany	8432	Lake Shore Central H.S.	X	X	X	X	X
Albion	7985	Albion H.S.	X	X	X	X	X	Albany	8803	Albion Central	X	X	X	X	X
Albion	7986	Albion H.S.	X	X	X	X	X	Albany	2868	Cayuga County Comm. Coll.	X	X	X	X	X
Albion	7987	Albion H.S.	X	X	X	X	X	Albany	8137	Albion Central Jr. Sr. H.S.	X	X	X	X	X
Albion	7988	Albion H.S.	X	X	X	X	X	Albany	8918	Baldwin Sr. H.S.	X	X	X	X	X
Albion	7989	Albion H.S.	X	X	X	X	X	Albany	8365	Ballston Spa H.S.	X	X	X	X	X
Albion	7990	Albion H.S.	X	X	X	X	X	Albany	2751	Gainesville Comm. Coll.	X	X	X	X	X
Albion	7991	Albion H.S.	X	X	X	X	X	Albany	8942	Bay Shore H.S.	X	X	X	X	X
Albion	7992	Albion H.S.	X	X	X	X	X	Albany	7109	Beacon H.S.	X	X	X	X	X
Albion	7993	Albion H.S.	X	X	X	X	X	Albany	2684	Broome Comm. Coll.	X	X	X	X	X
Albion	7994	Albion H.S.	X	X	X	X	X	Albany	8673	Conestoga H.S.	X	X	X	X	X
Albion	7995	Albion H.S.	X	X	X	X	X	Albany	9722	Brasher Falls H.S.	X	X	X	X	X
Albion	7996	Albion H.S.	X	X	X	X	X	Albany	8118	Brenwood H.S.	X	X	X	X	X
Albion	7997	Albion H.S.	X	X	X	X	X	Albany	9830	Brookport H.S.	X	X	X	X	X
Albion	7998	Albion H.S.	X	X	X	X	X	Albany	9271	Harry S. Truman H.S.	X	X	X	X	X
Albion	7999	Albion H.S.	X	X	X	X	X	Albany	9273	Herbert Lehman H.S.	X	X	X	X	X
Albion	8000	Albion H.S.	X	X	X	X	X	Albany	7260	Belmont H.S.	X	X	X	X	X
Albion	8001	Albion H.S.	X	X	X	X	X	Albany	9627	Abraham Lincoln H.S.	X	X	X	X	X
Albion	8002	Albion H.S.	X	X	X	X	X	Albany	9931	Canastota H.S.	X	X	X	X	X
Albion	8003	Albion H.S.	X	X	X	X	X	Albany	6740	Edward R. Murrow H.S.	X	X	X	X	X
Albion	8004	Albion H.S.	X	X	X	X	X	Albany	6737	George Wingate H.S.	X	X	X	X	X
Albion	8005	Albion H.S.	X	X	X	X	X	Albany	5132	James Madison H.S.	X	X	X	X	X
Albion	8006	Albion H.S.	X	X	X	X	X	Albany	6606	John Dewey H.S.	X	X	X	X	X
Albion	8007	Albion H.S.	X	X	X	X	X	Albany	8152	Bishop Timon H.S.	X	X	X	X	X
Albion	8008	Albion H.S.	X	X	X	X	X	Albany	8250	Canastota H.S.	X	X	X	X	X
Albion	8009	Albion H.S.	X	X	X	X	X	Albany	8480	Cambridge H.S.	X	X	X	X	X
Albion	8010	Albion H.S.	X	X	X	X	X	Albany	9929	Camden H.S.	X	X	X	X	X
Albion	8011	Albion H.S.	X	X	X	X	X	Albany	9530	Canajoharie Central H.S.	X	X	X	X	X
Albion	8012	Albion H.S.	X	X	X	X	X	Albany	8313	Canastota Academy	X	X	X	X	X
Albion	8013	Albion H.S.	X	X	X	X	X	Albany	9967	Canastota Central School	X	X	X	X	X
Albion	8014	Albion H.S.	X	X	X	X	X	Albany	8133	Hugh C. Williams Sr. H.S.	X	X	X	X	X
Albion	8015	Albion H.S.	X	X	X	X	X	Albany	9270	Carmel H.S.	X	X	X	X	X
Albion	8016	Albion H.S.	X	X	X	X	X	Albany	8541	Carthage Central H.S.	X	X	X	X	X
Albion	8017	Albion H.S.	X	X	X	X	X	Albany	9130	Central Islip H.S.	X	X	X	X	X
Albion	8018	Albion H.S.	X	X	X	X	X	Albany	9417	Monroe Woodbury H.S.	X	X	X	X	X
Albion	8019	Albion H.S.	X	X	X	X	X	Albany	9370	W.E. Clinton Central H.S.	X	X	X	X	X
Albion	8020	Albion H.S.	X	X	X	X	X	Albany	9932	Chatham H.S.	X	X	X	X	X
Albion	8021	Albion H.S.	X	X	X	X	X	Albany	9361	Maryvale Sr. H.S.	X	X	X	X	X
Albion	8022	Albion H.S.	X	X	X	X	X	Albany	9880	Chenango Sr. H.S.	X	X	X	X	X
Albion	8023	Albion H.S.	X	X	X	X	X	Albany	8140	Clare N. Syracuse H.S.	X	X	X	X	X
Albion	8024	Albion H.S.	X	X	X	X	X	Albany	9635	Clarence Cent. Sr. H.S.	X	X	X	X	X
Albion	8025	Albion H.S.	X	X	X	X	X	Albany	9969	Shenandoah H.S.	X	X	X	X	X
Albion	8026	Albion H.S.	X	X	X	X	X	Albany	9525	Clinton Springs H.S.	X	X	X	X	X
Albion	8027	Albion H.S.	X	X	X	X	X	Albany	9634	Clinton Sr. H.S.	X	X	X	X	X
Albion	8028	Albion H.S.	X	X	X	X	X	Albany	9935	Cobleskill Central School	X	X	X	X	X
Albion	8029	Albion H.S.	X	X	X	X	X	Albany	8789	St. Agnes Academic School	X	X	X	X	X
Albion	8030	Albion H.S.	X	X	X	X	X	Albany	8121	Comstock H.S.	X	X	X	X	X
Albion	8031	Albion H.S.	X	X	X	X	X	Albany	9937	Coopersville H.S.	X	X	X	X	X
Albion	8032	Albion H.S.	X	X	X	X	X	Albany	9554	Coopersville H.S.	X	X	X	X	X
Albion	8033	Albion H.S.	X	X	X	X	X	Albany	9121	East H.S.	X	X	X	X	X
Albion	8034	Albion H.S.	X	X	X	X	X	Albany	8119	New York Military Academy	X	X	X	X	X
Albion	8035	Albion H.S.	X	X	X	X	X	Albany	8120	Corland Jr. Sr. H.S.	X	X	X	X	X
Albion	8036	Albion H.S.	X	X	X	X	X	Albany	9978	Danville Sr. H.S.	X	X	X	X	X
Albion	8037	Albion H.S.	X	X	X	X	X	Albany	9947	Bethlehem Central H.S.	X	X	X	X	X
Albion	8038	Albion H.S.	X	X	X	X	X	Albany	8050	Hell Hollow Hills H.S. West	X	X	X	X	X
Albion	8039	Albion H.S.	X	X	X	X	X	Albany	8943	The Masters School	X	X	X	X	X
Albion	8040	Albion H.S.	X	X	X	X	X	Albany	2963	Tompkins Cortland C.	X	X	X	X	X
Albion	8041	Albion H.S.	X	X	X	X	X	Albany	8198	Dunkirk H.S.	X	X	X	X	X
Albion	8042	Albion H.S.	X	X	X	X	X	Albany	8158	Williams E. H. S. (E. Amherst)	X	X	X	X	X
Albion	8043	Albion H.S.	X	X	X	X	X	Albany	9150	East Hampton H.S.	X	X	X	X	X
Albion	8044	Albion H.S.	X	X	X	X	X	Albany	9131	East Islip H.S.	X	X	X	X	X
Albion	8045	Albion H.S.	X	X	X	X	X	Albany	8127	John H. Glenn H.S.	X	X	X	X	X
Albion	8046	Albion H.S.	X	X	X	X	X	Albany	8044	East Aurora H.S.	X	X	X	X	X
Albion	8047	Albion H.S.	X	X	X	X	X	Albany	6734	East Syracuse H.S.	X	X	X	X	X
Albion	8048	Albion H.S.	X	X	X	X	X	Albany	8433	Southside H.S.	X	X	X	X	X
Albion	8049	Albion H.S.	X	X	X	X	X	Albany	9745	Iroquois Central H.S.	X	X	X	X	X
Albion	8050	Albion H.S.	X	X	X	X	X	Albany	8125	Norpe Dame H.S.	X	X	X	X	X
Albion	8051	Albion H.S.	X	X	X	X	X	Albany	8168	Union Endicott H.S.	X	X	X	X	X
Albion	8052	Albion H.S.	X	X	X	X	X	Albany	8057	Fairport H.S.	X	X	X	X	X
Albion	8053	Albion H.S.	X	X	X	X	X	Albany	8122	Farmington Sr. H.S.	X	X	X	X	X
Albion	8054	Albion H.S.	X	X	X	X	X	Albany	8186	Saratoga River Central School	X	X	X	X	X
Albion	8055	Albion H.S.	X	X	X	X	X	Albany	6636	Valley Stream North H.S.	X	X	X	X	X
Albion	8056	Albion H.S.	X	X	X	X	X	Albany	8273	Fredonia H.S.	X	X	X	X	X
Albion	8057	Albion H.S.	X	X	X	X	X	Albany	8384	G. Ray Boley H.S.	X	X	X	X	X
Albion	8058	Albion H.S.	X	X	X	X	X	Albany	8245	Gloversville H.S.	X	X	X	X	X
Albion	8059	Albion H.S.	X	X	X	X	X	Albany	8328	Gouverneur H.S.	X	X	X	X	X
Albion	8060	Albion H.S.	X	X	X	X	X	Albany	8166	Grand Island H.S.	X	X	X	X	X
Albion	8061	Albion H.S.	X	X	X	X	X	Albany	9306	Granville H.S.	X	X	X	X	X
Albion	8062	Albion H.S.	X	X	X	X	X	Albany	6446	Greenport School	X	X	X	X	X
Albion	8063	Albion H.S.	X	X	X	X	X	Albany	9973	Greenwich Central H.S.	X	X	X	X	X
Albion	8064	Albion H.S.	X	X	X	X	X	Albany	8044	Guiderland Cr.	X	X	X	X	X
Albion	8065	Albion H.S.	X	X	X	X	X	Albany	9742	Frontier Cent. H.S.	X	X	X	X	X
Albion	8066	Albion H.S.	X	X	X	X	X	Albany	9062	Hamburg Central H.S.	X	X	X	X	X
Albion	8067	Albion H.S.	X	X	X	X	X	Albany	8936	Hammondsport H.S.	X	X	X	X	X
Albion	8068	Albion H.S.	X	X	X	X	X	Albany	9917	Hancock Central School	X	X			

**ACT Test Centers**

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City	Code	Test Center	Oct. 23, 1993	Dec. 11, 1993	Feb. 5, 1994	Apr. 9, 1994	Jun. 11, 1994	City	Code	Test Center	Oct. 23, 1993	Dec. 11, 1993	Feb. 5, 1994	Apr. 9, 1994	Jun. 11, 1994
<b>New York, cont.</b>								<b>NEW YORK Non-Saturday Test Centers*</b>							
Kings Park	8129	Kenmore W Sr H S	X	X	X	X	X	New York	8605	Northwestern Academy					
Kingston	9133	Kings Park H S	X	X	X	X	X	Union Springs	2992	Yeshiva Univ					
Lake Placid	8128	Northwood School	X	X	X	X	X	Elizabethtown	8149	Uncon Springs Academy					
Llanoconoma	9139	Sachem H S South Campus	X	X	X	X	X	Greater New York Academy	8816	Greater New York Academy					
Lancaster	9961	Lancaster H S	X	X	X	X	X	<b>NORTH CAROLINA</b>							
Liberty	8186	Liberty Central H S	X	X	X	X	X	Aids	9859	Christ School	X	X	X	X	X
Lindenhurst	8144	Lindenhurst Sr H S	X	X	X	X	X	Asheville	6301	A C Reynolds H S	X	X	X	X	X
Liverpool	9945	Liverpool H S	X	X	X	X	X	Blairsville	6483	T C Robertson H S	X	X	X	X	X
Lodi	9505	Lodiport H S	X	X	X	X	X	Black Mountain	3178	Haves McRae Coll	X	X	X	X	X
Long Beach	8036	Long Beach H S	X	X	X	X	X	Blazer Ek	9871	C D Owen H S	X	X	X	X	X
Lowville	8150	Lowville Acad & Cent Sch	X	X	X	X	X	Camden	8161	Consolidated Ed Center	X	X	X	X	X
Lyons	9979	Lyons Jr Sr H S	X	X	X	X	X	Chapel Hill	8688	Chapel Hill H S	X	X	X	X	X
Madison	8130	Franklin Academy	X	X	X	X	X	Charlotte	8578	E Mecklenburg H S	X	X	X	X	X
Manhasset	9435	St Mary's H S	X	X	X	X	X	Charlotte	8359	Independence H S	X	X	X	X	X
Marcy	8706	Whitesboro H S	X	X	X	X	X	Dallas	7042	Northside Christian Acad	X	X	X	X	X
Massena	8157	Massena Central H S	X	X	X	X	X	Dunham	6316	Southern H S	X	X	X	X	X
Massena Beach	8292	Walmart Food H S	X	X	X	X	X	Elizabeth City	3095	Elizabeth City Sr Univ	X	X	X	X	X
Matineck	9134	Matineck Cutchogue H S	X	X	X	X	X	Elizabethtown	5941	East Baden H S	X	X	X	X	X
Medford	9135	Patchogue Medford H S	X	X	X	X	X	Fayetteville	8902	E E Smith Sr H S	X	X	X	X	X
Medina	8228	Academy H S	X	X	X	X	X	Forest City	6292	Terry Sanford H S	X	X	X	X	X
Medford	8131	Longwood H S	X	X	X	X	X	Greensboro	9277	Northwest Sr H S	X	X	X	X	X
Middleton	2848	Orange County Comm Coll	X	X	X	X	X	Greensboro	9912	Walter Hines Page H S	X	X	X	X	X
Miler Place	9126	Miler Place H S	X	X	X	X	X	Greenville	3094	East Carolina Univ	X	X	X	X	X
Moncksie	8132	Moncksie H S	X	X	X	X	X	Havelock	8222	Havelock H S	X	X	X	X	X
Moravia	9330	Moravia H S	X	X	X	X	X	Hayesville	8487	Hayesville H S	X	X	X	X	X
Mount Vernon	6779	Mount Vernon H S	X	X	X	X	X	Jamestown	9585	Ragdale H S	X	X	X	X	X
Nanuet	9415	Nanuet Sr H S	X	X	X	X	X	Kannapolis	6783	A E Collins H S	X	X	X	X	X
New Hartford	9948	New Hartford Sr H S	X	X	X	X	X	Kinston	7917	Berke Academy	X	X	X	X	X
New Rochelle	2770	Jonas Coll	X	X	X	X	X	Leasburg	6741	Leasburg H S	X	X	X	X	X
Newark Valley	9694	Newark Valley H S	X	X	X	X	X	Manion	6208	Mc Dowell H S	X	X	X	X	X
Niagara Falls	9877	Niagara Falls H S	X	X	X	X	X	Marionette	8147	Rutherford Spaulding H S	X	X	X	X	X
North Babylon	9144	North Babylon Sr H S	X	X	X	X	X	Mebane	6246	Eastern Alliance H S	X	X	X	X	X
North Creek	9944	Johnsburg Central School	X	X	X	X	X	Morganton	6178	Tabernacle Christian School	X	X	X	X	X
N. Massapequa	9401	Plattekill H S	X	X	X	X	X	Mount Pleasant	6552	West Montgomery H S	X	X	X	X	X
N. Tonawanda	9563	North Tonawanda Sr H S	X	X	X	X	X	Newtown	6240	Newtown Conover H S	X	X	X	X	X
Northport	9307	Northport H S	X	X	X	X	X	Oxford	6256	J F Webb H S	X	X	X	X	X
Northwell	9949	Northwell H S	X	X	X	X	X	Pinebluffs	6757	Southeast Edgecombe H S	X	X	X	X	X
Nyack	5127	Nyack H S	X	X	X	X	X	Raeford	6425	Hoke County H S	X	X	X	X	X
Ogdenburg	8533	Ogdenburg Free Academy	X	X	X	X	X	Raleigh	9586	Needham Broughton H S	X	X	X	X	X
Olean	9950	Olean H S	X	X	X	X	X	Robesonville	6146	Wake Christian Academy	X	X	X	X	X
Oneida	8421	Oneida H S	X	X	X	X	X	Rochester	8968	Richmond Sr H S	X	X	X	X	X
Oneonta	8134	Oneonta Sr H S	X	X	X	X	X	Rocky Mount	3135	NC Wesleyan Coll	X	X	X	X	X
Orchard Park	9249	Orchard Park H S	X	X	X	X	X	Rutherfordton	8147	Rutherford Spaulding H S	X	X	X	X	X
Oswego	9951	Oswego H S	X	X	X	X	X	Salisbury	9982	E Rowan Sr H S	X	X	X	X	X
Otsego	9362	Trinity Preaching School	X	X	X	X	X	Salem	9609	Lee County Sr H S	X	X	X	X	X
Perry	9365	Perry Central School	X	X	X	X	X	Smithfield	6230	Smithfield Salem H S	X	X	X	X	X
Pittsford	8314	Pittsford Sutherland H S	X	X	X	X	X	Southport	6378	Southport H S	X	X	X	X	X
Pittsford	2844	St Univ at Pittsford	X	X	X	X	X	Taylorsville	6602	Alexander Central H S	X	X	X	X	X
Plymouth	9952	Plymouth Central School	X	X	X	X	X	Tinney	9508	Tinney H S	X	X	X	X	X
Potsdam	8141	Potsdam H S	X	X	X	X	X	Walnut Cove	6524	Scott-Stokes H S	X	X	X	X	X
Potsdam	8145	Potsdam Sr H S	X	X	X	X	X	Whiteville	6485	Whiteville H S	X	X	X	X	X
Queensbury	8099	Queensbury H S	X	X	X	X	X	Wilmington	8258	E A Laney H S	X	X	X	X	X
Ravenna	9287	Rav Coeymans Selkirk Sr H S	X	X	X	X	X	Wilmington	7853	Wilmington Christian Acad	X	X	X	X	X
Red Hook	9250	Red Hook H S	X	X	X	X	X	Wilson	9159	Wilson Christian Academy	X	X	X	X	X
Rochester	9666	Rochester H S	X	X	X	X	X	Wilson Salem	8169	Parland Sr H S	X	X	X	X	X
Rochester	8143	Riverhead H S	X	X	X	X	X	<b>NORTH CAROLINA Non-Saturday Test Centers*</b>							
Rochester	8422	Aganias Institute	X	X	X	X	X	Candler	8162	Mount Pleasant Academy					
Rochester	8316	Bienville Central School	X	X	X	X	X	Fletcher	8165	Fletcher Academy					
Rochester	9087	Greece Aradale H S	X	X	X	X	X	<b>NORTH DAKOTA</b>							
Rochester	9669	Irondequoit H S	X	X	X	X	X	Baer	8792	Beach H S	X	X	X	X	X
Rochester	2136	Rochester Jr Sr H S	X	X	X	X	X	Baer	3191	Turbe Mountain C C	X	X	X	X	X
Rochester	8033	Rome Free Academy	X	X	X	X	X	Baer	8171	Baer H S	X	X	X	X	X
Rochester	9955	Sauquoit H S	X	X	X	X	X	Bismarck	6773	Bismarck H S	X	X	X	X	X
Rochester	9363	Niagara Wheatfield Sr H S	X	X	X	X	X	Bismarck	3196	Bismarck St Coll	X	X	X	X	X
Rochester	2854	North Country Comm Coll	X	X	X	X	X	Bismarck	3201	Univ of Mary	X	X	X	X	X
Rochester	9632	Saranoga Springs H S	X	X	X	X	X	Bottineau	3204	NDSU Bottineau	X	X	X	X	X
Rochester	8426	Saratoga H S	X	X	X	X	X	Bowman	8172	Bowman H S	X	X	X	X	X
Rochester	8148	Saratoga H S	X	X	X	X	X	Cassport	9448	Cavalier Public School	X	X	X	X	X
Rochester	9140	Newfield H S	X	X	X	X	X	Cassport	8173	Dixie County H S	X	X	X	X	X
Rochester	9146	Ward Melrose H S	X	X	X	X	X	Deves Lake	3198	UND Lake Region	X	X	X	X	X
Rochester	8104	Lakeland H S	X	X	X	X	X	Dickinson	3210	Dickinson Sr Univ	X	X	X	X	X
Rochester	9924	Sorey H S	X	X	X	X	X	Eggleston	8174	Eggleston H S	X	X	X	X	X
Rochester	9137	Snaretown H S	X	X	X	X	X	Egan	6755	Egan Public H S	X	X	X	X	X
Rochester	9404	Sorey H S	X	X	X	X	X	Fargo	3202	North Dakota Sr Univ	X	X	X	X	X
Rochester	8158	E J Wilson H S	X	X	X	X	X	Farmon	6444	North H S	X	X	X	X	X
Rochester	8227	Soring Valley Sr H S	X	X	X	X	X	Fort Totten	6850	Sargent Central School	X	X	X	X	X
Rochester	9956	Staten Central School	X	X	X	X	X	Fort Yates	3205	Standing Rock Comm H S	X	X	X	X	X
Rochester	8363	Staten Island Academy	X	X	X	X	X	Grafton	8176	Grafton H S	X	X	X	X	X
Rochester	8876	Staten Island Tech H S	X	X	X	X	X	Grand Forks	3218	Univ of North Dakota	X	X	X	X	X
Rochester	9959	Syosset H S	X	X	X	X	X	Harvey	8177	Harvey H S	X	X	X	X	X
Rochester	8085	Bencho Louden H S	X	X	X	X	X	Hettinger	8178	Hettinger H S	X	X	X	X	X
Rochester	9343	Coscon H S	X	X	X	X	X	Jamestown	3203	Jamestown Coll	X	X	X	X	X
Rochester	9734	Henninger H S	X	X	X	X	X	Kennett	8180	Kennett H S	X	X	X	X	X
Rochester	2847	Onondaga Comm Coll	X	X	X	X	X	Kinross	7262	Kinross H S	X	X	X	X	X
Rochester	9974	West Genesee H S (Camillus)	X	X	X	X	X	Langdon	8181	Langdon Public H S	X	X	X	X	X
Rochester	7378	Slocum Hollow H S	X	X	X	X	X	Langdon	8186	Buna Central School	X	X	X	X	X
Rochester	8148	Ticonderoga H S	X	X	X	X	X	Linton	8170	Linton H S	X	X	X	X	X
Rochester	9715	Carmel Central H S	X	X	X	X	X	Linton	8185	Linton H S	X	X	X	X	X
Rochester	8782	Troy H S	X	X	X	X	X	Lisbon	8657	Manassah Public School	X	X	X	X	X
Rochester	8384	Tully Central H S	X	X	X	X	X	Mayfield	3212	Mayville Sr Univ	X	X	X	X	X
Rochester	2818	Monroe Valley C C	X	X	X	X	X	McCluskey	6222	McCluskey H S	X	X	X	X	X
Rochester	9962	Central H S	X	X	X	X	X	Minot	6836	Minot H S, Magic City Campus	X	X	X	X	X
Rochester	8164	Vestal H S	X	X	X	X	X	Minot	7214	Minot Sr Univ	X	X	X	X	X
Rochester	8153	Watson Jr Sr H S	X	X	X	X	X	Minot	8859	Minot Public School	X	X	X	X	X
Rochester	9090	Warren H S	X	X	X	X	X	Minot	3194	Fort Berthold Comm Coll	X	X	X	X	X
Rochester	9469	Warwick Sr H S	X	X	X	X	X	Minot	8183	New Town H S	X	X	X	X	X
Rochester	8213	Immaculate Heart H S	X	X	X	X	X	Minot	6222	Minot H					



ACT Test Centers

\*Non-Saturday test centers are listed at the end of each state. See page 11 for eligibility.

X = Test Center is open for that test date. O = See your counselor for the test date.

Table with columns for State, City, Code, Test Center, and dates (Oct. 23, 1993; Dec. 11, 1993; Feb. 5, 1994; Apr. 9, 1994; Jun. 11, 1994). Rows are organized by state: Ohio, Oklahoma, Oregon, and Pennsylvania.

Continued on next page



ACT Test Centers

Non-Saturday test centers are listed at the end of each state. See page 11 for eligibility.

X = Test Center is open for that test date. O = See your counselor for the test date.

Table listing ACT Test Centers across various states including Texas, Vermont, Virginia, Washington, and Utah. Columns include City, Code, Test Center, and dates for Oct 23, 1993, Nov 11, 1993, Dec 5, 1993, Jan 9, 1994, and Feb 11, 1994. The table is organized by state and includes a 'Texas Non-Saturday Test Centers' section.

Continued on next page

**ACT Test Centers**

\*Non-Saturday test centers are listed at the end of each state. See page 11 for eligibility.

X = Test Center is open for that test date. O = See your counselor for the test date.

City	Code	Test Center	Oct. 23, 1993	Nov. 11, 1993	Nov. 18, 1993	Dec. 5, 1993	Dec. 12, 1993	Dec. 19, 1993	Jan. 9, 1994	Jan. 16, 1994	City	Code	Test Center	Oct. 23, 1993	Nov. 11, 1993	Nov. 18, 1993	Dec. 5, 1993	Dec. 12, 1993	Dec. 19, 1993	Jan. 9, 1994	Jan. 16, 1994	City	Code	Test Center	Oct. 23, 1993	Nov. 11, 1993	Nov. 18, 1993	Dec. 5, 1993	Dec. 12, 1993	Dec. 19, 1993	Jan. 9, 1994	Jan. 16, 1994
Washington, cont.											De Pere	6567	De Pere H S	X								Pr Du Sac	8655	Sauk Prairie H S	X							
Thorp	6182	LeRoy Bell H S	X	X	X	X	X	X	X	X	4644	St Norbert Coll	X	X	X	X	X	X	X	X	X	8777	Puetski H S	X								
Vancouver	4448	Clark Coll	X	X	X	X	X	X	X	X	8571	St John's Military Academy	X	X	X	X	X	X	X	X	X	6353	Jerome I Case Sr H S	X	X	X	X	X	X	X	X	
Walla Walla	9908	Evergreen H S	X	X	X	X	X	X	X	X	8558	East Troy H S	X	X	X	X	X	X	X	X	X	6604	Saint Catherine's H S	X	X	X	X	X	X	X	X	
Wenatchee	4427	Walla Walla Comm Coll	X	X	X	X	X	X	X	X	6351	Memorial H S	X	X	X	X	X	X	X	X	X	8907	Webb H S	X	X	X	X	X	X	X	X	
White Swan	9473	White Swan H S	X	X	X	X	X	X	X	X	6349	Norm H S	X	X	X	X	X	X	X	X	X	8915	Reedsville H S	X	X	X	X	X	X	X	X	
Yakima	4486	Yakima Valley Coll	X	X	X	X	X	X	X	X	4670	U of WI Eau Claire	X	X	X	X	X	X	X	X	X	4645	Arcolet Area Tech Coll	X	X	X	X	X	X	X	X	
<b>WASHINGTON Non-Saturday Test Centers*</b>																																
Auburn	9622	Auburn Adventist Academy				12					4606	Marion Coll Fond Du Lac	X	X	X	X	X	X	X	X	X	8799	Rice Lake H S	X	X	X	X	X	X	X	X	
Pasco	6153	Concord Haven Academy				12					4673	U of WI Fond Du Lac	X	X	X	X	X	X	X	X	X	4534	U of WI Cur Richmond	X	X	X	X	X	X	X	X	
Spangle	8639	Upper Columbia Academy				12					6553	Fort Atkinson H S	X	X	X	X	X	X	X	X	X	8699	Ripon H S	X	X	X	X	X	X	X	X	
Wenatchee	8800	Cascadia Christian Academy				10					6313	Franklin H S	X	X	X	X	X	X	X	X	X	4578	U of WI River Falls	X	X	X	X	X	X	X	X	
<b>WEST VIRGINIA</b>																																
Abert	4515	Concord Coll	X	X	X	X	X	X	X	X	6892	Gale Emrick Tempaaleau H S	X	X	X	X	X	X	X	X	X	4595	U of WI Dr Sheboygan	X	X	X	X	X	X	X	X	
Buckley	4510	The Col of West Virginia	X	X	X	X	X	X	X	X	9520	Germantown H S	X	X	X	X	X	X	X	X	X	5641	Sheboygan Falls H S	X	X	X	X	X	X	X	X	
Bluefield	4514	Bluefield St Coll	X	X	X	X	X	X	X	X	8023	Kosciusko H S	X	X	X	X	X	X	X	X	X	8703	So Milwaukee Sr H S	X	X	X	X	X	X	X	X	
Buchanan	4544	W VA Wesleyan Coll	X	X	X	X	X	X	X	X	4683	U of WI Green Bay	X	X	X	X	X	X	X	X	X	8704	Sparta Sr H S	X	X	X	X	X	X	X	X	
Bunker Hill	7317	Rockwell H S	X	X	X	X	X	X	X	X	9505	West H S	X	X	X	X	X	X	X	X	X	4650	U of WI Stevens Point	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8011	Greeneville H S	X	X	X	X	X	X	X	X	X	8707	Shurgeon Bay H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8669	Greeneville H S	X	X	X	X	X	X	X	X	X	5961	Sun Prairie H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	9531	Harpur H S	X	X	X	X	X	X	X	X	X	6619	U of WI Superior	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8672	Craig H S	X	X	X	X	X	X	X	X	X	8600	Tomah Sr H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	4669	U of WI Rock County	X	X	X	X	X	X	X	X	X	8747	Turtle Lake H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	9305	Jacksonville H S	X	X	X	X	X	X	X	X	X	8657	Wausau H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	4571	Jefferson H S	X	X	X	X	X	X	X	X	X	8775	Kennebunk H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	4690	U of WI Parkside	X	X	X	X	X	X	X	X	X	8709	Riverside Middle School	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	6641	Kimberly H S	X	X	X	X	X	X	X	X	X	8719	Catholic Memorial H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8724	La Crosse	X	X	X	X	X	X	X	X	X	8710	Wausau North H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	4672	U of WI La Crosse	X	X	X	X	X	X	X	X	X	8711	Waupaca H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	4662	Vernor Coll	X	X	X	X	X	X	X	X	X	8453	Wausau H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	4573	Western WI Tech Coll	X	X	X	X	X	X	X	X	X	4654	U of WI Marathon Co	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8674	La Crosse H S	X	X	X	X	X	X	X	X	X	8454	Wausau West Sr H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	4621	Mount Senario Coll	X	X	X	X	X	X	X	X	X	8713	Central H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8698	Basore H S	X	X	X	X	X	X	X	X	X	4659	U of WI Dr Washington County	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8675	N W Highway & Naval Academy	X	X	X	X	X	X	X	X	X	8256	Donnegan H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8621	Lake Mills H S	X	X	X	X	X	X	X	X	X	8409	Whitefish Bay H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8603	Lancaster H S	X	X	X	X	X	X	X	X	X	8706	Whitefish H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8677	East H S	X	X	X	X	X	X	X	X	X	4654	U of WI Wisconsin	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	6181	James Madison Memorial Sr H S	X	X	X	X	X	X	X	X	X	8657	Wenot Lincoln H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	9676	Monona Grove H S	X	X	X	X	X	X	X	X	X	9478	Lincoln H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	9516	Wren H S	X	X	X	X	X	X	X	X	X	<b>WISCONSIN Non-Saturday Test Centers*</b>										
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	6565	Green Lake Coll	X	X	X	X	X	X	X	X	X	8655	Wisconsin Academy									
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	4692	U of WI Manitowish Co	X	X	X	X	X	X	X	X	X	7723	Jewish Comm Center									
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	4633	U of WI Dr Marinette	X	X	X	X	X	X	X	X	X	<b>WYOMING</b>										
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	6183	Marquette H S	X	X	X	X	X	X	X	X	X	8715	Star Valley H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	4697	U of WI Marshfield Wood	X	X	X	X	X	X	X	X	X	9072	Upper Snake River Valley H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	5575	Mayville H S	X	X	X	X	X	X	X	X	X	5571	Riverside H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8640	Marquette Sr H S	X	X	X	X	X	X	X	X	X	8718	Big Piney H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8282	Menomonee Falls H S	X	X	X	X	X	X	X	X	X	6719	Buffalo H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	9242	Menomonee Sr H S	X	X	X	X	X	X	X	X	X	4955	Casper Coll	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	6271	Homestead H S	X	X	X	X	X	X	X	X	X	8721	Cheyenne Central H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8683	Meritt H S	X	X	X	X	X	X	X	X	X	9226	Arvick Clearmont H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	7051	Bay View H S	X	X	X	X	X	X	X	X	X	8007	Cody H S	X	X	X	X	X	X	X	X	
Charleston	4522	Cacalia H S	X	X	X	X	X	X	X	X	8291	Dove Senior Holy Angels H S	X	X	X	X	X	X	X	X	X	8722	Coleville H S	X	X	X	X	X				

**APPENDIX C**

**SAT EXAMINATION SITES**

## College Board Regional Offices



**Middle States:** Suite 410, 3440 Market Street, Philadelphia, PA 19104-3338. (215) 387-7600

**Midwest:** Suite 401, 1800 Sherman Avenue, Evanston, IL 60201-3715. (708) 866-1700

**New England:** 470 Totten Pond Road, Waltham, MA 02154-1982. (617) 890-9150

**South:** Suite 250, 2970 Clairmont Road, Atlanta, GA 30329-1639. (404) 636-9465

**Southwest:** Suite 400, 701 Brazos Street, Austin, TX 78701-3253. (512) 472-0231

**West:** Suite 480, 2099 Gateway Place, San Jose, CA 95110-1017. (408) 452-1400

Suite 900, 4155 East Jewell Avenue, Denver, CO 80222-4510. (303) 759-1800

**In Puerto Rico,** inquiries should be directed to:

The College Board, Suite 701, Banco Popular, Hato Rey, Puerto Rico 00918. (809) 759-8625

*Mailing Address:* P.O. Box 71101, San Juan, Puerto Rico 00936-7001

**In Alaska and Hawaii:** inquiries should be directed to the Western office at the California address.

APPENDIX D

SURVEY OF RECRUITMENT, ADMISSION & SELECTION CRITERIA  
FOR RADIOLOGIC TECHNOLOGY PROGRAMS

OKLAHOMA STATE UNIVERSITY  
Department of Educational Administration and Higher Education  
Stillwater, OK 74078

Survey of Recruitment, Admission and Selection Criteria  
for Radiologic Technology Programs

**Instructions:** The items in this questionnaire have been arranged in two parts.  
Part I: Opinion Rating (for each item circle one response) and  
Part II: General Information.

- 4 - Strongly Agree  
3 - Agree  
2 - Disagree  
1 - Strongly Disagree  
0 - No Opinion
- 

**Part I: Admission Criteria Rating**

- |     |  |           |
|-----|--|-----------|
| 1.  | In your opinion, there is a correlation between a student's pre-admission ACT Composite Score and the student's score on the post-graduate certification examination sponsored by the A.R.R.T. | 0 1 2 3 4 |
| 2.  | In your opinion, there is a correlation between a student's pre-admission individual section scores on the ACT and the ARRT examination.   | 0 1 2 3 4 |
| 3.  | In your opinion, there is a significant relationship between grades in high school science subject and radiography curriculum counterparts.  | 0 1 2 3 4 |
| 4.  | In your opinion, high school grade point averages (HSGPA), algebra grades and biology grades should be used in the selection of students for radiologic technology programs.                   | 0 1 2 3 4 |
| 5.  | In your opinion, HSGPA or grades in algebra or biology can be used to predict passing of the ARRT examination.   | 0 1 2 3 4 |
| 6.  | In your opinion, the ACT is a valid predictor of college grades for students from low socioeconomic backgrounds.   | 0 1 2 3 4 |
| 7.  | In your opinion, ACT assessment should be used to decide a students' admission into a radiologic technology program.   | 0 1 2 3 4 |
| 8.  | In your opinion, ACT results should be used to reject radiologic technology student applicants.  | 0 1 2 3 4 |
| 9.  | In your opinion, ACT scores or SAT scores and high school rank should be used as admission criteria.   | 0 1 2 3 4 |
| 10. | In your opinion, a student's ACT scores combined with either HSGPA or high school ranking are highly predictive of radiologic technology program success.                                      | 0 1 2 3 4 |
| 11. | In your opinion, ACT results are useful in counseling and guiding students.  | 0 1 2 3 4 |



	4 Strongly Agree	3 Agree	2 Disagree	1 Strongly Disagree	0 No Opinion
12.	In your opinion, the use of GPA as the only admission criteria limits admissions to only academic achievers and excludes others with less academic ability.				
	0	1	2	3	4
13.	In your opinion, using the prediction of GPA as the only admission criteria excludes students with less academic ability but possibly greater skills in leadership.				
	0	1	2	3	4
14.	In your opinion, predictors of student success must be chosen which are appropriate to the goals of the radiologic technology program.				
	0	1	2	3	4
15.	In your opinion, HSGPA combined with aptitude tests are more effective predictors of college grades than either one alone.				
	0	1	2	3	4
16.	In your opinion, should standardized admission's criteria be ranked or weighted, so that students with the highest accumulated score be admitted to radiologic technology programs.				
	0	1	2	3	4
17.	In your opinion, are current radiologic technology programs, courses, policies and procedures appropriate for adult learners.				
	0	1	2	3	4
18.	In your opinion, should students, facts and impressions obtained by the interviewer be correlated to the academic/clinical situations, to predict a students success in radiologic technology.				
	0	1	2	3	4
19.	In your opinion, information obtained in a student interview enables the interviewer to assess an applicant's vocabulary and ability to be concise and explicit in conveying thoughts.				
	0	1	2	3	4
20.	In your opinion, traditional admissions criteria, previous academic performance and aptitude tests, have excluded large numbers of individuals, many of whom had the motivation and the personality characteristics necessary to succeed.				
	0	1	2	3	4
21.	In your opinion, there is a relationship between age, length of experience in an allied health setting prior to entry into a radiologic technology program, and academic success.				
	0	1	2	3	4
22.	In your opinion, cognitive, affective, and psychomotor domains of students should be weighted and used in selecting radiologic technology students.				
	0	1	2	3	4
23.	In your opinion, the goals and objectives of the radiologic technology program and the sponsoring institution should be related to cultivation of accepted applicant competencies so that an effective entry-level radiographer is a product of the two.				
	0	1	2	3	4
24.	In your opinion, valid and reliable behavior measurements should be used in the admissions process to radiologic technology programs.				
	0	1	2	3	4
25.	In your opinion, an array of relevant criteria should be used to assure applicant equity.				
	0	1	2	3	4
26.	In your opinion, a legal review of selection policies dealing with uniformity, as well as exceptions to such uniformity should be done every three years.				
	0	1	2	3	4
27.	In your opinion, a radiologic technology program should use the same admissions process for all applicants.				
	0	1	2	3	4

	4 - Strongly Agree	3 - Agree	2 - Disagree	1 - Strongly Disagree	0 - No Opinion
28.	In your opinion, applicants should be provided an opportunity to show that certain criteria may be inappropriate for evaluating their qualifications.				
	0	1	2	3	4
29.	In your opinion, considerable flexibility might have to be incorporated into radiologic technology student selection to attract individuals from under-represented groups in the applicant pool.				
	0	1	2	3	4
30.	In your opinion, a program should describe its admissions criteria publicly so that potential applicants can obtain a reasonable estimate of their likelihood of meeting such standards.				
	0	1	2	3	4
31.	In your opinion, rejected applicants should be given a statement of reasons for their rejection and a means of appeal if they want to challenge the explanation.				
	0	1	2	3	4
32.	In your opinion, all those who participate in student selection should be instructed and competent in the process of multiple domain evaluation of radiologic technology applicants.				
	0	1	2	3	4
33.	In your opinion, an internal audit should be done in the form of selection evaluation as well as external screening of the selection policies and procedures to assure consumers and governmental funding agencies that the admission process has been actually implemented according to stated protocols should be done each year.				
	0	1	2	3	4
34.	In your opinion, foresight is critical in the student selection process if radiologic technology programs are to survive the challenge of declining numbers of college-age applicants in the 1990's.				
	0	1	2	3	4
35.	In your opinion, research is essential to determine the relative importance of inappropriate selection processes.				
	0	1	2	3	4
36.	In your opinion, program directors must couple effective recruitment strategies with rationale, humane and equitable selection policies.				
	0	1	2	3	4
37.	In your opinion, information networks should be established to permit exchange of recruitment and selection in radiologic technology education.				
	0	1	2	3	4
38.	In your opinion, radiologic technology programs should deemphasize technical and scientific training in favor of emphasis on the social sciences, the humanities, and training in thinking or problem solving skills.				
	0	1	2	3	4
39.	In your opinion, radiologic technology programs should give more emphasis on training in scholastic skills such as writing and critical thinking as well as afford opportunities for the development of suitable values.				
	0	1	2	3	4
40.	In your opinion, the current focus on scientific knowledge in radiologic technology admissions decisions should be modified to allow for more emphasis in students' abilities to learn independently and acquire analytic skills and values appropriate to the field of radiologic technology.				
	0	1	2	3	4

## Part II: General Information

41. What weighted instruments are used as part of your selection criteria? (check all that apply)
- ACT                       Health Occupations Basic Entrance Test
- SAT                          PSB-Health Occupations Aptitude Examination
- Other \_\_\_\_\_
42. What criteria are used in your selection process of radiologic technology students? (please list)
- A. \_\_\_\_\_ E. \_\_\_\_\_
- B. \_\_\_\_\_ F. \_\_\_\_\_
- C. \_\_\_\_\_ G. \_\_\_\_\_
- D. \_\_\_\_\_ H. \_\_\_\_\_
43. Please attach a copy of your guidelines and forms used in your selection process.
44. Gender of respondent:  Male  Female
45. What is your job classification?  Program Director  Faculty  Other
46. How many people serve on your selection committee? \_\_\_\_\_
47. How many years have you served on student selection committees? \_\_\_\_\_
48. What is your highest level of education?
- Associate Degree  Masters Degree  Doctorate
- Bachelors Degree  Specialist Degree
49. What is the average age of applicants? \_\_\_\_\_ Male  Female
50. By percentages, what is the gender composition of your applicants?  Male  Female
51. What is your programs first time percentage pass rate for the ARRT Examination? \_\_\_\_\_
52. The location of your school may be described as: (check one)
- major metropolitan area (1,000,000 or more)  town or medium city (10,000 to 99,000)
- large city or metropolitan area (100,000 to 1,000,000)  small town or rural center (fewer than 10,000)

Thank you for answering this survey!  
All of your answers will remain confidential.

If you are interested in obtaining a copy of the results of this survey, please provide the following information.

Name: \_\_\_\_\_

Title/Department: \_\_\_\_\_

Institution: \_\_\_\_\_

Address: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_

-----  
Name: \_\_\_\_\_

College: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
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SUMMARY OF FINDINGS REQUEST FORM:

-----  
Name: \_\_\_\_\_

College: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
-----

SUMMARY OF FINDINGS REQUEST FORM:

-----  
Name: \_\_\_\_\_

College: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
-----

SUMMARY OF FINDINGS REQUEST FORM:

-----  
Name: \_\_\_\_\_

College: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State: \_\_\_\_\_ Zip: \_\_\_\_\_  
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APPENDIX E

INTRODUCTORY LETTER

April, 1991

Dear Colleague:

I am preparing a dissertation titled A National Study of Selection Criteria for Students in Community College Radiologic Technology Programs in partial fulfillment of the requirements for a Ed.D. in Educational Administration and Higher Education at Oklahoma State University. I respectfully ask for your assistance in filling out the enclosed questionnaire. Through the questionnaire, I hope to determine which criteria are used in the selection of students for radiologic technology programs throughout the United States. The attached questionnaire is also designed to identify what instruments are used in selection processes.

I sincerely hope you will provide me with 20-30 minutes of your time to complete and return the questionnaire in the enclosed, self-addressed envelope. To insure confidentiality of individual programs, a coding system is employed. At the completion of data analysis, information linking programs to specific research instruments will be discarded.

The results of the research will be reported in the dissertation. If you are interested in receiving a summary of the findings, please complete the enclosed form, Summary of Findings Request Form, and mail it along with your completed questionnaire.

Thank you for your consideration, time and attention.

Sincerely,

Paul William Bober, Ed.S., RT(R)  
Director of Radiography

as

Enclosures

APPENDIX F

FOLLOW-UP LETTER



July, 1991

Dear Colleague:

I am preparing a dissertation titled A National Study of Selection Criteria for Students in Community College Radiologic Technology Programs in partial fulfillment of the requirements for a Ed.D. in Educational Administration and Higher Education at Oklahoma State University. I respectfully ask for your assistance in filling out the enclosed questionnaire. Through the questionnaire, I hope to determine which criteria are used in the selection of students for radiologic technology programs throughout the United States. The attached questionnaire is also designed to identify what instruments are used in selection processes.

I sincerely hope you will provide me with 20-30 minutes of your time to complete and return the questionnaire in the enclosed, self-addressed envelope. To insure confidentiality of individual programs, a coding system is employed. At the completion of data analysis, information linking programs to specific research instruments will be discarded.

The results of the research will be reported in the dissertation. If you are interested in receiving a summary of the findings, please complete the enclosed form, Summary of Findings Request Form, and mail it along with your completed questionnaire.

Please return by July 11, 1991.

Thank you for your consideration, time and attention.

Sincerely,

Paul William Bober, Ed.S., RT(R)  
Director of Radiography

as

Enclosures

APPENDIX G

LIST OF ACRONYMS

## LIST OF ACRONYMS

ACT - American College Test  
 AHAT - Allied Health Aptitude Test  
 AHQT - Allied Health Qualifying Test  
 APST - Scores  
 APT - Aptitude Test Score  
 ASSET - Math & English Assessments  
 CAT - College Aptitude Test/Assessment  
 CBAP - College Board Assessment and Test Placement  
 CBP - College Board Placement  
 CGP - College Guidance and Placement  
 CGPE - Counseling Guidance and Placement Exam  
 CPE - College Placement Exam  
 CPT - Computerized Placement Test  
 ENGL - Command of English Language  
 EVAL - Evaluations  
 GPA - Grade Point Average  
 HGPA - Highest Grade Point Average  
 HOBET - Health Occupations Basic Entrance Test  
 IAE - Institutional Assessment Exam  
 INTV - Interview  
 MAPS - Basic Skills Exam  
 MATH - Mathematics  
 NJBS - New Jersey Basic Skills Tests  
 OPEN - Open Door  
 OWN - Use of own weighted instrument or assessment test(s)  
 PSB - Psychological Services Bureau  
 SAT - Scholastic Aptitude Test  
 SCHL - Scholastics  
 SPT - School Placement Tests  
 TABI - Vocational Test Measuring Math, Reading and Language  
 TASP - Texas Academic Skills Exam  
 A & P - Anatomy & Physiology  
 ACAD - Academic Achievement  
 ACT - American College Test  
 ACTC - American College Test Composite  
 ACTM - American College Test Mathematics  
 ACTR - American College Test Reading  
 AMAT - American Medical Aptitude Test  
 ALGB - Foundations of Algebra, Intermediate or College  
 APDT - Aptitude Test  
 APPL - Date of Completed Application  
 APST - Aptitude Stanine  
 APT - Aptitude

ASSET - Reading, Writing and Math  
BIOLOGY - Biology Prerequisite  
CGP - College Guidance and Placement  
CGPA - College Placement and Guidance A-1  
CGPC - College Guidance and Placement C-1  
CGPR - Comparative Guidance and Placement Reading  
CGPV - Comparative Guidance and Placement Verbal  
CHEM - Chemistry  
CHGP - College Highest Grade Point  
COLLEGE - Amount of college level courses completed  
COMP - Computers  
CPC - Completed Prerequisite Courses  
CPT - College Placement Test  
CPT - Computerized Placement Test  
CRED - Credentials  
DEGREE - Educational Degree  
DMD -  
DOMI - Domicile  
ENGL - English  
EXPR - Medical Experience  
FILE - File Completed  
GED - General Education Development  
GEOM - Geometry  
GNED - General Education  
GOAL - Career Goal Statement  
GPA - Grade Point Average  
GPC - Grade Point Composite  
HGPA - Highest Grade Point Average  
HLEX -  
HS - High School  
HSA - High School Average  
HSB - High School Biology  
HSC - High School Courses  
HSMT - High School Math Test  
HSRANK - High School Class Rank  
INTV - Interview/Observation in Radiology Department  
MAPS - Basic Skills Exam  
MATH - Math Prof Test  
MDIM -  
NIBS - New Jersey Basic Skills Test  
ORNT - Pre-admission Orientation  
PBK - Professional Background Knowledge  
PHC - Basic Physics  
PHYS - Physical Exam Completed  
PREQ - Pertinent Courses Completed  
PROF - Proficiency Test  
PSB - Psychological Services Bureau  
PTCR - Patient Care Experience  
QWE - Quality of Written Essay  
READ - Freshman Reading  
RECM - Recommendation(s)  
REFR - References  
REME - Remedial Courses  
RESD - Residency  
SAT - Scholastic Aptitude Test

SCNC - Successful Completion of Necessary Courses  
SCNS - Successful Completion of Necessary Sciences  
SKET -  
SKILL - Texas Academic Skills Exam  
VIST - Hospital Visitation  
WKEXP - Previous Health Care Work Experience  
WQR - Written Question Response  
WRITING - Written Communication

**APPENDIX H**

**STATISTICAL ANALYSIS**

Descriptive statistical analysis utilizing the equation:

$$Y = B_0 + B_i X_i + e_i, \text{ should be used}$$

When N sets of values for  $X_i$  are given, the constants  $B_0$  and  $B_i$  must be determined in such a way to keep  $e_i$ , regression disturbance, at a minimum value. The dependent variable  $Y_1$  will be the predicted value for the terminal profile a limited time before and after specified education has taken place.  $Y_2$  will be the predicted registry score as outlined below.

The independent variable include:

$X_1$ : HOBET composite

$X_2$ : HSGPA

$X_3$ : College GPA

$X_4$ : HOBET Social Interaction Profile

$X_5$ : Core GPA (Radiography Course)

$X_6$ : Terminal Profile Score

The regression analysis will involve the identification of the appropriate regression constants and coefficients for the following equations:

$$Y_1 = B_0 + B_1 X_1 + B_2 X_2$$

$$Y_1 = B_0 + B_2 X_2 + B_3 X_3 + B_4 X_4$$

$$Y_2 = B_0 + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_5 X_5 + B_6 X_6$$

APPENDIX I

WEIGHTING MECHANISM FOR RADIOLOGIC TECHNOLOGY

APPLICANT DATA



WEIGHTING MECHANISM FOR RADIOLOGIC TECHNOLOGY  
APPLICANT DATA

A. BEHAVIORAL DOMAINS		
DOMAIN	INFORMATION SOURCE	VALUES ASSIGNMENT
COGNITIVE	Overall High School GPA (General Academic Potential)	<1.5 reject 1.6 - 2.0 = 1 point 2.1 - 2.5 = 2 points 2.6 - 3.0 = 3 points 3.1 - 3.5 = 4 points 3.6 - 4.0 = 5 points
	GED Score (General Education Development)	40 = reject 41 - 45 D = 1 point 46 - 50 C = 2 points 51 - 55 B = 3 points 56 - 60 A = 4 points
	Overall College GPA	<1.5 reject 1.6 - 2.0 = 1 point 2.1 - 2.5 = 2 points 2.6 - 3.0 = 3 points 3.1 - 3.5 = 4 points 3.6 - 4.0 = 5 points
	Science High School GPA (Specific Academic Potential)	<2.0 reject 2.1 - 2.5 = 1 point 2.6 - 3.0 = 2 points 3.1 - 3.5 = 3 points 3.6 - 4.0 = 4 points
	Science College GPA	<2.0 reject 2.1 - 2.5 = 1 point 2.6 - 3.0 = 2 points 3.1 - 3.5 = 3 points 3.6 - 4.0 = 4 points
	SAT Combined Score (Standardized Achievement)	<701 reject 701 - 800 = 1 point 801 - 900 = 2 points 901 - 1000 = 3 points 1001+ = 4 points
	ACT Composite Score	<10 reject 11 - 15 = 1 point 16 - 20 = 2 points 21 - 25 = 3 points 26+ = 4 points

APPLICANT DATA (cont'd)

A. BEHAVIORAL DOMAINS		
DOMAIN	INFORMATION SOURCE	VALUES ASSIGNMENT
AFFECTIVE	Formal Interview (integrity, motivation, empathy)	100 reject 101 - 150 = 1 point 151 - 200 = 2 points 201 - 250 = 3 points 251 - 300 = 4 points
	Letter of Recommendations (good leadership, perseverance)	<34 reject 35 - 69 = 1 point 70 - 104 = 2 points 105 - 140 = 3 points
	Clinical Interview (poise, personality)	28 reject 29 - 39 = 1 point 40 - 50 = 2 points
	Essay (written communication skills, motivational)	Poor = reject Acceptable = 1 point Exceptional = 2 points
PSYCHOMOTOR	Outside Activities/Hobbies (physical activities involving gross motor skills and spatial perception)	1 hobby/sport = 1 point 2+ hobbies/sports = 2 points
<p>B. POINT ASSIGNMENTS FOR DEMOGRAPHIC BIOGRAPHIC DATA CLASSIFICATION</p> <p>Applicant is ethnic minority - add 1 point. Applicant has worked in a health care setting - add 1 point.</p>		

C. COMMENT(S)

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Applicant Name \_\_\_\_\_

Total Points Accumulated \_\_\_\_\_

Selection Committee Member \_\_\_\_\_

Date Reviewed \_\_\_\_\_

VITA 2

Paul William Bober

Candidate for the Degree of  
Higher Education

Thesis: A STUDY OF COGNITIVE AND NON-COGNITIVE SELECTION CRITERIA FOR  
STUDENTS IN COMMUNITY COLLEGE RADIOLOGIC TECHNOLOGY PROGRAMS

Major Field: Higher Education

Biographical:

Personal Data: Born in Milwaukee, Wisconsin, May 21, 1951, the son  
of Arnold W. and Aldine Ann Bober.

Education: Graduated from Bosco High School, Milwaukee, Wisconsin, in  
May 1965; received a Bachelor of Science Degree in Natural  
Science from Dominican College at Racine in May 1973; completed  
requirements for the Master of Science Degree at Pittsburg State  
University, Pittsburg, Kansas in May 1984 and the Education  
Specialist Degree in July 1986.

Professional Experience: Faculty-Clinical Instructor, Radiologic  
Technology Program, Labette Community College, August 1982 to  
August 1989; Program Director, Radiologic Technology, Labette  
Community College, August 1989 to present.