# PROSPECTS FOR THE DEVELOPMENT OF DOCTORAL PROGRAMS IN CLINICAL LABORATORY SCIENCE

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# ABSTRACT

## PROSPECTS FOR THE DEVELOPMENT OF DOCTORAL DEGREE PROGRAMS IN CLINICAL LABORATORY SCIENCE

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Directors and deans of accredited clinical laboratory science programs that offer a master's degree were surveyed to assess the prospects for development of doctoral degree programs in clinical laboratory science (CLS). They were asked about their plans to institute doctoral programs, their perceptions of their institutions' resources in support of doctoral programs, as well as information on the actual resources and factors influencing their decisions to develop a program. Thirty-four institutions were included in the population and responses were received from thirty-two. Administrators from three institutions reported being in some phase of developing a doctoral program in clinical laboratory science. The deans and directors from the programs with plans were more optimistic about their resources for supporting a doctoral program than were their counterparts from institutions that were not planning a doctoral program. However, the actual resources of the institutions that were proceeding with plans for doctoral programs were essentially the same as the resources of the institutions without plans. A difference was that the programs with plans had on average, one more faculty member with an active research program. The respondents documented the need for

doctorally-prepared clinical laboratory scientists as faculty in CLS programs since nearly 85% of directors reported difficulty in hiring doctorally-prepared faculty. The likely supply of CLS doctoral students was estimated to be about 13 per year nationwide. An extended consortium model for design of doctoral programs was recommended. This model proposes multiple university participation in a consortium which provides shared, electronically-delivered courses. Doctoral research would be supervised by a research director off-campus. This model holds good prospects for developmental-grant funding because it maximizes student access while minimizing the resource expenditures of individual institutions.

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# CHAPTER I

## Introduction

Within the profession of clinical laboratory science (CLS), also known as medical technology (MT), doctoral education for clinical laboratory scientists (CLSs) gained interest in the 1980s and became a controversial topic at professional meetings and in the published literature (Day, 1989; Frohman, 1989; Kelly, 1990a; Kelly, 1990b; Kelly, 1990c; Mendelson, 1988; Westgard, 1989). The heightened interest within the profession stemmed from pressure on individuals to earn doctoral degrees and from moves within the American Society for Medical Technology (ASMT) directed at advancing the professional self-determination of CLS.

Just as nurses in the 1970s (Grace, 1978), CLSs holding positions as academic faculty in colleges and universities have come under individual pressure to earn doctoral degrees, conduct on-going research, and publish the results in order to gain tenure, be promoted, and maintain their positions (Mendelson, 1988). To meet these demands, and because there were only two doctoral programs for CLSs in the U.S. until 1990, CLSs have "borrowed" doctoral degrees from other disciplines such as education and the basic sciences, just as nurses did during the 1960s (Matarazzo, 1971).

More general interest and controversy over doctoral education for CLSs were fueled late in the 1980s during discussions on a position paper then being drafted by the ASMT. The paper, "Future Directions of Clinical Laboratory Science Educational Programs" (American Society for Medical Technology [ASMT], 1988), discussed faculty qualifications for teaching in academic CLS programs. Some participants in that discussion recognized that CLS was not viewed as an academic discipline from outside the profession because there was not a defined, distinct body of knowledge; there were virtually no doctoral programs; and most faculty were not doctorally-prepared. This contingency pressed for the document to state that the doctoral degree was indeed the terminal degree in the field or profession of CLS, as it is in the commonly recognized academic disciplines such as chemistry, English, mathematics, or psychology. These same participants also wanted wording added to support and encourage more faculty to earn doctoral degrees and to foster the development of more doctoral programs in the field.

Some university-employed participants without doctoral degrees found this recommendation to be problematic. They anticipated that their own promotion and tenure would be thwarted once the professional association went on record recognizing the doctorate as the terminal degree in 1988. Therefore, the wording was softened to declare that the doctorate would be considered the terminal degree by the year 2000.

In the same discussions, some participants pressed to have the doctorate in clinical laboratory science recognized as the terminal degree. Since at the time there were only two doctoral programs for CLSs in the country, most practitioners hoping to earn the doctorate by the year 2000 would need to pursue degrees in related areas. Therefore, this recommendation was also modified to recognize any doctorate, not even specifying a Doctor of Philosophy (PhD).

Recognition of the doctorate as the terminal degree was a step in the professional self-determination or professionalization of CLS (Brubacher, 1962; Greenwood, 1966). Further, such a professional sanction was expected to bolster proposals for development of doctoral programs specifically designed for CLSs. However, as with nursing in the 1960s (Murphy, 1981), the issue of the uniqueness of the body of knowledge in CLS persisted and would hamper efforts to initiate doctoral programs. Therefore, in 1989, ASMT approved another position paper, "Doctoral Education in Clinical Laboratory Science" (ASMT, 1989). Among the topics discussed in the paper was a unique curriculum, clinimetrics; distinct from microbiology, chemistry, physiology, or other sciences. Clinimetrics is the science of laboratory analysis and its articulation in this document was analogous to nursing's development of a theory of nursing, distinct from medicine, physiology, psychology, or anthropology. It was also a necessary step in the professionalization of CLS (Greenwood, 1966).

## Statement of the Problem

Some important components necessary for development of doctoral programs in CLS seem to be in place. The profession has formally recognized the doctoral degree and described the unique curriculum content for that degree. Additionally, there is a body of CLSs with doctoral degrees who should be able to expand the body of knowledge and act as research mentors for students. There is anecdotal evidence of a need for doctorally-prepared CLSs, especially as faculty for academic programs.

In the presence of favorable attitudes, resources will be a limitation to the immediate development of doctoral programs in CLS. Anecdotal evidence suggests that few academic programs have the critical mass of doctoral-level faculty. Further, the other resources available within the profession are unknown. Therefore, the problem to be investigated is the identification of institutions with the best resources and the greatest likelihood of being able to develop and sustain doctoral programs.

It will be valuable to document the availability of resources and the state of development of doctoral degree programs for CLSs. The results of this study will provide a snapshot of the state of development of doctoral programs in CLS in 1990. Data generated by this study will be valuable for administrators in assessing the relative strength of their institution's resources as they contemplate initiation of such programs. The resources available within the profession as a whole for the development of doctoral degree programs will be

assessed and may be of use in planning cooperative ventures. The data may be of value to funding agencies in supporting developmental projects and the results may also be useful to prospective students.

## The Research Questions

The research questions to be investigated are these:

(1) Are there institutions that are perceived by their administrators to possess the resources necessary to develop a doctoral program in CLS?

(2) In 1990, how many CLS programs are in the process of developing doctoral programs for CLSs and what is the status of their progress?

- (a) How was the decision to proceed with development made?
- (b) What problems or obstacles to implementation are anticipated?
- (c) What types of programs are planned and what are their requirements?

(3) If the resources to develop a doctoral program in CLS are not currently available, what are the projected needs and from where are those resources expected to come?

(4) How do programs that are proceeding with the development of a doctoral program compare to those that are not developing one?

(a) How do their administrators' opinions compare in regard to the resources of their institutions to initiate doctoral programs?

(b) How do these institutions compare in actual resources?

(c) How do they compare on the numbers of inquiries about doctoral education they have had?

(d) How do they compare in regard to problems with hiring doctorally-prepared faculty?

(e) How do they compare in regard to the numbers of master's degrees granted annually?

(f) How do they compare in the number of master's graduates that go on to doctoral study?

(5) Is there a perceived need among CLS program directors and deans for more doctorally-prepared CLSs as faculty members and graduate mentors in CLS programs?

(a) How does this perceived need compare to the need perceived in other professions for doctorally-prepared faculty?

(b) What problems have been encountered in recruiting doctorally-prepared, professionally-certified faculty for CLS programs?

(c) What accommodations have been made if applicants with the desired credentials have not been available?

Questions 1, 2, 3, and 5 will be answered with descriptive data. Question 4 will require comparisons that can be analyzed by the use of hypothesis testing. The operational hypotheses to be tested and the questions that they address are these:

(4) How do programs that are proceeding with the development of a doctoral program compare to those that are not developing one?

(a) How do their administrators' opinions compare on the resources of their institutions to initiate doctoral programs?

$H_o$: There is no significant difference between deans and directors in their opinions about the adequacy of resources at their institution for the development of a doctoral program in CLS.

$H_o$: There is no significant difference between deans of programs with plans to initiate a doctoral program and deans of programs without plans to initiate a doctoral program in their opinions about the adequacy of the resources at their institution for the development of a doctoral program in CLS.

$H_o$: There is no significant difference between directors of programs with plans to initiate a doctoral program and directors of programs without plans to initiate a doctoral program in their opinions about the the adequacy of the resources at their institution for the development of a doctoral program in CLS.

(b) How do these institutions compare in actual resources?

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in regard to the number of faculty.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in regard to the number of doctorally-prepared faculty.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in regard to the number of faculty with active research programs.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in regard to the amount of external funding the programs receive.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in regard to hospital availability.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in regard to the presence of other doctoral programs within their administrative unit.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the number of annual faculty publications.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the number of annual grant proposals submitted.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average dollar amount of grants received.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average number of students enrolled in the university/college.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average number of students enrolled in the undergraduate CLSs program.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average number of students enrolled in the master of science program in CLS.

$H_o$: There is no significant difference between the directors of programs that are proceeding with a doctoral program and those directors whose institutions are not, in the perceived level of administrative support for initiating such a program.

(c) How do they compare on the numbers of inquiries about doctoral education that they have had?

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average annual number of inquiries received about doctoral education.

(d) How do they compare in regard to problems with hiring doctorally-prepared faculty?

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the opinions of their administrators about difficulty in hiring doctorally-prepared CLS faculty.

(e) How do they compare in regard to the numbers of master's degrees granted annually?

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average annual number of masters degree graduates.

(f) How do they compare in the number of master's graduates that go on to doctoral study?

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average annual number of master's degree graduates going on to doctoral study.

## Definition of Terms

The following operational definitions will be used:

Academic clinical laboratory science program or clinical laboratory science program: programs sponsored by accredited colleges or universities offering a bachelor's degree in clinical laboratory science.

Accredited clinical laboratory science programs: formal programs of study in clinical laboratory science that are accredited by the Committee on Allied Health Education and Accreditation (CAHEA) of the American Medical Association. Students graduating from such programs are eligible for certification examinations and may earn a professional certificate (credential).

Clinical Laboratory Science: used synonymously with medical technology (MT), medical laboratory science, and medical laboratory technology to refer to the allied health profession whose scope of practice encompasses the development, performance, and monitoring of chemical, biological, and physical laboratory analyses performed on blood or other body fluids and used for the diagnosis, monitoring, and treatment of disease. Practitioners are known as clinical laboratory scientists (CLSs) or medical technologists (MTs).

Director: used synonymously with program director or chairperson; an administrator within the CLS academic unit; usually the department chairperson or the identified chief administrator of the master's degree program in CLS.

Dean: the administrator immediately superior to the director as defined herein, and outside the CLS academic unit, to whom any requests to institute a doctoral program must be sent.

Doctoral degree: encompasses all post-master's degrees conferred by accredited institutions of higher education including doctor of philosophy degrees (PhD) and professional doctorates such as the doctor of medicine (MD), doctor of public health (DrPH), doctor of nursing science (DNSc), doctor of arts (DA), and doctor of education (EdD).

External funding: sources of revenue for CLS programs outside the university or health science center in which the program is located.

Hospital availability: access to clinical specimens for research purposes by an affiliation of some sort with a hospital or other diagnostic laboratory.

Professional credential: a certificate or other recognition that an individual has met the standards of a professional certifying body; eg. MT(ASCP) or CLS(NCA) for clinical laboratory scientists, RRT for radiographers, RN for nurses. For the purposes of this study the academic designations MD and PharmD will be considered to be professional credentials as well as professional doctorates. Licenses will not be considered professional credentials as licensing is a governmental, and not a professional sanction of an individual's credentials.

# CHAPTER II

## Review of the Literature

The review of the literature supporting this research project will encompass three areas pertinent to doctoral education for clinical laboratory scientists (CLSs):

1) the history of the development of doctoral education in the United States;
2) the development of doctoral education in nursing; and
3) graduate education in clinical laboratory science (CLS).

### A Brief History of Graduate Education in the United States

The history of graduate education in the United States has been carefully reviewed and documented by others (Berelson, 1960; Eells & Haswell, 1960; Prior, 1965; Simpson, 1983; Spurr, 1970; Walters, 1965) who provide the general references for this summary. It is not the intent here to detail this history, rather to highlight significant events, persons, and institutions as may be pertinent to the development of graduate education in the profession of clinical laboratory science (CLS). This discussion will therefore be only a brief description of the history of the doctoral degree in the United States (U.S.).

The development of graduate education in the United States has been divided into five eras (Berelson, 1960):

(a) The Pre-history: to 1876

(b) The University Revolution: 1876-1900

(c) Consolidation and Standardization: 1900-World War I

(d) Growth and Diversification: World War I to World War II

(e) Revival and Reappraisal: World War II to 1960

A sixth era apparent since Berelson's writing, Pluralism and Innovation: 1960 to the present, will also be discussed.

## The Pre-history: to 1876

The educational system of the early United States was quite naturally built upon an English model. It consisted of elementary and secondary schools. The colleges did not have graduate schools, but granted bachelor's degrees (BA) in the classical curriculum of the arts. This could be converted to a master's degree three years after graduation by maintaining acceptable behavior and paying a fee; thus an unearned degree. The master's degree was of value, however, because it conferred upon its holder the right to teach at the college level.

Walters (1965) cites five reasons for the failure of U.S. colleges to develop graduate schools in the early 1800s. At that time the U.S. was mostly a rural society with little demand for advanced education and an overt distrust

of intellectual pursuits. Since the country was so young, there was no scholarly tradition. The existing colleges were founded on the English model which provided a classical curriculum to only a few affluent students. The curriculums were rigid and designed to prepare only teachers and clerics.

Since advanced education was not available at home during the 19th century, U.S. students went abroad. The young country had only recently earned its freedom from England, so going to Germany was preferred. As well, the quality of advanced studies in Germany, especially in science, exceeded what was available in Britain. Research-oriented doctoral degrees were developed in Germany early in the 1800s under the direction of Wilhelm von Humbolt. Doctoral degrees were not instituted at British universities until after World War I.

By 1850, 200 Americans had studied in Germany. The significant efflux continued throughout the century with 22% (446) of the foreign students in German schools in 1891 being from the U.S. (Simpson, 1983). It is estimated that nearly 10,000 Americans studied in German universities between 1865 and 1910 (Walters, 1965). Though not all such students earned degrees, half of the 10,000 were studying for the PhD; not degrees in medicine, law, or theology.

Some students who had earned PhDs in Germany returned home to prominent positions in U.S. colleges. They brought with them the philosophy of freedom and the methods of instruction used in the German schools and sought to create comparable doctoral programs in the U.S. Among these

pioneers were Theodore D. Woolsey, president of Yale from 1846-71; Francis Wayland, president of Brown University from 1827-55; and Henry Tappan, president of the University of Michigan from 1852-63. Their efforts were generally of limited success.

Late in the 1850s, John Porter, a member of the faculty of Yale, led the first successful effort to institute graduate education in the U.S. Porter, who had studied chemistry under Liebig at Giessen in Germany, appealed to the Yale corporation to create a Doctor of Philosophy degree at the Sheffield School of Science.

> The Faculty further request of the Board that the degree of Doctor of Philosophy be instituted and in accordance with the usage of German Universities be conferred on those students who have successfully pursued the above-named higher course of scientific study....Its institution would remove a disadvantage under which our Department of Philosophy and the Arts labors in comparison with similar departments of German Universities. The degree which they offer is an inducement which we do not present. Its establishment here would, in the opinion of the Faculty, enable us to retain in this country many young men, and especially students of Science, who now resort to German Universities for advantages of study no greater than we are able to afford. (Eells & Haswell, 1960, p. 28)

The Corporation approved the request and in 1861 three students graduated with Doctor of Philosophy degrees, the first granted by a U.S. institution.

Despite this achievement, graduate education in the U.S. was not fully accepted. As with master's degrees, the value of the doctoral degree was undermined by the granting of unearned doctorates, honorary doctorates and even bogus doctoral degrees. These problems persisted throughout the remainder of the 19th century, but in 1876 an important milestone was attained.

## The University Revolution: 1876-1900

In 1876, Johns Hopkins University was founded under the direction of Daniel Coit Gilman. It was truly innovative and strategically planned to avoid some of the problems faced by well established institutions in trying to inaugurate graduate studies. Gilman and the sponsors of Johns Hopkins sought to establish a university that was independent of the influence of church and state. Further, to avoid the resistance posed by the vested interests of undergraduate faculty, they instituted a graduate-only university simultaneously freeing Johns Hopkins from the influences of the arts and the classical curriculum. They rode the theme of the times in developing a university devoted to the application of research to solution of social problems. The faculty were selected for their research abilities, not teaching abilities. Gilman also instituted fellowships to attract students of promise and to stem the loss of

students to Germany. The result was a graduate school of unequaled stature setting the standards for graduate education in the U.S.

Following a similar design, Clark University and the University of Chicago developed graduate schools without undergraduate colleges. Spurred by these successes, established institutions such as Columbia, Harvard, and Cornell were encouraged to continue their developments of a German-style graduate school atop their English-style undergraduate college. Though the transition was difficult in all cases, graduate universities took hold in these and other institutions during the last quarter of the 19th century. The quality of the programs improved and students began staying home instead of going abroad.

Still, problems existed for universities seeking to develop doctoral programs. At the close of the 19th century, most faculty of state colleges were clergymen who had failed with congregations. They did not teach single subjects but multiple ones within the traditional classical curriculum. However, since they did not have a research background, they were not prepared to teach in the university. Doctorally-prepared faculty were a distinct minority.

## Consolidation and Standardization: 1900-World War I

In 1900, the graduate programs had become well established in many institutions, however, there was little consistency among institutions' requirements for the doctoral degree. Further, there was concern that small

institutions seeking to join the growing demand for graduate education could not provide a high quality program. Lastly, U.S. educated undergraduates were not being accepted into foreign, especially German, graduate programs. To address these concerns, the American Association of Universities (AAU) was born. The presidents of the universities at California, Chicago, Columbia, Harvard, and Johns Hopkins invited their counterparts at Catholic University, Clark, Cornell, Michigan, Pennsylvania, Princeton, Stanford, Wisconsin, and Yale to a meeting to discuss these and other problems of graduate education.

The topics addressed by the AAU in those early years have become regular topics for subsequent, similar organizations. Their concerns included "...the nature of the dissertation, the meaning of research, the conditions of fellowship awards, admission requirements, preparation for college teaching, the role of the master's degree and the foreign language requirements" (Walters, 1965, p. 16-17).

> In these years the members also discussed such contemporary topics as outside remunerative work by professors, the summer school and graduate work, the relation of academic and professional doctorates, the organization of research activities, research professorships, cooperation with industry, and the graduate school's failure to create a 'society of scholars' within itself (Berelson, 1960, p. 19).

The AAU never sought to accredit graduate schools, though it did create a list

of "approved" undergraduate institutions used by foreign graduate schools in considering applicants.

Other associations concerned about graduate education developed during this period. The National Association of State Universities and the Association of Land-Grant Colleges and Universities sought similar ends as the AAU but represented institutions where newer disciplines were emerging, especially the more practical disciplines such as agriculture. The American Association of University Professors brought faculty, not just deans and presidents, into the discussion on standards of graduate education.

Another influence on graduate education during this period was from outside the university community. Philanthropic groups, especially the Carnegie Foundation, in setting standards for grant recipients, required the recipient institution to have at least six doctoral-level faculty. The result, of course, was that the demand for doctorally-prepared faculty increased. Similarly, accrediting agencies set standards for doctorally-prepared faculty. So the demand for doctoral graduates as faculty for universities increased.

## Growth and Diversification: World War I To World War II

Following the first world war, the number of students seeking doctoral education increased dramatically. Simultaneously, the number of institutions offering the degree also increased. Part of the impetus for students to seek advanced education was the broadening demand for doctorally-prepared

researchers. Industry and government had discovered the value of the PhD. Though most graduates still became faculty members of universities, increasing numbers of graduates were finding positions in industry and government. The result was a significant change in the primary site of research in the U.S. Prior to 1900, virtually all research, especially basic research, was conducted at universities. By the 1930s, universities employed the minority of researchers.

The change in the primary employer of PhD graduates affected the look of the degree since industry and governmental employers had different views of what graduate work should entail. Where traditional graduate studies emphasized independent work for the dissertation, industry and government required employees who could work cooperatively. Similarly, the development of a specific skill for the dissertation was less important to these new employers than a thorough understanding of the fundamentals of the science and creative thinking to apply the science to the solution of new problems.

Also during the period between the wars, the emerging professions discovered the value of doctoral work. Though some "professional" doctorates, such as the Doctor of Education (EdD), had been developed earlier, the number of new degrees increased significantly during this era. Typically, professional doctorates are meant to prepare expert practitioners in a profession such as business administration (DBA) or public health (DrPH). They are comparable to the classical doctorates in medicine and law. They are

generally granted by the appropriate school or college, not the graduate school. The curriculum differs from a PhD in the same field in that the professional degree does not have a language requirement, may require more course work, and does not require the original research project, though a substantial project may be required. The latter requirement means that the catalog descriptions of the PhD and the related professional degree were often not clearly different. Ashton (1965) considers the professional degrees to meet a purpose "parallel and non-competitive with the PhD" (p. 17). To this day, the PhD designation has been reserved for "professional" preparation in research; essentially focussing on process, not content.

Revival and Reappraisal: World War II to 1960

During the period of remarkable economic expansion in the U.S. following World War II (WWII), doctoral education also grew. The impetus here was money, much of which came from the federal government. It had become clear during the war that graduate education was a national security issue. The GI Bill, and graduate fellowships from the National Science Foundation (NSF) and National Institutes of Health (NIH) fueled the increased interest in graduate education. Simultaneously the numbers of fields offering a PhD grew, as did the number of professional areas.

Pluralism and Innovation: 1960 to 1990

A review of the agendas for the annual meetings of the Council of Graduate Schools in the United States from its inception in 1961 to the present provides insight into the factors affecting graduate schools in the last three decades. Two facets repeatedly appear in the meeting proceedings: issues of pluralism and innovation.

The 1960s brought a decade of social change and unrest to the United States. The universities were at the center of student protests against racial injustice and the war in Southeast Asia. The make-up of the student population in graduate schools began to reflect increasing numbers of African-Americans as the civil rights movement improved their opportunities in education and employment. Following closely behind was the women's movement and the number of female students also increased. U.S. universities became the universities of choice for international students, in an ironic contrast to the previous century. Non-traditional and part-time students added to the variety of people entering graduate schools with needs, beliefs, and attitudes that were different from the traditional full-time, white male students of previous eras.

The most recent decades were also marked by innovation in curriculum and administration of graduate programs. Residency and foreign language requirements began to be recognized as anachronistic. Alternate modes of administering programs led to a new concept of "campus". External degree programs, interinstitutional programs, and industry collaborations meant that

students were no longer physically on campus as they had been previously. The introduction of communication technology such as teleconferencing meant that students could earn a degree without ever setting foot on the university campus.

## Summary

The history of the development of doctoral degrees in the U.S. is summarized in Table 1. The evolution of doctoral degrees in the United States

Table 1

Comparison of the histories of the PhD in the United States (PhD in U.S.), doctorates in nursing(Doc in Nurs.), and doctorates in clinical laboratory science (Doc in CLS)

| | PhD in U.S. | Doc in Nurs. | Doc in CLS |
|---|---|---|---|
| Master's degree-prepared faculty | Prior to 1850; predominant into 1900s | Prior to 1950; predominant into 1970s | predominant into 1980s |
| Period of borrowed PhDs | From Germany until 1876 | From other disciplines until 1960s | From other disciplines into 1990s |
| Concern for quality of doctoral programs | 1900, AAU founded | 1980s | |
| Debate about PhD vs professional doctorates | since 1900 | since 1960s | |
| Federal support for doctoral programs | after WWII | after 1960 | |
| Outside pressures for doctoral faculty | grant agencies in 1900s | National League for Nursing | |

began with borrowed degrees from Europe. Once doctoral degrees were established in the U.S., quality was an issue for nearly a quarter of a century. Demand for doctoral-degree graduates came from outside the universities. Programs began to flourish only after the U.S. government provided financial support, seeing the value of doctoral-degree graduates for its own purposes. Most recently, graduate schools have responded to the needs of an increasingly diverse student population of minorities, women, and international students. Graduate programs have become more creative in the methods of administration in part to meet the needs of these new student populations.

## The Development of Doctoral Education in Nursing

As will be seen in the following section, doctoral education for clinical laboratory science (CLS) is barely in its infancy. It is valuable, therefore, to look to examples outside of CLS, but similar enough to provide insights that may predict future events in that profession. The literature in nursing was reviewed and has been selected for this comparison.

As an identifiable health profession, nursing is approximately 80 years older than CLS. Nursing is usually classed separately from the allied health professions like clinical laboratory science, physical therapy, and radiology technology. Yet there are many similarities making the evolution of nursing, as

the older profession, an example for the newer ones such as CLS. Nursing is primarily a profession of women that developed from a practical orientation, later moved educationally into the academic environment, and still has multiple educational routes leading to the professional credential. Nursing has struggled to develop an identity and body of knowledge distinct from the practice of medicine. In these ways, nursing is very like CLS. Perhaps the greatest difference between nursing and CLS is that nursing has far more practitioners. Still, the well documented educational development of the nursing profession may provide insights into the doctoral development in CLS.

As with the development of the PhD in general, the history of the developmental changes in education of nurses has been well documented by others (Grace, 1978; Matarazzo, 1971; Matarazzo & Abdellah, 1971; Murphy, 1985). This review of the literature is summarized in Table 1 and will be cited when applicable to the history of doctoral education in CLS. However, the literature on the development of doctoral programs for nursing contains several especially pertinent articles that deserve a detailed review.

## Research on the Development of Doctoral Programs in Nursing

An important study was reported by Leininger in 1976. She surveyed 58 nursing schools that offered graduate nursing programs accredited by the National League for Nursing. She inquired about present and planned doctoral programs for nurses, the type of degree offered or planned, financial support

for doctoral programs and students, projected needs for graduates of such programs, on-going research to support doctoral study, and faculty preparation for supervising graduate students. She had an 80% response rate.

Leininger found that there were ten nurse-scientist programs whose federal support was scheduled to end in 1976. The nurse-scientist programs were federally-funded, PhD programs in disciplines such as physiology or microbiology, but especially designed for nurses. She reported 14 other existing programs at 13 institutions leading variably to a PhD, EdD, or the professional Doctor of Nursing Science (DNSc) in nursing or nursing subspecialties. Twenty-two new programs were planned for initiation by 1980. Only one of these was the conversion of a nurse-scientist PhD into a doctorate in nursing. The remaining 21 were planned at institutions that did not previously have doctoral programs. Twelve of the 21 planned to offer a PhD in nursing, eight would offer a DNSc, one would grant a Doctor of Arts (DA) in nursing and the remaining one was undecided at the time of the study.

Analyzing Leininger's data further shows that virtually all respondents not offering a doctorate in 1976 (n=23) planned to do so by 1980. As noted above, 20 of the planned 21 new programs were at institutions not offering doctoral education in 1976. With 21 new programs planned, one program converted from nurse-scientist, nine nurse-scientist programs closing and 14 programs continuing, Leininger predicted that there would be 35 doctoral programs for nurses in 1980. As noted by Murphy (1981), 22 programs

actually existed in 1980. Assuming that the 14 non-nurse-scientist programs established prior to 1976 did not close, only 8 of the 21 actually came to fruition. This is not surprising in light of other responses to Leininger's study.

Eighty-nine percent of respondents asserted that state funds were not sufficient to support a nursing doctoral program in their institution. Deans and directors estimated a more than three to one probability that they would not be able to find adequate funding. Respondents who already offered doctoral programs estimated direct costs for their programs from as little as $20,000 to as much as $354,000 for fiscal year 1972-73, and all but two received some federal funds to support the program.

Thirty of the 46 respondents did not believe they had an adequate level of on-going nursing research in their institution to support doctoral education. It cannot be discerned from the report which institutions these were. Presuming that the 14 programs established prior to 1976 did have adequate on-going funding, they would not be part of the 30. The 21 institutions with proposed programs, or at least most of those planning to proceed with program initiation, apparently did not believe they had adequate on-going research or funds to support such a program. Hence, it is little wonder that only 8 of the planned 21 programs were actually initiated by 1980.

As reported by Leininger, the major needs or priorities related to doctoral education for nurses were, in rank order, (a) well-prepared faculty to conduct research and to teach in graduate programs, (b) nursing researchers

and research, and (c) institutional funds to support doctoral programs in nursing.

In 1978, the American Association of Colleges of Nursing (AACN) reported the results of a survey similar to Leininger's conducted among their member colleges. They reported 20 programs that would have students enrolled by the end of 1978; 14 of these awarding the PhD; 5, the DNSc; and 1, the EdD. Twenty-eight schools described being in various stages of approval or planning for doctoral programs. The AACN predicted from the survey data that there would be 50 doctoral programs by the end of the century. In 1988, Downs reported that there were already 45.

Shores (1986a) studied the process used for making a decision to initiate a doctoral program in nursing. She surveyed 25 of the 27 programs existing in 1986. Nineteen usable survey instruments were returned. The instrument asked respondents to indicate the degree of importance that each of 21 factors held in the decision to initiate a doctoral program. Shores was looking for differences between programs that initiated PhD degrees vs professional doctorates. She found few differences. Perhaps the most significant was that for programs opting for the professional degree, the influence on this decision from groups outside the school of nursing was significant (57% reported this influence), while of those initiating PhD programs, only 8% reported a significant outside influence on this decision.

From the responses, Shores developed a list of 16 recommendations she felt should be considered in the development of prospective programs. Among the recommendations were:

> 1. PhD and professional doctoral programs in other disciplines should be present on your campus before initiation of a doctoral program.
> 2. Your school of nursing should be affiliated with a medical center (hospital with 500 or more beds and several specialties) before doctoral program initiation.
> 3. You must be certain of your college/university administration's support for the doctoral program.
> 4. Give first priority to securing an adequate number of highly qualified faculty... (1986a, p. 29)

The nursing literature is replete with recommendations of this sort, (Cleland, 1976; Murphy, 1984; Shores, 1986b; Starck, 1980) though often relying on non-empirical sources.

## Summary

The use of nursing as an example for the development of doctoral degrees for clinical laboratory scientists is illuminating. It provides recommendations on resources needed and the decision making process regarding initiation of doctoral programs. The historical view provided by the

literature will provide an interesting comparison to clinical laboratory science as doctoral programs in the latter profession continue to develop.

## Doctoral Education for Clinical Laboratory Scientists

Clinical laboratory science (CLS) is the allied health profession concerned with diagnostic laboratory testing. The phrase "clinical laboratory science" is used interchangeably with "medical technology". The scope of practice in CLS extends from the selection of the test to be ordered on a patient through the test performance and back to the interpretation of the test results. It includes collection of an appropriate specimen; proper handling and preparation of that specimen; development, evaluation, selection, implementation, monitoring, and performance of assays and methods; reporting of results and interpretation of same. The role of the medical technologist extends to the management and administration of laboratory services and the education and training of practitioners in all levels of practice.

In order to understand the evolution of graduate education in CLS, an appreciation of the historical development of the profession's educational system is valuable. The most complete history of the development of the profession is available in Williams' Introduction to the Profession of Medical Technology (Lindberg, Britt & Fisher, 1984), the major source for this summary

of the development of educational programs in CLS. Special attention will be given to the primary literature on graduate and doctoral education.

## Development of Education Programs in CLS

During the latter quarter of the nineteenth century when nursing was first evolving as a profession and doctoral education in the U.S. was taking hold, the profession of CLS was just emerging. The science of laboratory medicine, pathology, was beginning. Though most hospitals did not have laboratories and few physicians performed laboratory testing, some pioneered in the development of laboratory tests. As early as 1844, Dr. Douglas was teaching laboratory examinations to other physicians at the University of Michigan. Dr. William Welch established a laboratory at Bellevue Hospital in New York in 1878 and at Johns Hopkins University in 1885. By the end of the century, clinical laboratories were being established in the hospitals and universities of most large cities.

During this early developmental period, laboratory testing was performed by physicians and especially medical students and interns. However, some physicians began to train technicians to assist in the laboratory procedures. According to Lindberg, et al. (1984), the 1900 U.S. census listed 100 technicians, all male but not all laboratory technicians. Physicians who

specialized in laboratory testing were known at this time as "specialists" or "technicians", and may well be those counted in the census.

In 1915, the Pennsylvania legislature enacted a law requiring all hospitals to have an adequate laboratory and to employ a full time technician, not necessarily a physician. There were few technicians available to fill this requirement. As a result, more physicians began to train technicians. Typically, the nurses and secretaries of the hospital and laboratory were recruited as students. This pattern spread to other states where hospitals increasingly demanded that physicians with an interest and knowledge of laboratory examinations direct the laboratory. They, of course, needed technicians to perform the assays.

The first formal training program for laboratory technicians was established in 1916. Dr. John Kolmer of Philadelphia instituted the program to comply with the Pennsylvania statute. By 1918 there were 75 graduates, all women.

A formal training program was established at the University of Minnesota in 1922. A baccalaureate degree was offered in 1923 and by 1926 there were 13 graduates.

Pathologists had formed a professional organization early in the 1920s. The American Society of Clinical Pathologists (ASCP) addressed the need for qualified laboratory technicians, probably in part due to Dr. Kolmer's influence as president of the organization. In 1928, the ASCP issued a report of its

Committee on Registration of Laboratory Technicians detailing a recommendation for a standardized course of study for medical technicians and further recommending that a registry be established. Later in that year, the Registry of Medical Technicians was established to certify individuals meeting basic training requirements and to register schools providing approved training.

The Registry established two levels of laboratory practitioners. "Medical technologist" was the title given to persons possessing a baccalaureate degree and completing one year of laboratory experience. "Medical technician" was the title to be used by certificants with a minimum of a high school education and six months of laboratory experience.

In 1933, the Registry issued its first list of approved schools. The 34 schools listed varied considerably in their admission requirements, however. Interestingly, the Registry did not require completion of one of these approved programs in order to be eligible for certification. Still, the Registry did hope to persuade colleges and universities to include four-year baccalaureate programs or two-year certificate programs. They proposed a baccalaureate curriculum including two years of general education and basic science preparation, essentially a premedical program, followed by one year of basic medical sciences, with the fourth year spent gaining clinical laboratory experience. Indeed, this became the model for the design of most CLS programs into the 1960s.

Following this model, universities and colleges offering CLS programs did not have to revise their course offerings to any significant degree. The courses needed in preparation for the clinical practicum were the general courses to be offered to students in other majors and provided by the faculties of those departments. This was so even for the third year courses in medical sciences such as physiology, biochemistry, and microbiology. The laboratory-specific education was provided by practitioners and pathologists during the hospital practicum. As a result, and in distinction to nursing (Lenz & Morton, 1988), no clinical laboratory scientists (CLSs) were needed as part of the campus faculty. Hence, the profession of CLS did not experience the pressures to gain advanced education that influenced both academic faculties in general at the turn of the century, and nursing during the post-war periods.

In 1933, ASCP established the Board of Schools to accredit the laboratory component of educational programs. Until nearly 1970, the predominant structure of educational programs remained in the 3+1 format first proposed in 1928; that is, three years of academic preparation on the college campus and the fourth year in a clinical laboratory. However, program designers in the post-war period began to look at this design and propose and institute alternative formats. Lindberg et al. (1984) wrote that in 1968, the Board of Schools was encouraging such innovation. Lindberg et al. also note there was no need for the Board of Schools to accredit graduate programs

since, as academic programs, these would be accredited by the appropriate academic accrediting agencies.

Among the modifications being proposed in the 1960s for the undergraduate program was integration of the clinical experience into the academic portion of the curriculum. Some of this could be accomplished by providing didactic instruction in laboratory sciences on the college campus. However, to do so would require faculty with laboratory expertise, not typically found within traditional academic departments. As a result, CLSs were hired by academic institutions as faculty to teach the clinical laboratory courses. This trend accelerated in the 1970s and 1980s with more and more so called "integrated programs" being developed.

As Williams (1971) noted, "The need for advanced degrees for medical technologists has markedly increased as the scope of laboratory medicine broadens. The opportunities for employment are primarily in the areas of supervision, teaching, and specialization" (p. 33-34). Heinemann (1969), in discussing the role of the university in CLS education, listed expectations for university and college faculty. The list is most significant in that research was not listed among the activities expected of faculty. Yet, as time went on CLS faculty found themselves facing the same demands for promotion and tenure as other academic faculty. In the 1970s it was often adequate in an academic position to hold a master's degree, thereby possessing a degree more advanced than the students were seeking. However, the pressures on CLS

programs to compete as academic units with others possessing largely doctorally-prepared faculty led CLSs to pursue doctoral degrees. Laboratories also hired increasing numbers of doctorally-prepared scientists, not physicians, to direct and manage departments within the clinical laboratory, especially clinical chemistry and clinical microbiology departments.

By 1982, the paucity of doctorally-prepared CLSs was a significant problem for academic institutions. Speaking at a national symposium on CLS education, Mary Lee Seibert, Dean, College of Allied Health Professions, Temple University, discussed the problems of finding doctorally-prepared individuals to be faculty members in academic CLS programs (Seibert, 1985). As determined by the 1987-88 salary survey conducted by the American Society of Allied Health Professions (American Society of Allied Health Professions, 1989), doctoral-level CLS faculty were still a minority with 60% holding master's degrees and only 21% holding doctorates.

To meet the need for doctorally-prepared faculty, academic CLS programs have hired non-CLSs, especially in clinical chemistry and clinical microbiology. It is similar to nursing hiring non-nurses to teach nutrition or psychology (Lenz and Morton,1988). The difference lies in that nursing used non-nurses to teach supportive sciences, not nursing courses. CLS has had to rely on doctorally-prepared, non-CLSs to teach the professional courses.

In 1988, the House of Delegates of the American Society for Medical Technology (ASMT) approved a position paper, "Future Directions of Clinical

Laboratory Science Educational Programs". (ASMT, 1988) A constituency within the organization realized that the continued viability of academic programs depended on the success with which the faculty could achieve academic promotion, compete for research funds, and publish their works. Believing that support from the professional organization was important for these goals, the paper included the following recommendations:

1. Programs should utilize faculty with appropriate levels of education and experience for the courses they teach...
3. Programs should assure that faculty are cognizant of their function as role models and encourage activity in research, publication, consultation and community service...
6. By the year 2000, the terminal degree in the clinical laboratory science field will be the doctorate. Programs should encourage and assist all faculty in obtaining doctoral degrees. (p. 6)

The last point was especially controversial. During discussion, it was suggested that the last statement be a requirement for a PhD or even a PhD in CLS. The latter was rejected since only two doctoral programs in the profession existed in the U.S. at that time, so the generic "doctorate" was retained as the final recommendation.

In June, 1989, the House of Delegates of ASMT approved another position paper "Doctoral Education in Clinical Laboratory Science" (ASMT, 1989). Noting the existence of only two doctoral programs in the profession

and comparing that to nursing and physical therapy, the paper states "...there is an undersupply of advanced programs in clinical laboratory science particularly at the doctoral level" (ASMT, 1989, p. 2). The paper also notes the "borrowing" of doctorates from other disciplines by CLSs and the problems related to this.

> Graduate education is available in some of the different disciplines and provides specialists in each of those disciplines. These specialists, once established in the separate disciplines, may no longer choose to identify themselves with clinical laboratory science per se, resulting in a loss of future researchers, educators and leaders. (ASMT, 1989, p. 2)

The paper describes a curriculum outline for doctoral studies. Analogous to nursing's search for a "theory of nursing", the paper recommends emphasis in "clinimetrics" for doctoral programs that, for institutional reasons, must distinguish their offerings from the related sciences of microbiology, biochemistry, etc. The paper describes in general terms the resources necessary to establish a doctoral program:

> Such resources, include, but are not limited to, a faculty that is doctorally prepared and qualified to teach and supervise doctoral-level research, a library with all the services and materials necessary to support research activities of both students and faculty, suitably equipped research space,

financial aid for graduate students, and accessible clinical facilities and materials to support clinical research. (ASMT, 1989, p. 4)

Among the final recommendations of the document is the following description of the status of doctoral education in 1989:

> Given the need for doctoral level clinical laboratory scientists, it is important to support existing graduate programs in Clinical Laboratory Science, both at the master's and doctoral levels.
>
> Because there are only a few available doctoral level graduate programs in Clinical Laboratory Science, it is essential to support the development of new graduate programs in those institutions capable of implementing such programs. (ASMT, 1989, p. 7)

Graduate Education for Clinical Laboratory Scientists

The reported literature on graduate education for CLSs is sparse. It will be reviewed chronologically to provide comparison to the previous historical description.

In 1966, the National Council on Medical Technology Education of the National Committee for Careers in Medical Technology (Heinemann, 1967) conducted an informal survey of the graduate study interests of CLSs. Supported by a grant from the Cancer Control Division; Public Health Service; Department of Health, Education and Welfare, Heinemann randomly selected

223 CLSs who were members of the American Society for Medical Technology. Half of these subjects were teaching supervisors, presumably in clinical programs, and the others were non-teaching technologists. An additional 50 surveys were completed by persons attending the conference of the National Council on Medical Technology Education. The survey inquired about pursuit of graduate education, major and degree, financial support, preferred area of study, and satisfaction with graduate studies.

The survey was returned by 73 of the 111 teaching supervisors and 39 of the 112 non-teaching supervisors for a return rate of 66% and 39%, respectively. Twenty-one responses were received from the 50 conference attendees.

Twenty-six percent of the teaching supervisors and 13% of the non-teachers possessed advanced degrees. One teacher and two non-teachers possessed doctorates. An additional 23% of the teachers and an equivalent percentage of the non-teachers were working toward graduate degrees. Five teachers and one non-teacher were working toward doctorates.

Heinemann combined those subjects already possessing graduate degrees with those in process for a total of 36 teaching supervisors and 14 non-teaching subjects. Seventy-seven percent of the teaching supervisors held or were pursuing graduate degrees in the sciences, such as biology, chemistry, or microbiology. The remaining degrees were in education (17%) and management/administration (6%). All of the non-teaching subjects were

pursuing or possessed a graduate degree in a science supporting laboratory medicine, though two of these sought minors in education.

Nearly three-quarters of both teachers and non-teachers reported satisfaction with the degree program. However, the most frequently cited deficiency was the lack of a laboratory or medical orientation in the course of study. The teachers also noted dissatisfaction with graduate programs that did not prepare them directly for teaching assignments.

Most of the students in both groups attended school on a part-time basis. Fifty-six percent of the teaching supervisors reported receiving financial assistance. For more than half of those it was in the form of a faculty appointment providing special tuition and fee allowances. Nearly one quarter of the teachers reported part-time employment and 17% reported support from scholarships and fellowships. More than one third of the non-teaching subjects reported support from scholarships and fellowships.

Heinemann reported results for all respondents relative to interest in graduate education, not participation. Interest in majoring in one of the supportive sciences was preferred, though some interest, mostly from teachers, was noted in education. Respondents indicated interest in courses taught in non-traditional formats, such as shortened summer courses. They cited inability to gain time away from work as the biggest hinderance to graduate study, with financial concerns and family commitments named secondarily.

When asked about the development of future graduate programs, the majority of respondents preferred an emphasis in laboratory management or administration. "There is limited interest in an advanced degree in medical technology" (Heinemann, 1967, p. 510). However, combined programs with a major-minor combination of both sciences and education or sciences with management were also suggested.

Heinemann's study is, by her own report, "informal". The subjects were selected from a subset of CLSs participating in a professional association. As such, they are probably not representative of CLSs in general. It is doubtful whether they are even representative of CLSs who would be interested in graduate studies. There may be many graduate-education-oriented CLSs, especially those seeking doctoral preparation as research scientists, who do not affiliate with the general professional organization. Therefore, generalization from this data would be risky.

Heinemann's report is confusing in that it is never clear how the twenty-one responses from the conference participants were incorporated into the data, thus creating further lack of trust in the representative nature of the results. However, it is apparent that by 1966, teaching supervisors were probably seeking graduate education in higher numbers than non-teaching CLSs. This is consistent with Williams' 1971 reference to the career value of graduate education.

Referring to her own 1967 report, Heinemann writes in 1969 "Continuing education is more than short courses and workshops. It is also graduate study for advanced degrees." (p. 497) However, she makes no other mention of graduate study in this report on the role of colleges and universities in CLS education.

Writing again in 1971, Heinemann reports on continuing education for CLSs. She cites the 1967 report of ASMT's Education Committee. The report suggested the development of more graduate programs in CLS. Although Heinemann continued her review of continuing education for CLSs, no further reference to graduate education was included except a quote from Ruth French in an unpublished institutional document where French states, "The purpose of continuing education activities for the allied health professions personnel...shall be to:...4. Provide means for individuals to increase their academic attainment through course work applicable to bachelor's and/or advanced degrees" (Heinemann, 1971, p. 151). However, the major emphasis of Heinemann's 1971 paper was on non-credit educational activities.

In 1982, Rausch, Bartzack, Catchings, Howard, and Pruden (1982) published the "Report of the Topic Study Group on Graduate Education in Medical Technology". This ASMT sponsored group studied ASMT members possessing graduate degrees and inquired about level of degree, multiple degrees, majors, reasons for pursuing graduate studies, benefits, and problems.

Rausch, et al. surveyed 20% (461) of 2,305 ASMT members who indicated that they possessed a graduate degree in 1979. This 20% of subjects was randomly selected from the total population. Four hundred fifty seven surveys were successfully mailed and 315 (69%) were returned.

Ninety-nine percent reported that their first graduate degree was a master's degree. Fifteen percent of the respondents held a second degree. These were nearly equally distributed between doctoral and master's degrees. The authors extrapolated to conclude that approximately 1% of active ASMT members held a doctoral degree in 1979. More than 90% of these doctorates were granted by graduate, not professional, schools. This probably under-represents the number of CLSs pursuing graduate professional programs such as medical school since such students and practitioners are likely to disaffiliate with the generalist CLS professional association once they have embarked on their second profession.

The data were analyzed by dividing the group of respondents into two groups: graduates of the ASMT/Central Michigan University (CMU) external degree program and graduates of all other programs. About one-fifth of respondents were graduates of the former program that offers only management and education majors. Of the non-CMU graduates, 25% earned their first degree in an area related to education, while 11% chose management/administration. The remaining 64% majored in basic and clinical sciences. The pattern of second degrees paralleled the first.

Most respondents pursued advanced education to satisfy a desire for more knowledge. However, improved employment options and career advancement ranked high, especially among the non-CMU graduates. The CMU students may have already attained advanced positions in their laboratories and chose the external degree program in order to continue in their position while pursuing graduate work. This is consistent with the fact that non-CMU students attained the tangible benefits of improved salary and advanced positions more often than did the CMU subset who may already have attained higher positions.

The factors affecting the selection of a particular program were the major to be studied and the convenience of the location. The greatest problems arose due to time constraints and problems of coordinating work and class schedules. Most of the CMU students were part-time students, consistent with the external design of the program. More than one-half of the non-CMU group pursued full-time graduate studies. In the discussion, the authors cited the following as contributing to the high-rate of part-time students:

> The relative newness of graduate programs in medical technology, the difficulties that young faculty members in medical technology have in attracting research funds which could support graduate students, the paucity of doctoral degrees held by medical technologists, and the lack of independence in practice of medical technologists have an influence on the matter of support for graduate education and students.

> Institutions contemplating the offering of graduate programs in medical technology should be sensitive to the needs of students for financial assistance. (p. 941)

Though the study group was charged to develop recommendations "...addressing resultant needs, issues and concerns..." (p. 935) identified by the study, the paper does not list such recommendations. The problems related to graduate education are documented as above, but no remedial plans were suggested and particular issues relative to doctoral education were not identified.

As with Heinemann's study (1967), the use of subjects affiliated with a professional association limits the generalizability of the results. However, the common notion that most CLSs earned their doctoral degrees in education was not supported by this study. Further, the education-oriented majors are likely over-represented in this study group since it is more likely that persons earning science PhDs would disaffiliate with ASMT than educators who presumably are teaching CLS even after receiving their advanced degree.

Rausch et al. and Heinemann found, that, into the 1980s, CLSs, like nurses in previous decades, borrowed PhDs from other disciplines; a finding that is not surprising since only two doctoral programs in CLS were in existence.

For a journalistic-style article, Mendelson (1988) interviewed leading members of ASMT for their opinions on doctoral education for CLSs. The

interviewees reported their anecdotal understanding of the influences on the development of doctoral programs. Karen Karni, Director, Medical Technology Program, University of Minnesota, is cited as saying that academic faculty in MT programs are under increasing pressure to gain grant funding, conduct research, and publish the results. "Consequently, universities increasingly expect MT faculty to provide credentials competitive with those of faculty in other departments" (p. 328). Karni is quoted later as saying, "If we are to achieve recognition, power, and esteem - as a profession and as professionals - we must compete successfully with colleagues, in medicine and in the basic and applied sciences, who hold doctorates" (p. 329). The article also notes that only two doctoral programs in CLS existed in 1988, so most practitioners pursuing graduate education were forced to earn degrees in other disciplines. The article then briefly discusses the problems of implementing new doctoral programs as described in ASMT's position paper (ASMT, 1989).

Beck and Chamness (1990) report the results of a survey to determine whether undergraduate CLS students are encouraged to pursue graduate study and whether current undergraduate programs prepare students adequately. They surveyed 50 academically-based undergraduate programs and 50 hospital-based programs. They also surveyed 116 graduate programs to which CLSs might apply, including programs in chemistry, medicine, veterinary medicine, clinical laboratory science, and microbiology. They had an 86% return from the undergraduate programs and 76% return from graduate

programs. Most (64%) of the undergraduate program administrators report at least moderate encouragement to students for graduate studies, with no statistically significant difference between levels of encouragement from academic vs. hospital-based programs. However, they estimate that less than 10% of their graduates actually go to graduate school.

The graduate programs surveyed were favorable toward admitting students with the academic preparation of the average undergraduate MT student, though in some cases, additional course work was requested before final consideration.

## Summary

On the whole, the literature on graduate education for CLSs is sparse. That devoted to doctoral education specifically is largely anecdotal with little empirical support. The literature reviewed describes circumstances parallel to those reported in the nursing literature and are summarized in Table 1 along side the nursing summary. If nothing else, the increased interest in doctoral education for CLSs, initiated by the two ASMT documents, has opened discussion of the subject to a broader audience than was previously concerned with it.

# CHAPTER III

## Methods

To answer the research questions posed in Chapter I, a survey method was used. The study population, survey instruments, survey instrument administration, follow-up procedures, and data analysis will be described.

### The Study Population

It was assumed that clinical laboratory science (CLS) programs that already offer the master's degree would be those most likely to develop the doctoral degree. Similarly, programs that offer an undergraduate component leading to the professional credential are expected to be most sensitive to the professional issues motivating the development of doctoral degree programs. Therefore, the academic CLS programs of interest are those that offer undergraduate programs accredited by the Council on Allied Health Education and Administration (CAHEA) of the American Medical Association and are included in their directory (American Medical Association [AMA], 1989), and that also offer a master's degree for clinical laboratory scientists (CLSs).

The programs of interest were identified in three ways, since no single, complete listing exists. First, the list of CAHEA-approved undergraduate CLS programs (AMA, 1989) was cross-referenced with listings of master's degree programs for CLSs available from the Petersen's Guide listing of graduate

programs (vonVorys, 1989). Second, the resulting list was expanded by sending an inquiry (Appendix A) to every academically-based, CAHEA-accredited program asking whether a master's degree is offered. Third, telephone calls were made to program officials who did not respond to the questionnaire but whose programs were suspected of offering a master's degree program.

Once the programs were identified, the directors and deans (as operationally defined) were identified. The mail inquiry used to identify the master's degree programs (Appendix A) also inquired about the names of program administrators. If the mail inquiry was not returned or was not usable, telephone calls were made to identify the appropriate individuals to whom the survey materials were sent.

Since the population of interest consists of 34 deans and 34 directors, and this is a small number of subjects, no sample was drawn. Rather the whole population was surveyed.

## The Survey Instruments

The survey instrument for directors is appended (Appendix B), as is the survey instrument for deans (Appendix C). Since no survey instrument existed to assess the information and opinions needed, these were developed by the researcher. The instruments were developed based on recommendations from the nursing literature on the resources needed to implement a doctoral

program (Cleland, 1976; Shores, 1986a; Shores, 1986b). The portion of the instruments on opinions about doctoral education for CLSs was developed based on the issues described in the literature on professionalization (Greenwood, 1966) and modeled after those of Davis (1985), used to assess opinions of a similar population on program accreditation and professionalization issues. The results of that opinion portion will be reported in other sources and will not be reported here.

The original draft of the director's survey was piloted with program directors of CLS programs not offering graduate programs (and therefore not part of the study population) and to former directors of programs with graduate programs. The original draft of the dean's survey was pilot tested with deans whose colleges do not have CLS programs and with associate and assistant deans of CLS programs who were not subjects in the study.

## Survey Instrument Administration

The surveys were sent to the subjects' business addresses March 1, 1990 by first class mail. The survey and its accompanying documents were mailed in a 9 1/2 X 12" envelope, thus eliminating the need to fold documents. The survey was accompanied by a letter of transmittal and a self-addressed stamped envelope for return of the survey. As indicated in the letter of transmittal, the surveys carried a number code for follow-up purposes.

The letter of transmittal (Appendix D) was individually addressed and

printed by word-processor and laser printer on letterhead of Michigan State University, College of Natural Science. The letters were signed individually by the researchers using a blue, felt-tip pen.

The letters were co-signed by Dr. Sharon L. Zablotney. Dr. Zablotney was president of the American Society for Medical Technology at the time of the mailing and is nationally-known as a CLS educator and leader. She was Associate Dean of the Michigan State University, College of Natural Science, and has directed CLS programs at several universities in the U.S. Her endorsement was expected to contribute significant credibility to the study.

The researcher also signed the letter. She is also known nationally within the CLS profession. She chaired the ASMT task force that developed a model undergraduate curriculum and was founding co-editor of the Society's journal, Clinical Laboratory Science. She received recognition as Michigan's Medical Technology Educator of the Year for 1989. She has held positions at the national-level within ASMT and at the time of the study was the immediate past-president of the Michigan Society for Medical Technology.

The letter of transmittal asked for a response within 14 days of receipt of the survey.

## Follow-up Procedures

Seven days after the survey was mailed, a follow-up postcard (Appendix E) was sent to non-responding subjects to remind those who had set the

survey aside that the response deadline was approaching and to encourage responses.

Three weeks after the initial mailing, which was two weeks after the reminder postcard, a second letter (Appendix F) and copy of the survey with all enclosures was sent to all non-respondents.

Any subjects who had not responded within two weeks of the last letter (i.e. five weeks after the initial mailing) were considered non-respondents. If the demographic data regarding earned degree, major, etc. could not be deduced from the mailing address, the subject was telephoned to gain that information.

## Analysis of Data

The data were analyzed using the Statistical Package for the Social Sciences-X (SPSS-X) (SPSS Inc., Chicago, IL). The commands used included DESCRIPTIVES and FREQUENCIES to calculate means and frequencies, respectively.

# CHAPTER IV

## Research Findings

Thirty-four institutions with a CAHEA-accredited undergraduate program plus a master's degree program were identified. Survey instruments inquiring about resources for supporting doctoral programs and plans to initiate a doctoral program were mailed to the directors and deans of all identified programs for a total of 68 subjects, 34 in each group. Both the dean and director of the researcher's institution declined to participate due to familiarity with the researcher. Therefore, the total number of subjects was 66, divided equally between deans and directors, and the total number of institutions was 33. Upon analyzing the results, one institution was deleted when the administrator responded that the institution no longer offered a master's degree. Therefore, the final total of institutions and subjects was 32 and 64, respectively.

The survey materials were successfully mailed to all subjects. None were returned as undeliverable. One director contacted the researcher suggesting that she was not the appropriate respondent and recommended that the survey be forwarded to a colleague. The researcher concurred and the survey materials were so forwarded.

Forty-nine survey instruments were returned by the due date; 28 from directors and 21 from deans. In response to the follow-up mailing three weeks

later, an additional six surveys were returned; two from directors and four from deans. Of the 30 directors' instruments, 29 were usable. Twenty-four of the 25 returned deans' instruments were usable. The final average return rate was 83% with 91% from directors and 75% from deans. Thirty of 32 institutions were represented.

## Respondent Profiles

A profile of the respondents is available in Table 2. Nearly one half of respondents who indicated the type of facility in which their program is housed were from colleges of allied health. Colleges of medicine or arts/sciences and health science centers were nearly equally represented.

Forty percent of respondents were certified laboratory professionals and, as would be expected, virtually all of those certificants were clinical laboratory science (CLS) program directors. There was one dean certified as a medical technologist (MT). Twelve of the MT respondents also held certification as clinical laboratory scientists (CLSs). Three of the MTs had a laboratory specialty certification. It is significant that 65% of deans held no professional certification despite the fact that many of them direct colleges of allied health.

Eighty-five percent of respondents held a doctoral degree in some field. The doctor of philosophy was the predominant degree and was distributed nearly equally between directors and deans. Sixty-six percent of directors held doctorates that predominantly were PhDs. All but one dean held the doctorate.

Table 2

Profile of respondents

| | N |
|---|---|
| Directors | 29 |
| Deans | 24 |
| Total | 53 |

| | Total | Directors | Deans |
|---|---|---|---|
| Type of facility | | | |
| Health Science Center | 6 | 5 | 1 |
| Allied Health College | 24 | 12 | 12 |
| Arts/Science College | 8 | 3 | 5 |
| Medicine | 11 | 7 | 4 |
| Other | 2 | | 2 |
| Unknown | 2 | 2 | |
| Certification | | | |
| MT(ASCP) | 21 | 20 | 1 |
| with CLS(NCA) | 12 | | |
| with specialty | 3 | | |
| RRT/PT/Other allied health | 2 | | 2 |
| MD/DDS | 5 | | 5 |
| None | 17 | 2 | 15 |
| Unknown | 8 | 7 | 1 |
| Highest earned degree | | | |
| BS/BA | 1 | | 1 |
| MS/MA | 7 | 7 | |
| PhD | 26 | 12 | 14 |
| EdD | 5 | 2 | 3 |
| DrPH/DHS | 2 | 1 | 1 |
| MD/DDS/PharmD | 5 | | 5 |
| Unknown | 7 | 7 | |
| Major | | | |
| Education | 14 | 8 | 6 |
| Natural science | 25 | 14 | 11 |
| Medicine/dentistry | 5 | | 5 |
| Pharmacy/Public health | 1 | | 1 |
| Social science/Humanities | 1 | | 1 |
| Unknown | 7 | 7 | |

All physicians (MDs) responding were deans, four of whom were deans in colleges of medicine.

Most respondents' terminal degrees were in science. Education was the second most common major.

Table 3 displays the nature of the relationship between terminal degree and major for all respondents. The majority of respondents holding PhDs earned their degrees in science, as did the master's and baccalaureate respondents.

Table 3

Numbers of respondents holding academic degrees in various majors

| | Highest Earned Degree | | | | | | |
|---|---|---|---|---|---|---|---|
| MAJOR | BS/BA | MS/MA | PhD | EdD | MD/DDS | DrPh/DHS | Totals |
| Education | | 2 | 7 | 5 | | | 14 |
| Natural Sci. | 1 | 5 | 18 | | | 1 | 25 |
| Medicine | | | | | 5 | | 5 |
| Pharm/Pub Health | | | | | | 1 | 1 |
| Social sci/ Humanities | | | 1 | | | 1 | |
| Totals | 1 | 7 | 26 | 5 | 5 | 2 | 46 |

Table 4 presents the respondents' certifications and earned terminal degrees. Fifty-four percent of the PhD respondents held no

Table 4

Numbers of respondents holding certification and various earned degrees

| HIGHEST DEGREE | CERTIFICATION MT(ASCP) | RRT/PT/Other Allied Health | MD/DDS | None | Totals |
|---|---|---|---|---|---|
| BS/BA | | | | 1 | 1 |
| MS/MA | 7 | | | | 7 |
| PhD | 11 | 1 | | 14 | 26 |
| EdD | 2 | 1 | | 1 | 4 |
| DrPH/DHS | 1 | | | 1 | 2 |
| MD | | | 5 | | 5 |
| Totals | 21 | 2 | 5 | 17 | 45 |

professional certification. Eleven of the 12 remaining PhDs were certified MTs. Fourteen of 21 MT-respondents held doctorates, 11 of which were PhDs.

Table 5 displays the degrees and majors for all CLSs responding. Among CLSs holding master's degrees, the majority were in science. However, doctorates were distributed nearly equally between education and science.

Table 5

Numbers of CLS respondents holding earned degrees in various majors

CLS Respondents

| | HIGHEST EARNED DEGREE | | | | | | |
|---|---|---|---|---|---|---|---|
| MAJOR | BS/BA | MS/MA | PhD | EdD | MD/DDS | DrPH/DHS | Totals |
| Education | | 2 | 5 | 2 | | | 9 |
| Natural Sci. | | 5 | 6 | | | 1 | 12 |
| Totals | | 7 | 11 | 2 | | 1 | 21 |

Data profiling non-respondents is shown in Table 6. The profile of non-respondents is comparable to respondents in all categories except for a slightly higher representation of physicians among the non-respondents.

## Resources for the Development of Doctoral Programs in Clinical Laboratory Science

Both deans and directors were queried about their perceptions of the adequacy of resources within their institutions for the development of a doctoral program in CLS. Directors were asked additional questions about the actual resources of their institutions.

Table 6

Profile of non-respondents

| | N |
|---|---|
| Directors | 3 |
| Deans | 8 |
| Total | 11 |

| | Total | Directors | Deans |
|---|---|---|---|
| Type of facility | | | |
| Health Science Center | 1 | 1 | |
| Allied Health College | 2 | | 2 |
| Medical School | 3 | | 3 |
| Unknown | 5 | 2 | 3 |
| Certification | | | |
| MT(ASCP) | 3 | 3 | |
| MD/DDS | 4 | | 4 |
| None | 1 | | 1 |
| Unknown | 3 | | 3 |
| Highest earned degree | | | |
| BS/BA | 1 | 1 | |
| MS/MA | 2 | 2 | |
| PhD | 3 | | 3 |
| EdD | | | |
| MD/DDS/PharmD | 4 | | 4 |
| Unknown | 1 | | 1 |
| Major | | | |
| Natural science | 3 | 2 | 1 |
| Medicine | 4 | | 4 |
| Unknown | 4 | 1 | 3 |

To analyze the opinion items about resources, the following procedure was used. First, since effectively the entire population was represented by the respondents, no inferential statistics were used for data interpretation. Differences between groups of subjects were interpreted to be real, and the practical meaning of the differences was inferred by the researcher.

To determine whether subgroups of respondents differed in their opinions, the responses of the subgroups were compared. The numerical value of the responses were used to calculate mean responses. The mean of all responses to all eight items from individuals in one subgroup (e.g. deans) were compared to the mean of all responses to all eight items from individuals in the comparison group (e.g. directors). Since responses range from 1 to 4, a mean of all responses above 2.5 would indicate disagreement with the statements while a mean of all responses below 2.5 would indicate agreement. The mean value of all responses of individuals in different subgroups were compared to determine whether the stated null hypothesis was retained.

For further insight into the respondents' views on the opinion items, individual item means were compared between subgroups.

The first hypothesis proposed regarding resources was:

$H_o$: There is no significant difference between deans and directors in their opinions about the adequacy of resources at their institution for the development of a doctoral program in CLS.

The mean of all responses from directors was 2.58 while the mean of all responses from deans was 2.70 (Table 7). The null hypothesis was retained. Both groups held generally pessimistic views of the adequacy of their resources to support a doctoral program.

Table 7

Means of responses of directors and deans regarding resource perceptions

| Item no. | Item Content | Directors | Deans |
|---|---|---|---|
| 18 | Faculty skills, knowledge and ability | 2.07 | 2.50 |
| 19 | Faculty interest | 1.89 | 2.26 |
| 20 | Laboratories, libraries, and other facilities | 2.07 | 2.08 |
| 21 | Funding | 3.32 | 3.25 |
| 22 | Time | 3.10 | 3.00 |
| 23 | Numbers of faculty | 2.79 | 2.92 |
| 24 | Demand from prospective students | 2.93 | 2.96 |
| 25 | Demand from prospective employers of graduates | 2.48 | 2.64 |
| | Mean of all responses | 2.58 | 2.70 |

The individual resource perceptions of deans were compared to those of directors (Table 7). On the whole, both directors and deans were pessimistic about funding (item 21), faculty time (item 22), and

numbers of faculty (item 23) to support a doctoral program. Further they did not perceive a demand from either students (item 24) or employers (item 25) for doctoral programs in CLS. However, both groups believed that, in their institution, the facilities needed for a doctoral program (laboratories, libraries, etc) were adequate (item 20) and that faculty were interested in directing doctoral students (item 19). However, deans were somewhat skeptical of their faculty's ability to do so as evidenced by a neutral response to item 18.

Suspecting that administrators with plans to develop a doctoral program may differ from those without plans, the following hypothesis was posited:

> $H_o$: There is no significant difference between deans of programs with plans to initiate a doctoral program and deans of programs without plans to initiate a doctoral program in their opinions about the adequacy of the resources at their institution for the development of a doctoral program in CLS.

The null hypothesis was rejected. The deans with plans had a generally neutral view as evidenced by a mean of all responses of 2.38 (Table 8). Deans without plans had a mean of all responses of 2.75 (Table 8), a generally negative view of their resources.

Table 8

Means of responses regarding resource perceptions of deans with and without plans to develop a doctoral program

| Item no. | Item Content | Deans with plans | Deans without plans |
|---|---|---|---|
| 18 | Faculty skills, knowledge, and ability | 2.00 | 2.57 |
| 19 | Faculty interest | 2.00 | 2.30 |
| 20 | Laboratories, libraries, and other facilities | 2.00 | 2.10 |
| 21 | Funding | 3.00 | 3.29 |
| 22 | Time | 2.67 | 3.05 |
| 23 | Numbers of faculty | 2.67 | 2.95 |
| 24 | Demand from prospective students | 2.33 | 3.05 |
| 25 | Demand from prospective employers of graduates | 2.33 | 2.68 |
| | Mean of all responses | 2.38 | 2.75 |

When the individual item responses of deans whose programs are proceeding with developing a doctoral program (deans with plans) are compared to those of deans from programs that are not proceeding (deans without plans), a clear pattern emerges (Table 8). Deans with plans had a lower mean value (i.e. more positive attitude) on all eight resource perception questions as compared to the deans without plans. However, the magnitude of the difference is generally small. Differences of opinion occurred only on items 18 and 24. Deans with plans believed their faculty have the skills and

knowledge to direct doctoral students (item 18) whereas deans without plans were neutral to the item. Deans with plans were neutral to item 24 about prospective student interest whereas deans without plans were distinctly pessimistic about it. Once again, deans from both programs were neutral or pessimistic about funding (item 21), faculty time (item 22), and faculty numbers (item 23) to support a doctoral program.

Directors from programs with plans were hypothesized to differ from their counterparts in institutions without plans as described in the following hypothesis:

> $H_o$: There is no significant difference between directors of programs with plans to initiate a doctoral program and directors of programs without plans to initiate a doctoral program in their opinions about adequacy of resources at their institutions to develop a doctoral program in CLS.

The null hypothesis was rejected because the mean of all responses from directors with plans was an optimistic 2.00 whereas that of directors without plans was a pessimistic 2.74 (Table 9).

The individual resource perceptions of directors with and without plans are compared in Table 9. As with the deans, the directors with plans had a mean response lower than the directors without plans for all eight resource perception items (items 18-25). Unlike the deans, the mean responses of the directors with plans were significantly lower than those of directors without plans for 6 of the 8 items. The directors with plans agreed with all items except

item 21 indicating their general optimism about resources, but also indicating concern over funding (item 21). The directors without plans disagreed with or were neutral to 5 of the 8 items. They were optimistic only about faculty ability (item 18) and interest (item 19) in supervising doctoral students, and about facilities (item 20).

Table 9

Means of responses about resource perceptions of directors with and without plans to develop a doctoral program

| Item no. | Item Content | Directors with plans | Directors without plans |
|---|---|---|---|
| 18 | Faculty skills, knowledge, and ability | 1.67 | 2.22 |
| 19 | Faculty interest | 1.67 | 2.00 |
| 20 | Laboratories, libraries, and other facilities | 2.00 | 2.17 |
| 21 | Funding | 3.00 | 3.48 |
| 22 | Time | 2.33 | 3.33 |
| 23 | Numbers of faculty | 2.00 | 3.04 |
| 24 | Demand from prospective students | 1.67 | 3.08 |
| 25 | Demand from prospective employers of graduates | 1.67 | 2.62 |
| | Mean of all responses | 2.00 | 2.74 |

The following hypotheses were proposed regarding actual resources to support doctoral education.

$H_o$: There is no significant difference between institutions that are

proceeding with a doctoral program and those institutions that are not in regard to the number of faculty.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in regard to the number of doctorally-prepared faculty.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in regard to the number of faculty with active research programs.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in regard to the amount of external funding the programs receive.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in regard to hospital availability.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in

regard to the presence of other doctoral programs within their administrative unit.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the number of annual faculty publications.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the number of annual grant proposals submitted.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average dollar amount of grants received.

$H_o$: There is no significant difference between the directors of programs that are proceeding with a doctoral program and those directors whose institutions are not, in the perceived level of administrative support for initiating such a program.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average number of students enrolled in the university/college.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average number of students enrolled in the undergraduate CLSs program.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average number of students enrolled in the master of science program in CLS.

The mean values of the actual resources as reported by directors with plans were compared to those reported by directors without plans (Table 10). Based on these findings all the null hypotheses are retained with the exception of the following:

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in regard to the presence of other doctoral programs within their administrative unit.

Table 10

Means of actual resources for the development of doctoral programs in CLS from institutions with and without plans

| Item no. | Resource | Programs with plans | Programs without plans |
|---|---|---|---|
| 29 | Other doctoral programs in the same college | 100% yes | 79% yes<br>21% no |
| 30 | Access to a clinical laboratory | 100% yes | 100% yes |
| 31 | Dean's support | | |
| | None | 33% | 50% |
| | Complete | | 5% |
| | Tentative | 67% | 45% |
| 32 | Administration support | | |
| | None | 33% | 42% |
| | Complete | 33% | 21% |
| | Tentative | 33% | 37% |
| 33a | Number of faculty with an active research program | 3.0 | 1.7 |
| 33b | Percent of total faculty with active research program | 58 | 33.3 |
| 34 | External funding of research | $ 30,000 | $ 35,000 |
| 35 | Annual faculty publications from the unit | 4.33 | 3.7 |
| 36 | Annual grant requests | 2.33 | 3.2 |
| 37 | Average amount of funding requests | $200,000 | $162,571 |
| | Dollars received/grants requested | $ 12,876 | $ 10,938 |
| 54 | Number of students at the institution | 16,500 | 20,630 |
| 55a | Number of undergraduates in the MT program | 59 | 50 |
| 55b | Number of graduate students in the master's program | 11 | 9 |
| 57a | Number of faculty in the MT program | 5.7 | 5.3 |
| 57b | Percent of faculty with PhD | 42 | 45 |
| 57c | Percent of faculty with with MT certification | 76 | 86 |
| 57g | Percent of faculty with tenure | 37 | 45 |

$H_o$: There is no significant difference between the directors of programs that are proceeding with a doctoral program and those directors whose institutions are not, in the perceived level of administrative support for initiating such a program.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in regard to the number of faculty with active research programs.

As indicated in the perception items, some of the areas of greatest concern for administrators were faculty numbers and external funding. On these items there was no difference between programs with plans and those without. The two types of programs had, on average, the same number of faculty (item 57a) and the same percentage of doctoral-level faculty (item 57b). Though the percentages of certified faculty (item 57c) and tenured faculty (item 57g) may appear to differ, the absolute numbers of people represented by these percentages were the same for both groups, so no significant difference existed.

Programs that are proceeding with the development of a doctoral program showed a slightly higher, though not meaningfully different, level of external funding (item 34) for a comparable number of faculty. However, programs with plans had a higher percentage of faculty actively involved in

research (item 33). Though programs with plans submitted fewer grant requests (item 36) for more total support (item 37), the differences were not significant. The grant dollars actually resulting from those requests were comparable (item 34) as were the ratios of dollars received to grants requested.

Programs with plans were all situated in colleges that offer other doctoral programs (item 29) while 21% of the programs without plans were in academic units without other doctoral programs. All respondents indicate that a clinical laboratory is available as a source of research specimens (item 30).

Programs with plans differed little from programs without plans in terms of size of the institution (item 54), size of the undergraduate CLS student population (item 55a), and graduate student numbers (item 55b).

Directors in programs without plans appear to have perceived a lower level of support for a doctoral program from higher administration in their institutions (item 32) than directors with plans. A single respondent without plans perceived complete support from his or her immediate superior (item 31). However, on the whole, directors without plans perceived a lower level of support from their immediate superiors than did directors with plans.

Deans were asked to describe the administrative obstacles to gaining support for a doctoral program. Funding was the problem cited most often with space being second most frequently mentioned. No documented demand or need from students and employers and duplication of other degree content

were mentioned. Too few faculty, too few faculty with on-going research, and too little time were each mentioned once.

Directors were asked to estimate the incremental increase in faculty, funds, and facilities that would be needed to support a doctoral program. All directors who responded to this question estimated a need for more faculty. Sixty-one percent estimated a need for two full-time equivalent (FTE) positions, though others estimated a need for four or five additional FTEs.

On average, the directors estimated a need for one-time only start-up funds of $350,000. However, this figure is slightly inflated by a single estimate of three million dollars, while all other estimates range from $20,000 to $300,000. A more realistic average estimate of $121,000 is obtained when the single high estimate is eliminated.

The estimates of annual recurring expenses range from $10,000 to a high of $2,000,000. These high and low figures each seem questionable as the salary to fund two faculty would obviously exceed $10,000 and the $2,000,000 figure is out of line with other estimates. The more realistic estimates are $60,000 to $120,000, with an of average $95,000/year in recurring costs including faculty salaries.

Eighty-six percent of respondents indicated a need for additional laboratory space (item 28). About half of the respondents indicated a need for additional office space for faculty and one quarter reported a need for additional space for graduate students. One respondent indicated a need for a

building to accommodate research laboratories, office space, and teaching facilities.

## Plans to Develop Doctoral Programs in Clinical Laboratory Science

Deans and directors were both asked about their programs' intentions to develop a doctoral program. Directors were asked additional questions about the details of those plans. As shown in Table 11, three deans and their directors (i.e. three institutions) indicated they were in some stage of developing a doctoral program. Those three directors' responses to the descriptive items about their proposed programs and the planning process are provided in Tables 12 and 13.

Table 11

Numbers of institutions with plans for doctoral programs in CLS

| | Numbers of Respondents | |
|---|---|---|
| Status of Plans | Directors | Deans |
| No plans, no discussion | 15 | 16 |
| Discussed, but no plans | 8 | 5 |
| Proposal submitted | 3 | 2 |
| Plans to implement | | 1 |

Table 12

Details of plans for doctoral programs for clinical laboratory scientists

| Question | Program A | Program B | Program C |
|---|---|---|---|
| Type of degree to be offered | professional doctorate | doctorate in allied health with emphasis in lab science | PhD |
| Rationale for offering this degree | needs | | needed in the field; institutional survival |
| Title of the major | clinical science education | | laboratory medicine |
| Admission requirement | certified MT, bachelor's degree, 3 years of work experience, TOEFL > 565 | | |
| Sources of funding | reallocation of unit funds, added permanent funds, institutional and external start-up funds | | reallocation of unit funds, added permanent funds, external start-up |
| Financial support for | assistantships, external grants | | assistantships, tuition waivers |
| Obstacles | institutional politics | | reluctance to approve any new graduate programs due to finances, lack of other model programs, funding, low undergraduate enrollment, competition from specialty programs |

Table 13

Planning process for programs developing a doctoral program for clinical laboratory scientists

| | Program | |
|---|---|---|
| Question | A | C |
| With whom did you consult? | other doctoral programs in the college and university, other doctoral programs in MT, persons in the graduate college, external administrators and faculty | other doctoral programs in the college, other doctoral programs in MT, persons the graduate college |
| What forms of needs assessment did you use? | survey local MTs, unsolicited inquiries | survey alumni and local MTs, contact existing doctoral programs in MT, professional leaders |
| Did you use any resources from professional associations? | policy statement | no |

## Factors Influencing Decisions to Develop Doctoral Programs

All subjects were questioned about factors that may influence their decisions to develop a doctoral program. The first set of questions to directors asked about possible student interest in such a program. Directors and deans

were then both queried about problems in hiring doctoral-level faculty, effectively asking them to respond as prospective employers of doctoral graduates.

Three hypotheses were proposed about the supply of graduate students and demand for doctoral programs:

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average annual number of master's degree graduates.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average annual number of master's degree graduates going on to doctoral study.

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the average annual number of inquiries received about doctoral education.

As the results in Table 14 indicate, only the second of these null hypotheses was retained. Over the last five years, programs with plans have graduated about 50% more master's students (item 48a) than programs without plans.

Programs proceeding with a doctoral program received about one-third fewer inquiries (item 49) each year from prospective doctoral students. However, about the same number of students from each type of program have gone on to doctoral studies over the last 5 years (item 48d).

Table 14

Means of items regarding student supply and demand for doctoral programs in CLS

| Item no. | Student Factor | Programs with plans | Programs without plans |
|---|---|---|---|
| 48a | Numbers of master's students graduated in the past 5 years | 14.3 | 9.5 |
| 48d | Numbers of master's graduates going on to doctoral studies in the past 5 years | 2.5 | 2.0 |
| 49 | Numbers of inquiries about doctoral studies in the past year | 6 | 9.3 |

Since academic CLS programs are employers of doctorally-prepared CLSs, the following hypothesis was proposed relating plans for developing a doctoral program to difficulty in filling faculty vacancies:

$H_o$: There is no significant difference between institutions that are proceeding with a doctoral program and those institutions that are not in the opinions of their administrators about difficulty in hiring doctorally-prepared CLS faculty.

This null hypothesis was retained based on the results presented in Table 15. Though programs without plans reported twice as many faculty vacancies over the last 5 years (item 50a), administrators' responses indicate a similar problem in filling their vacancies. All programs with plans (N = 3) sought doctorally-prepared candidates while three-quarters of programs without plans indicated that they did the same (item 50b). Sixty-seven percent of the programs with plans sought candidates with both doctorates and professional certification. Of the 76% of programs without plans that sought doctoral candidates, 81% (i.e. 62% of all programs without plans) sought faculty who were also professionally-certified. All of the programs with plans that sought both credentials reported being unsuccessful in filling their vacancies. Eighty-three percent of programs without plans that sought both a doctorate and professional certification (i.e. 51% of all programs without plans) were unsuccessful in filling their faculty vacancies. Since the number of programs with plans is so small, the percentage differences between the groups are meaningless. Essentially, both groups have had difficulty in hiring faculty when a doctorate is required along with professional certification and the null hypothesis is retained.

When deans were asked the same basic question about difficulty in hiring doctoral-level faculty, all of the deans with plans indicated that there were problems while only 45% of the deans without plans indicated there were problems (Table 15). The majority of deans felt that the problem of recruiting

Table 15

Means of responses regarding faculty vacancies over the last 5 years

Directors' Survey

| Item no. | Faculty Issue | Programs with plans | Programs without plans |
|---|---|---|---|
| 50a | Number of faculty vacancies in the last five years | 1 | 2.14 |
| 50b | Were doctorally-prepared candidates sought? | | |
| | No | | 24% |
| | Yes | 100% | 76% |
| 50c | Was laboratory certification also required? | | |
| | No | 33% | 19% |
| | Yes | 67% | 81% |
| 50d | Were you successful in recruiting candidates with the required credentials? | | |
| | Yes | | 17% |
| | No | 100% | 83% |

Deans' Surveys

| | | | |
|---|---|---|---|
| 32 | Problems in hiring doctoral-level faculty? | | |
| | No | | 55% |
| | Yes | 100% | 45% |
| 33 | Similar problems in other disciplines? | | |
| | Same in all health professions | 67% | 67% |
| | Worst in MT | 33% | |
| | Worst in other disciplines | | 33% |

doctorally-prepared faculty in CLS is the same as in other health professions (Table 15). For the few who thought it was easier to recruit in other professions, their reasons are listed in Table 16.

Table 17 lists the types of credentials that were sought for faculty when both a doctorate and certification were sought.

Table 16

Deans perceptions of the disciplines in which recruiting doctoral faculty is easiest and why

Larger pool of candidates in:
- nursing
- dietetics/nutrition
- exercise science
- chemistry
- biology
- health services administration

Faculty salaries are higher in physical therapy

There are fewer programs in health services administration competing for the available candidates

Nursing is a more academically mature profession

Table 17

Credentials sought for faculty in CLS programs

| Credentials | Numbers of respondents |
|---|---|
| MT certification plus PhD in science/ basic science | 6 |
| MT certification plus PhD in science with expertise in hematology | 2 |
| MT certification plus PhD in science with expertise in immunohematology | 2 |
| MT certification plus PhD in science with expertise in microbiology | 1 |

Table 18 lists the strategies used when candidates meeting the specified qualifications could not be found. Table 19 describes the specific problems respondents described as contributing to difficulties in hiring doctoral faculty.

Table 18

Strategies employed when faculty with the desired credentials could not be recruited

| Strategy | Number of Respondents |
|---|---|
| Hire lecturer for one year and reopen the search | 3 |
| Hire a master's candidate with certification | 4 |
| Waive certification requirement but require clinical experience or post-doctoral training | 3 |
| Reorganize faculty responsibilities and reopen search for candidates with different expertise | 1 |

Table 19

Deans and directors perceptions of the factors contributing to the problems in hiring doctoral-level faculty in CLS programs

| Factors | Number of respondents |
|---|---|
| Low faculty salaries | 6 |
| Lack of qualified applicants | 10 |
| Lack of tenure-stream position | 1 |
| Research-oriented faculty do not want the service/teaching obligations in MT program | 1 |

## Demographic and Biographic Data on Respondents

Demographic and biographic data were collected in the last part of each administrator's survey. Table 2, previously presented, summarizes this information.

Respondents were offered the opportunity to comment in an open-ended format as to their opinions about doctoral education for CLSs. Table 20 includes these comments.

Table 20

Anecdotal comments of respondents and their professional credentials

DEANS

Encourage CLS faculty to obtain PhD in related science.
DrPh, college of allied health

I believe that doctorates should be in basic sciences rather than in CLS.
PhD in physiology, college of allied health

I think such a program is badly needed. It would be a disservice to the students involved and indeed the entire profession if a program were developed, however, in the absence of a solid, productive faculty involved in the generation of new knowledge.
EdD in physical education, college of allied health

Tracks in clinical laboratory preparation in basic science PhD departments would be easiest to push.
Doctor of dentistry, college of allied health

Unneeded, unnecessary. A clinical laboratory scientist should seek a PhD in a related science department so as to learn research skills with appropriately trained scientists. A PhD in CLS would be looked on as a "window dressing" degree with no real substance to it. Such a thing therefore detracts from the value of an earned doctorate in a traditional terminal degree program.
PhD in medical microbiology

DIRECTORS

I think a doctoral program in allied health science would provide a solution with a greater breadth and use than a PhD in MT. a program with a core curriculum and specialization in MT/PT or OT, etc. is at this time, a better solution.
MS in natural science, MT certification, academic health science center

In the practice of clinical laboratory sciences there is no need for a doctoral degree. In academia there is and always will be a need for doctoral degrees - such degrees should be (in my opinion) in the science of the CLS area that the faculty member is specializing in. The doctorate in CLS will become a reality on many university campuses once the faculty in the CLS departments are primarily scientists (not with

Table 20 (cont'd).

education degrees) and are heavy into research. Instituting doctoral degrees that are not rigorous in science will hinder - not help - our profession.

DrPh in epidemiology, MT certification, college of allied health

Do not really believe doctorate in clinical laboratory science is needed. Need more clinical microbiologists, clinical chemists, etc. - specialty areas. Issues at undergraduate level more pressing and not any positions for doctorates except in educational institutions.

PhD in educational administration, MT certification, college of sciences

Out biggest problem in implementing a PhD in MLS would be our low student FTEs. The PhD in dietetics is currently facing problems at the university level for this reason. Next problem is lack of professional identity. We have too many practitioners who regret having gone into med tech in the first place and who do not feel there are career opportunities beyond the bachelor's degree.

PhD in biochemistry, MT certification, college of allied health

In our institution we will probably never hire anyone with less than a PhD again. While we would prefer future vacancies to be filled by med techs with doctorates, these individuals are rare. We probably will fill a retirement in 1/2 years with a PhD clinical chemist since med techs with research capabilities are very hard to come by. Research comes first here at U of ____.

Medical technology is part of the department of laboratory medicine and pathology of the medical school. The department has a PhD pathobiology program. I'd like to be able to put in a CLS "track" within pathobiology, rather than initiate anew PhD program which could be attacked by other interest groups.

If MT's don't pursue doctorates (of any kind) we may find our faculty filled by PhDs in genetics, molecular biology, etc., rather than with those who come from the CLS background. The "shape" that doctoral education takes isn't important - the graduates are.

PhD in education, MT certification, college of medicine

I am concerned about advertisements for faculty in medical laboratory science programs that state "PhD preferred or required". We all know what happens to PhDs in academic settings, or most settings. Here, we are in the School of Medicine. Any PhD is on tenure track and MUST publish. The amount of teaching required of med laboratory science faculty does not allow significant amounts of time for research. So either that person does not succeed in maintaining tenure, or master's

Table 20 (cont'd).

level or BS degree people end up doing the teaching, especially in the laboratory sessions. I am supportive of PhDs as program directors, but I think that it is unrealistic to require all faculty members to hold PhDs.

MS in medical technology, MT certification, college of medicine

# CHAPTER V

## Discussion and Conclusions

Three areas of conclusions will be discussed. They are the resources for the development of doctoral programs in clinical laboratory science (CLS), plans to develop doctoral programs, and the need for more doctorally-prepared clinical laboratory scientists (CLSs). Recommendations for the development of doctoral programs in CLS will also be described.

### Resources for the Development of Doctoral Programs in Clinical Laboratory Science

The following research questions were investigated in regard to the resources for the development of doctoral programs in CLS:

(1) Are there institutions that are perceived by their administrators to possess the resources necessary to develop a doctoral program in CLS?

(3) If the resources to develop a doctoral program in CLS are not currently available, what are the projected needs and from where are those resources expected to come?

(4) How do programs that are proceeding with the development of a doctoral program compare to those that are not developing one?

(a) How do their administrators' opinions compare in regard to the resources of their institutions to initiate doctoral programs?

(b) How do these institutions compare in actual resources?

(c) How do they compare on the numbers of inquiries about doctoral education they have had?

(d) How do they compare in regard to problems with hiring doctorally-prepared faculty? (See discussion of The Need for More Doctorally-prepared CLSs)

(e) How do they compare in regard to the numbers of master's degrees granted annually?

(f) How do they compare in the number of master's graduates that go on to doctoral study?

As would be expected, administrators developing a doctoral program perceive their resources more favorably than their counterparts who are not developing doctoral programs. Directors are even more optimistic than deans regarding their resources. However, a pessimistic view may in fact be a realistic assessment of resource adequacy, so the data on actual resources is important in assessing the perception responses.

Institutions developing doctoral programs do not have distinctly greater resources to support doctoral education as described by the survey instrument. The only meaningful difference is a higher percentage of the faculty in programs with plans are reported to be involved in active research. However, in absolute terms this is an average increase of only one individual faculty member compared to the programs without plans. It would seem that directors in programs with plans perceive this level of resources to be adequate while those without plans do not. A survey of the resources of the two existing doctoral programs would have been useful to provide a standard of what is an adequate level of resources.

Other institutional factors not surveyed may influence administrators' perceptions of resource adequacy. Nearly all directors estimate a need for additional faculty, funds, and facilities to support a doctoral program. It may be that those institutions with plans legitimately perceive a likelihood of attaining those additional resources and, equally legitimately, administrators without plans cannot expect to attain the additional needed resources.

The sources for those new resources were listed only by directors with plans to develop a program. In both cases, directors anticipated that at least some funding would need to come from outside the institution.

## Plans to Develop

## Doctoral Programs in Clinical Laboratory Science

Administrators were queried about their institutions' plans for developing a doctoral program in CLS to address the following research questions:

(2) In 1990, how many CLS programs are in the process of developing doctoral programs for CLSs and what is the status of their progress?

(a) How was the decision to proceed with development made?

(b) What problems or obstacles to implementation are anticipated?

(c) What types of programs are planned and what are their requirements?

Three institutions were described by both their deans and directors as being in the process of developing a doctoral program for CLSs.

The two programs proceeding with the development of doctoral programs that provided information on their prospective degree programs describe two distinctly different degree programs. The first will emphasize laboratory education and grant a professional doctorate. The other will grant a PhD in laboratory medicine. The latter type of program is probably more important to the professionalization of CLS by identifying laboratory medicine

as a distinct field of study. In fact, the existing doctoral programs in CLS are actually degrees in biomedical science or biology with an emphasis in laboratory medicine. The director of Program C (Table 12) may have been referring to this when s/he noted there are no model doctoral programs in CLS. Unfortunately, neither of the responding directors provided any information of the details of the planned degree program.

Program C's list of obstacles (Table 12) includes several rather predictable items such as finances and administrators' reluctance to approve any new graduate programs. Competition from specialty programs may be interpreted to mean related science disciplines that will compete for students. Those programs may have some relative advantage since there are few models of doctoral programs in laboratory medicine and students may not be adventurous enough to pursue a doctorate in an unproven discipline. However, Program C did a more extensive needs assessment than did program A and presumably found support from potential students. Both programs reporting on their developmental process reported performing some level of needs assessment.

In Leininger's 1976 study of prospective nursing programs, she found a great deal of enthusiasm for developing doctoral programs but significant pessimism about resources, particularly funding. CLS program administrators in this study appear to have beliefs about resources similar to those of earlier nursing administrators. By 1980 only one third of the projected programs in

Leininger's study actually had come to fruition. If a similar ratio were to apply as doctoral programs for CLSs begin to develop, only one of the three proposed programs is likely to emerge by 1993. However, in the nursing situation there were many programs competing for the available outside resources such as grant funding so that many of them were likely to fail in their initial efforts. Since so few programs in CLS are developing doctoral programs at this time, each will be in a better position to compete for external resources including funding and students.

Although not included directly within the survey scope, institutional factors may affect the decision to institute a doctoral program. Several respondents offered extemporaneous comments that indicated that the decision to institute a doctoral program may depend on institutional factors, such as organizational structure, despite the good intentions of administrators at all levels. For example, one respondent discussed the apparent duplication that a doctorate in CLS would provide since the CLS program was situated within the department of pathology in the college of medicine and CLSs were already eligible for that existing doctoral degree. Therefore, though attitudes may impede the development of a doctoral program when resources are adequate and institutional obstacles are minimal, favorable attitudes even in the presence of adequate resources may still not be enough to allow for the development of such programs.

## The Need for More Doctorally-Prepared Clinical Laboratory Scientists

Directors and deans were both questioned about the need for more doctorally-prepared CLSs in order to address the following research questions: (5) Is there a perceived need among CLS program directors and deans for more doctorally-prepared CLSs as faculty members and graduate mentors in CLS programs?

(a) How does this perceived need compare to the need perceived in other professions for doctorally-prepared faculty?

(b) What problems have been encountered in recruiting doctorally-prepared, professionally-certified faculty for CLS programs?

(c) What accommodations have been made if applicants with the desired credentials have not been available?

CLS programs may become producers of doctoral graduates but they are already employers of them. CLS programs provide faculty positions as one of the most obvious employment opportunities for graduates of doctoral programs. Therefore, CLS programs that are having difficulty in recruiting faculty with doctoral qualifications may decide to try to fill the need for

themselves and others. Though none of the program directors from programs with plans directly addressed this, each of them indicated that they had been unable to fill faculty vacancies with doctoral faculty.

Respondents to this study have substantiated a previous anecdotal impression that academic CLS programs have been experiencing difficulty in identifying and recruiting doctoral-level faculty, especially if certification is also required. Seventy-seven percent of all respondents have experienced this within the last five years. Some institutions have apparently maintained their commitment to build a research-oriented, doctorally-educated faculty by reopening searches when appropriate candidates could not be found. Other programs have forsaken the goal of building a doctoral faculty by hiring master's degree-prepared people. This may be with stipulations on earning a doctorate that were not indicated in the survey, but the open-ended format of the question allowed for that and none was offered. However, as master's-prepared faculty are significantly disadvantaged in the grant funding process, the prospects for developing a research program are effectively negated and the program has made a decision that limits its growth as a research unit.

The problem for this profession appears to be no greater than in other allied health disciplines, in the view of deans. However, it is doubtful whether development of more doctoral programs, particularly those designed especially for CLSs, will solve the apparent shortage of doctorally-educated practitioners. Doctoral programs in related sciences are available around the country and this

is an acceptable credential for CLSs in lieu of a doctorate in their own science. Therefore, the number of available programs and convenience of doctoral study is not a factor preventing CLSs from pursuing doctoral education.

More importantly, not many certified CLSs are entering doctoral study. The programs studied here report that about two master's graduates go on to doctoral studies every five years. There were 32 programs in the population, thus about 64 CLSs enter doctoral study every five years or about 13 every year. This estimate is low because it is based on graduates of master's degree programs associated with CLS programs and does not include CLSs that pursue graduate programs in other academic departments. However, it is still a useful figure since students graduating with master's degrees in other disciplines would be more likely to pursue doctoral work in the same discipline. Therefore, this number is probably a conservative but reasonable estimate of the number of CLSs that would be interested in doctoral studies in CLS annually in the United States. In the end, this means there are not many CLSs inclined to pursue doctoral studies. There may be some demand from past graduates but once satisfied, the annual number of students may be expected to be modest.

The problem of few CLSs pursuing doctoral studies is compounded when CLSs enter doctoral programs in other disciplines. The profession experiences some loss of members as doctoral candidates choose to affiliate themselves with colleagues in their new doctoral discipline and forsake CLS.

The reasons an individual would do this or why an individual would not choose doctoral study in the first place are the more fundamental issues. Few CLSs apparently perceive the value of doctoral education for themselves and their profession. Unlike bachelor's degree programs in other academic disciplines that groom undergraduates toward doctoral study, CLS has often failed to do this. This has been in large part because most professional education programs were provided within hospitals, not academic settings. The students were taught by baccalaureate-educated practitioners and by physicians, neither of whom had an orientation toward research. Today, 70% of accredited CLS programs are still provided in the 3+1, hospital-based format so that a significant proportion of students do not have role models of doctoral-level CLS researchers and are not mentored toward doctoral study as in typical academic disciplines and programs.

The data reported by Beck and Chamness (1990) refute this, however, with hospital-based and academically-based program directors reporting equivalent levels of encouragement for students in the pursuit of graduate studies. Since the data were not presented comparing responses of hospital-based to academically-based administrators, the authors' conclusion cannot be validated. They posed the question about encouragement without guidelines on what "slight", "moderate", or "a great deal of encouragement" were, so the respondents' self-reports are not standardized. A respondent actually doing very little to encourage students may perceive that they are doing a moderate

amount of encouraging, while another respondent doing a greater amount in absolute terms, may perceive that to be only slight encouragement. Further, a relatively small percentage of hospital-based programs was surveyed and may not be truly representative of that group.

The development of university-based CLS programs over the last several decades provides the foundation for changing this pattern and instilling in students a sense that the educational continuum within the CLS profession includes doctoral study. However, the reality is that university-based programs still face difficulties in this areas. As indicated by the results of this study, more than 50% of their faculty still do not possess doctoral degrees. Unfortunately, there is no published data from the past to reveal how this figure may have changed over the last decade. Anecdotally, the percentage of doctorally-educated faculty in CLS programs is rising nationwide as evidenced by the change in credentials described in advertisements for faculty vacancies. Yet, six programs, nearly 20% of the total, did not require a doctorate when filling recent faculty vacancies.

Other problems contribute to the failure of CLSs to pursue doctoral study including the lack of appreciation within the profession for the factors affecting professional self-determination. Further study is needed to ascertain the degree to which the general population of professionals is sensitive to these professionalization issues. However, though CLSs are concerned about professionalism, as evidenced in the literature, professionalization and its

related issues are rarely discussed. Even when it is mentioned, the fairly simplistic attributes view is taken and CLS is compared to the classic characteristics of a profession. The influences of power held by competing professions is rarely discussed.

## Implications and Recommendations

The implications resulting from this study are most meaningful when synthesized with other sources of information. These sources include information on the necessary resources for doctoral programs gleaned from existing programs in CLS, the literature on adult education, the literature on graduate education for CLSs in particular, and the projected number of prospective doctoral students from this study.

In this study, the resources of CLS programs planning doctoral degrees were comparable to those of the programs that were not proceeding with developing a doctoral program. However, in the opinion of most administrators surveyed, this level of resources is inadequate to support a doctoral program. Their pessimistic assessment may be accurate if the existing doctoral programs in CLS are used as a standard against which to measure the adequacy of resources. The programs at Northeastern University in Boston and Catholic University in Washington, DC do not rely solely on the CLS faculty and CLS program resources to support their CLS doctoral

programs (Catholic University, 1989; Northeastern University, 1988). At Northeastern University, the degree is actually a PhD in Biomedical Sciences with a specialization in Medical Laboratory Science. The PhD program is jointly supported by several departments including pharmacy, medical laboratory science, and pharmacology. Similarly, at Catholic University, the doctoral degree is actually a DA or PhD degree in Biology with an emphasis in Clinical Laboratory Science and therefore is supported by the resources of the relatively larger biology department. Further, the program appears to rely heavily on clinical faculty as research directors. A second factor that cannot be overlooked in regard to these existing doctoral programs is that each is geographically situated in an area of high population density, increasing the number of prospective students without requiring significant sacrifice on the student's part e.g. moving, giving up jobs, disrupting family life.

The literature on CLS graduate education (Heinemann, 1967; Rausch, et al, 1982), indicates that the population seeking graduate education in CLS is typical of working adult students. Issues of convenience, such as part-time attendance and evening classes, are paramount in decisions to pursue graduate education; a finding that is consistent with the literature in adult education (Cross, 1981; Knowles, 1980). Graduate programs often ignore barriers that prevent working adults from pursuing advanced degrees and persist in scheduling classes during the day or requiring residency or full-time status for extended time periods. This is probably not prudent for CLS

programs whose likely student population will include a majority of working adults unless student financial support is substantial. Another factor to be considered here is geographic location, which is an especially significant barrier for working adults with other adult obligations and responsibilities, such as working spouses and children in school.

The fourth item to be synthesized here is the relatively small number of prospective students nation-wide that will be interested in doctoral studies in CLS, as projected from this study.

The following recommendations are based on four assumptions: (a) Programs likely to develop doctoral programs for CLSs have relatively few faculty with only a modest amount of funded research on-going. (b) These programs have responsibility for an accredited undergraduate program and a master's program with all the teaching and administrative responsibilities attendant to these. Therefore, they have relatively little time for teaching and administering a doctoral program. (c) There is likely to be less than one doctoral student annually and s/he will prefer to be a part-time student because of adult responsibilities. Hence, his or her program will last at least 4 years post-master's degree. (d) Most prospective students will live geographically distant from the university.

When considered together, these factors suggest that cooperative programs allowing sharing of resources will be necessary for programs like those surveyed. Among the programs surveyed this may be planned but this

information was not specifically sought. Resource sharing may be within the institution, as with Northeastern University. However, it may be possible to rely on the resources of outside institutions within reasonable geographic distance, as at Catholic University. For example, researchers in local industries (e.g. pharmaceutical, chemicals, diagnostics), medical research centers, or public health agencies may act as research directors for doctoral candidates, thus easing the academic department's resource needs both in faculty time and laboratory supplies, equipment, and space. This model is effectively an extended, but traditional model of graduate education with all course work offered on campus, but the research experience offered off campus.

The extended model may work very effectively for institutions that are geographically close to other facilities that have on-going research programs. Since this model presumes the student will be in residence reasonably close to the academic institution in order to attend classes, the model is probably most reasonable for academic institutions that are in large population centers and therefore can expect a more consistent supply of prospective students.

An alternate model may be more appropriate for institutions that do not have the prospects of resource sharing within a reasonable geographic distance or those in areas of low population density with uncertain prospects for a regular supply of students. The alternative is a university-without-walls model and may take one of two forms, centralized or consortium.

The centralized model would suggest that a given institution, e.g.

University of X, offers the doctoral program. Courses are presented in formats that are easily delivered electronically so that students at significant distance can participate and assignments are handled either through the mail or electronically. The student's research is directed by an individual approved by University of X but geographically near the student and probably working in facilities like those used in the extended model above. Periodic (e.g. annual) visits to the university may be required for short-term courses and conferences with supervising faculty. The degree is ultimately granted by the University of X.

Theoretically, a student in any geographic location with the necessary research resources available could earn a doctorate from the University of X and in that sense the centralized university-without-walls model could easily meet student needs for access. It does ease the resource demand on the sponsoring institution since the research portion of the student's degree would be off-campus as in the extended model above. However, the major disadvantage of the centralized model is that it does not address all the institution's needs. The responsibility for teaching a full array of courses still resides with the University of X and may pose a burden to the small faculty. Further, such a small faculty is necessarily limited in expertise and the breadth of the degree will be limited.

A consortium model addresses some of the disadvantages of the centralized model. A consortium of programs currently providing master's

degree programs could be formed. Each program would seek approval from its institution to sponsor a doctoral degree by resource sharing with the consortium. Using electronic modes of delivery, each institution would contribute a course (or several courses) relying on the expertise of its faculty. Faculty at each institution would supervise the research of their own students.

The consortium model addresses the institution's needs for resource sharing because each institution would offer fewer doctoral-level courses than in the previously discussed models. A degree of shared curriculum planning would be needed among the participating institutions. However, major responsibility for supervising research and the attendant expenses of that are still borne by each institution. By including multiple institutions, the model extends the geographic area which would be served by doctoral programs but still requires students to be reasonably close to a participating university.

A fourth model that is a hybrid of the extended and consortium models could be developed - an extended consortium model. Once the consortium model is developed, the individual institutions could offer their students the option of having their research director be an off-campus researcher at some geographic distance. The expanded consortium model has the advantages of minimizing the course teaching obligations of any single institution as well as minimizing the resource demands for providing research experiences. The student has maximum access by virtue of being able to participate in the degree program without moving and could conceivably participate on a part-

time basis. This model would seem to hold good prospects for grant funding by relying on institutional cooperation and maximizing access for prospective students. These same features may help overcome the concerns of administrators in regard to faculty numbers, time, funding, and facilities.

## Summary

The resources within the CLS profession to develop doctoral programs were surveyed. The resources at institutions proceeding with doctoral studies and those that are not were generally comparable, therefore other factors affect the decision to proceed. Those factors may include attitudes of administrators but may also include institutional factors not studied in this survey such as institutional structure. Three programs out of 32 studied reported being in the planning process for a doctoral program. Nearly all respondents reported having difficulty identifying and recruiting doctoral-level faculty who are also professionally certified in CLS, thus substantiating a limited need for graduates of doctoral programs in laboratory science. An extended consortium model for a doctoral program is recommended to maximize access for students while minimizing the demand on institutional resources.

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# APPENDIX A

MICHIGAN STATE UNIVERSITY

MEDICAL TECHNOLOGY PROGRAM
E-57 McDONEL HALL
(517) 353-7800

EAST LANSING · MICHIGAN · 48825-1100

For a research survey on doctoral education for medical technologists, we need to identify CAHEA accredited medical technology programs that also administer master's degree programs designed especially for medical technologists. If yours is such a program, please complete the information requested below and return to Kathy Doig at the address above by January 10, 1990. Thank you.

_____
CAHEA accredited program/institution

_____
Address

_____

_____

_____
CAHEA program director

_____
Graduate program title

_____
Chief administrator of the graduate program

Please provide the name and address of the first or immediately-superior administrator/dean to whom requests to institute a doctoral program would be directed.

_____
Administrator/Dean

_____
Address

_____

_____

_____

# APPENDIX B

## CLINICAL LABORATORY SCIENCE
## DOCTORAL PROGRAM STUDY

### Program Administrator's Survey

Please complete the following survey regarding doctoral education in clinical laboratory science. For the purposes of this survey the phrases "clinical laboratory science", "medical technology", "medical laboratory science" and "medical laboratory technology" will be considered synonymous.

### Part I

**This first set of questions asks your opinion about doctoral education for medical technologists.**

Indicate the degree to which you agree or disagree with the following statements by circling the letter representing the opinion which is most like your own: Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). Please feel free to comment in the margins.

1. The terminal academic degree in clinical laboratory science in the U.S. presently is the master's degree.....SA A D SD

2. The terminal academic degree in clinical laboratory science in the U.S. should be the doctoral degree.....SA A D SD

3. There is a need for more doctorally-prepared clinical laboratory scientists.....SA A D SD

4. There is no need for more doctoral programs specifically designed for clinical laboratory scientists.....SA A D SD

5. There is a need for more doctoral programs in clinical laboratory science.....SA A D SD

6. It is preferable for clinical laboratory scientists to earn doctoral degrees in clinical laboratory science.....SA A D SD

7. Doctoral programs in clinical laboratory science should confer a professional doctorate, like the Doctor of Nursing Science, rather than a PhD.....SA A D SD

8. There are no employment options for graduates of doctoral programs in clinical laboratory science.....SA A D SD

9. The curricular emphasis of doctoral programs for clinical laboratory scientists should be unique as compared to other disciplines.....SA A D SD

10. Clinical laboratory scientists should preferably earn doctorates in sciences related to laboratory medicine such as microbiology.....SA A D SD

11. The curriculum of doctoral programs in clinical laboratory science should be designed by certified laboratory scientists who also hold doctoral degrees in education.....SA A D SD

12. For a certified laboratory scientist, a doctoral degree in clinical laboratory science is more professional than a doctorate in a different discipline.....SA A D SD

13. Development of doctoral programs in clinical laboratory science will do nothing to further the laboratory science profession.....SA A D SD

14. Decisions about instituting doctoral programs in clinical laboratory science will be made by parties outside the laboratory science profession.....SA A D SD

15. Clinical laboratory science is not a distinct discipline with a research base adequate to support doctoral education.....SA A D SD

16. Clinical laboratory scientists are not capable of developing doctoral programs and supervising doctoral students.....SA A D SD

17. Doctoral programs designed for clinical laboratory scientists should also admit non-certified individuals.....SA A D SD

**Part II**

**This next set of questions asks your opinions about the resources of your Clinical Laboratory Science unit to initiate a doctoral program.**

18. Our faculty possess the skills, knowledge and ability to supervise doctoral students in research.....SA A D SD

19. Our faculty possess the interest to supervise doctoral students in research.....SA A D SD

20. We have the laboratories, libraries and other necessary facilities to support doctoral students.....SA A D SD

21. We have the funding necessary to support a doctoral program.....SA A D SD

22. We have the time necessary to supervise doctoral students.....SA A D SD

23. We have sufficient numbers of faculty to institute a doctoral program.....SA A D SD

24. There is sufficient demand from prospective students for a doctoral program in clinical laboratory science.....SA A D SD

25. There will be demand from employers for graduates of a doctoral program in clinical laboratory science.....SA A D SD

If you feel that the faculty, facilities or funds are currently inadequate to support a doctoral program in your facility, please estimate the incremental increase needed in each of these areas:

26. Faculty

27. Funds

a. One time only, start-up costs

b. Recurring, annual expenses

28. Facilities

29. Are there other PhD and/or professional doctoral programs in other disciplines offered within your college or comparable academic unit?

[ ] no
[ ] yes; please list degrees and up to five majors

30. Do you have access to a hospital or other clinical facility as a source of clinical specimens for research?

[ ] no
[ ] yes

31. How much support do you have from the dean of your college or comparable administrator for development of a doctoral program within your unit?

[ ] none
[ ] complete
[ ] tentative
[ ] I don't know

32. Do you have support from the graduate school or college (or comparable administrative unit) for development of a doctoral program within your unit?

[ ] no
[ ] yes, tentative support
[ ] yes, complete support
[ ] I don't know

33. How many faculty do you have who have an active research program ie. supported by outside funds or publish regularly in peer-reviewed journals or submit grants for support of research or actively conduct research.

number _____ what percentage of your faculty is this? _____

34. What is the overall level of external funding for support of research in your unit?

35. On average, how many peer-reviewed manuscripts are published annually by faculty in your unit?

36. On average, how many grant requests for support of research are submitted annually by faculty in your unit?

37. What is the average dollar amount of the grant proposals submitted from your unit?

## Part III

**The next set of questions asks about your intentions to develop a doctoral program for medical technologists.**

Please place an "x" in the box next to the response which most closely represents your opinion. Select only one response unless otherwise directed. Please feel free to comment in the margins.

38. Has your institution/unit considered initiating a doctoral degree program in clinical laboratory science?

[ ] no -> go to question 48
[ ] we have briefly discussed it but have no plans for developing a program in the near future -> go to question 48
[ ] we have seriously discussed it but have rejected the idea; briefly describe your rationale for this decision then -> go to question 45

[ ] we have submitted a proposal to higher administration for consideration
[ ] we have approval for implementation and have initiated planning for an implementation date of _____

39. a) What type of degree are you planning to offer?

[ ] Doctor of Philosophy (PhD)
[ ] Doctor of Education (EdD)
[ ] Doctor of Science (DSc)
[ ] Doctor of Arts (DA)
[ ] professional doctorate ie. Doctor of Clinical Laboratory Science or Doctor of Medical Technology
[ ] other; please specify _____

b) What was the rationale for offering this degree?

40. What will be the title of the major for the doctoral degree you propose?

41. Summarize, or provide appropriate documents, that describe the requirements for the doctoral degree which you propose eg. admission requirements, number of credits of course work, numbers of credits of research, major topic areas for course work, language requirement, residence requirement. etc.

42. What sources of funding will support the doctoral program you propose? Mark all which apply.

[ ] reallocation of unit funds
[ ] additional permanent institutional funds
[ ] institutional start-up funds only
[ ] external grant for start-up
[ ] other; please specify _____

43. What sources of financial support will be available for graduate students? Mark all which apply.

[ ] teaching assistantships; amount _____
[ ] research assistantships; amount _____
[ ] institution-supported fellowships; amount _____
[ ] tuition waivers
[ ] external grants and fellowships
[ ] other; please specify _____

44. List the major problems or obstacles you perceive in gaining administrative approval for a doctoral program.

## Part IV

**The next set of questions asks about the decision making process used to determine whether or not your unit would institute a doctoral program at this time.**

45. Regarding your decision relative to developing a doctoral program, with which of the following did you consult? (Mark all that apply)

[ ] other doctoral programs within the college
[ ] other doctoral programs within the university
[ ] doctoral programs in medical technology programs at other institutions
[ ] persons within the graduate school/college on your campus
[ ] other; please specify _____

46. Did you conduct a needs assessment for a doctoral program in your unit?

[ ] no
[ ] yes; please mark all your needs assessment methods

[ ] survey alumni
[ ] survey prospective employers
[ ] survey other medical technology programs
[ ] survey current master's degree students
[ ] survey current bachelor's degree students
[ ] survey local medical technologists
[ ] collect data on unsolicited inquiries
[ ] contact existing doctoral programs in clinical laboratory science
[ ] others; please specify _____

_____

47. Did you use any resources from professional associations such as the American Society for Medical Technology or the American Society of Clinical Pathologists in making your decision about instituting a doctoral program?

[ ] no
[ ] yes; please list any documents or describe any resources used and explain how they were used

## Part V

**The last set of questions asks for demographic information on your program and faculty.**

48. a. How many students have graduated from your master's degree program in the last 5 years?

b. How many of them completed a thesis? _____

c. In which areas were theses written? Indicate number of each.

____ clinical sciences
____ education
____ laboratory management
____ other; please specify _____

d. How many of the graduates of the last five years have entered doctoral programs?

49. How many inquiries regarding doctoral studies have you had in the last year?

50. a. How many tenure-track faculty vacancies have you had within the last 5 years?

b. Have you sought to hire doctorally-prepared candidates for at least some of these vacancies?

[ ] no -> go to question 52
[ ] yes; doctorate only in a science related to clinical laboratory science
[ ] yes; doctorate in any area of expertise including education/laboratory management

c. Have you required professional certification in addition to a doctoral degree?

[ ] no; -> go to question 51
[ ] yes; certification as a generalist clinical laboratory scientist
[ ] yes; certification in a laboratory specialty
[ ] yes; certification as a generalist clinical laboratory scientist or in a laboratory specialty

d. Have you been successful in recruiting doctorally-prepared, professionally-certified faculty with the credentials you require?

[ ] yes, in all cases; -> go to question 51
[ ] not in all cases; describe the specific combination(s) of qualifications which you have not been able to find eg. certified MT with PhD in science and expertise in hematology

e. Describe what you have done when you were unable to find a candidate with the preferred combination of credentials eg. waive the certification requirement, reopen search, etc.

51. Describe any problems not mentioned above that you have had in recruiting doctorally-prepared faculty.

52. In which of the following is your unit administratively housed?

[ ] academic health science center
[ ] college of allied health or pharmacy and allied health
[ ] college of arts and/or sciences
[ ] college of nursing
[ ] college of medicine
[ ] other; please specify _____

53. Which of the following positions do you hold? Mark all that apply.

[ ] faculty in the clinical laboratory science program
[ ] CAHEA medical technology program director
[ ] chairperson/program director of undergraduate program
[ ] chairperson/program director of master's degree program
[ ] dean/administrator of college/unit which houses the clinical laboratory sciences program
[ ] other; please specify _____

54. How many students are there at your university/college?

55. How many students are there in your clinical laboratory science program?

undergraduates _____

graduate students _____

56. If you would care to offer any additional opinions about doctoral education for clinical laboratory scientists, please do so here.

CONTINUE ON NEXT PAGE

57. Please complete the following chart which describes your faculty. Include yourself as Number 1. You may distribute it to faculty to facilitate its completion. Make additional copies of this page and attach if necessary

| | Highest degree earned | Major/ department of degree | Professional certifications and agency | Academic rank | Tenure? y or n |
|---|---|---|---|---|---|
| 1. | | | | | |
| 2. | | | | | |
| 3. | | | | | |
| 4. | | | | | |
| 5. | | | | | |
| 6. | | | | | |
| 7. | | | | | |
| 8. | | | | | |
| 9. | | | | | |
| 10. | | | | | |

Thank you taking the time to complete this survey.
Please return the survey on or before March 15, 1990 in the postage paid envelope to:

Kathy Doig, M.S., CLS
E-37 McDonel Hall
Michigan State University
E. Lansing, MI 48825
(517)353-7800

# APPENDIX C

## CLINICAL LABORATORY SCIENCE DOCTORAL PROGRAM STUDY

Please complete the following survey regarding doctoral education in clinical laboratory science. For the purposes of this survey the phrases "clinical laboratory science", "medical technology", "medical laboratory science" and "medical laboratory technology" will be considered synonymous.

### Part I

**This first set of questions asks your opinion about doctoral education for medical technologists.**

Indicate the degree to which you agree or disagree with the following statements by circling the letter representing the opinion which is most like your own: Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). Please feel free to comment in the margins.

1. The terminal academic degree in clinical laboratory science in the U.S. presently is the master's degree.....SA A D SD

2. The terminal academic degree in clinical laboratory science in the U.S. should be the doctoral degree.....SA A D SD

3. There is a need for more doctorally-prepared clinical laboratory scientists.....SA A D SD

4. There is no need for more doctoral programs specifically designed for clinical laboratory scientists.....SA A D SD

5. There is a need for more doctoral programs in clinical laboratory science.....SA A D SD

6. It is preferable for clinical laboratory scientists to earn doctoral degrees in clinical laboratory science.....SA A D SD

7. Doctoral programs in clinical laboratory science should confer a professional doctorate, like the Doctor of Nursing Science, rather than a PhD.....SA A D SD

8. There are no employment options for graduates of doctoral programs in clinical laboratory science.....SA A D SD

9. The curricular emphasis of doctoral programs for clinical laboratory scientists should be unique as compared to other disciplines.....SA A D SD

10. Clinical laboratory scientists should preferably earn doctorates in sciences related to laboratory medicine such as microbiology.....SA A D SD

11. The curriculum of doctoral programs in clinical laboratory science should be designed by certified laboratory scientists who also hold doctoral degrees in education.....SA A D SD

12. For a certified laboratory scientist, a doctoral degree in clinical laboratory science is more professional than a doctorate in a different discipline.....SA A D SD

13. Development of doctoral programs in clinical laboratory science will do nothing to further the laboratory science profession.....SA A D SD

14. Decisions about instituting doctoral programs in clinical laboratory science will be made by parties outside the laboratory science profession.....SA A D SD

15. Clinical laboratory science is not a distinct discipline with a research base adequate to support doctoral education.....SA A D SD

16. Clinical laboratory scientists are not capable of developing doctoral programs and supervising doctoral students.....SA A D SD

17. Doctoral programs designed for clinical laboratory scientists should also admit non-certified individuals.....SA A D SD

**Part II**

**This next set of questions asks your opinions about the resources of your Clinical Laboratory Science unit to initiate a doctoral program.**

18. Our faculty possess the skills, knowledge and ability to supervise doctoral students in research.....SA A D SD

19. Our faculty possess the interest to supervise doctoral students in research.....SA A D SD

20. We have the laboratories, libraries and other necessary facilities to support doctoral students.....SA A D SD

21. We have the funding necessary to support a doctoral program.....SA A D SD

22. We have the time necessary to supervise doctoral students.....SA A D SD

23. We have sufficient numbers of faculty to institute a doctoral program.....SA A D SD

24. There is sufficient demand from prospective students for a doctoral program in clinical laboratory science.....SA A D SD

25. There will be demand from employers for graduates of a doctoral program in clinical laboratory science.....SA A D SD

If you feel that the faculty, facilities or funds are currently inadequate to support a doctoral program in your facility, please estimate the incremental increase needed in each of these areas:

26. Faculty

27. Funds

a. One time only, start-up costs

b. Recurring, annual expenses

28. Facilities

29. If you support the idea of developing a doctoral program, but the resources are inadequate, how could adequate resources be obtained?

CONTINUE ON NEXT PAGE

## Part III

**The next set of questions asks about your intentions to develop a doctoral program for medical technologists.**

30. Has your institution/unit considered initiating a doctoral degree program in clinical laboratory science?

[ ] no
[ ] we have briefly discussed it but have no plans for developing a program in the near future
[ ] we have discussed it seriously but have rejected the idea; briefly describe your rationale for this decision

[ ] we have submitted a proposal to higher administration for consideration
[ ] we have approval for implementation and have initiated planning for an implementation date of _____

31. What problems or obstacles do you see to gaining administrative approval for a doctoral program in clinical laboratory science?

32. Have you experienced difficulty in hiring doctoral-level faculty in your clinical laboratory science/medical technology program?

[ ] no
[ ] yes; please describe the types of problems you have had

33. Are there other health-related programs within your college or comparable administrative unit?

[ ] no
[ ] yes, please list all health-related programs in your college/unit

34. Are there other health-related programs at your institution which are housed in colleges (or comparable administrative units) other than yours?

[ ] no
[ ] yes

34. To what degree have you faced problems similar to those you described in question 32 when hiring faculty in fields other than clinical laboratory science?

[ ] The problems are the same in all health professions
[ ] The problems are worst in _____
specify profession
[ ] The problems are worst in medical technology

35. In which profession have you had <u>least</u> difficulty hiring doctorally-prepared, professionally-certified faculty members?

Why do you think this has been easier?

**Part IV**

**The last set of questions is on demographic data.**

36. Which of the following do you administer?

[ ] academic health science center
[ ] college of allied health
[ ] college of arts and/or sciences
[ ] college of nursing
[ ] college of medicine
[ ] other; please specify _____

37. What is your highest earned academic degree?

38. In what major/department did you earn the degree named above?

39. What professional credentials or certifications such as an RN, CLS, RRT do you hold?

40. Are you the first administrator who would receive a request for a doctoral program from the clinical laboratory science/medical technology program?

[ ] yes
[ ] no

41. If you would care to offer any additional opinions about doctoral education for clinical laboratory scientists, please do so here.

Thank you taking the time to complete this survey.

Please return the survey on or before March 15, 1990 in the postage paid envelope to:

Kathy Doig, M.S., CLS
Medical Technology Program
E-37 McDonel Hall
Michigan State University
E. Lansing, MI 48825
(517)353-7800

# APPENDIX D

COLLEGE OF NATURAL SCIENCE
MICHIGAN STATE UNIVERSITY

(517) 355-4470
103 Natural Science Building
East Lansing, Michigan 48824-1115

February 27, 1990

Dear Dr. :

Doctoral education for clinical laboratory scientists/medical technologists has become an area of prominent interest in the past year. We are interested in studying the opinions of the administrators of medical technology programs as they are critical to the development of doctoral programs specially designed for medical technologists. The data which we amass will be useful to you and other administrators in developing, designing and gaining approval for doctoral programs within your institution. It will include information on the characteristics of other programs, their status in developing doctoral programs and prospects for success as well as the market for graduates.

Since the success of doctoral programs lies with the administrators, deans and directors, your opinions are crucial to the study we are conducting. As there are few institutions which can even consider sponsoring doctoral programs for medical technologists, your response is especially important. Therefore, we ask you to take a few minutes to participate in this study. The survey instrument has been pilot tested on a sample of your peers and has been revised to maximize our data collection while minimizing your time commitment. In all cases, the time for completion of the instrument was less that 30 minutes. As it is your opinions in which we are interested, please do not delegate this to a member of your faculty or staff.

The results of the survey will be entirely confidential. The survey carries a code number to be used for follow-up only. In published reports of the results, only aggregate data will be reported and your individual responses will not be identifiable. You indicate your voluntary agreement to participate by completing and returning the survey.

*"SCIENCE IS YOUR FUTURE — BE A PART OF IT"*

Please return the survey by March 15, 1990. Should you have any questions regarding the study, please call Ms. Doig collect between 8am-noon and 1pm-5pm (EDT), Monday through Friday at (517)353-7800. We will be happy to share the executive summary of the study with you upon its completion in mid-1990.

Your participation is sincerely appreciated.

Yours truly,

Sharon L. Zablotney, Ph.D., CLS
Associate Dean
College of Natural Science

Kathryn Doig, M.S., CLS
Undergraduate Director
Medical Technology Program

# APPENDIX E

Approximately one week ago you should have received a letter from us requesting your participation in the CLS Doctoral Program Study. If you have already returned your survey, we would like to thank you for your prompt participation. If you did not receive our letter, please call Ms. Doig collect at 517-353-7800 between 8 am and 5 pm EST.

If you have not yet completed your survey, we would like to remind you that it will take less than 30 minutes of your time. Your participation is critical since there are so few programs which currently offer graduate study for medical technologists. Without your response, the data may be inaccurate and misleading. Please complete the survey and return in before March 15, 1990. Your prompt participation will facilitate completion of the project and dissemination of the results to you and others. Thank you.

Sharon L. Zablotney, PhD, CLS
Associate Dean
College of Natural Science
Michigan State University

Kathryn Doig, M.S., CLS
Undergraduate Director
Medical Technology Program
Michigan State University

# APPENDIX F

COLLEGE OF NATURAL SCIENCE
MICHIGAN STATE UNIVERSITY

(517) 355-4470
103 Natural Science Building
East Lansing, Michigan 48824-1115

March 22, 1991

Dear Dr :

Approximately three weeks ago you received a request from us for your participation in a survey regarding doctoral education for clinical laboratory scientists. To date we have not received your response. If you have completed the survey already, we thank you for your participation and you can discard this correspondence. If you have misplaced the previous mailing, we have enclosed another copy of the survey.

As we explained in our first letter to you, we are interested in studying the opinions of the deans and program chairpersons of medical technology programs as they are critical to the development of doctoral programs specially designed for medical technologists. The data which we amass on doctoral programs for medical technologists will be useful to you and other administrators in developing, designing and gaining approval for doctoral programs within your institution. It will include information on the characteristics of other programs, their status in developing doctoral programs and prospects for success as well as the market for graduates.

Since the success of doctoral programs lies with the administrators, deans and directors, your opinions are crucial to the study we are conducting. As there are few institutions which can even consider sponsoring doctoral programs for medical technologists, your response is especially important. Without it, the data may be inaccurate and misleading. We are awaiting your response to complete the survey results. Therefore, we ask you to take a few minutes now to participate in this study. The survey instrument has been pilot tested on a sample of your peers and has been revised to maximize our data collection while minimizing your time commitment. In all cases, the time for completion of the instrument was less that 30 minutes.

The results of the survey will be entirely confidential. The survey carries a code number to be used for follow-up only. In published reports of the results, only aggregate data will be reported and your individual responses will not be identifiable. You indicate your voluntary agreement to participate by completing and returning the survey.

Please return the survey by April 6, 1990. Should you have any questions regarding the study, please call Ms. Doig collect between 8am-noon and 1pm-5pm (EDT), Monday through Friday at (517)353-7800. We will be happy to share the executive summary of the study with you upon its completion in mid-1990.

Your participation is sincerely appreciated.

Yours truly,

Sharon L. Zablotney, Ph.D., CLS
Associate Dean
College of Natural Science

Kathryn Doig, M.S., CLS
Undergraduate Director
Medical Technology Program