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UNIVERSITY OF ALBERTA

A FOLLOW-UP STUDY OF THE 1985-1989 ALBERTA COMBINED LABORATORY & X-RAY TECHNICIAN GRADUATES

by

JOANNE J. RITCHIE (C)

A THESIS

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The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies and Research for Acceptance, a thesis entitled A FOLLOW-UP STUDY OF THE 1985-89 ALBERTA COMBINED LABORATORY & X-RAY TECHNICIAN GRADUATES submitted by JOANNE J. RITCHIE in partial fulfilment of the requirements for the DEGREE OF MASTER OF EDUCATION.

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ABSTRACT

This study was conducted to identify the strengths and weaknesses of the Combined Laboratory & X-Ray Technician Program (CLXT) as perceived by the graduates and the clinical preceptors. The Stufflebeam CIPP Model provided the conceptual framework, with product evaluation being utilized for the study.

Data were collected using three separate questionnaires designed for the graduates, the medical laboratory preceptors and the medical radiography (x-ray) preceptors. The questionnaires were designed by the researcher and consisted of closed questions, using a Likert scale, and open-ended questions. Prior to mailing the questionnaires, a pilot study was done. The questionnaires were mailed to a population of 71 graduates who graduated between 1985-1989, 11 medical laboratory preceptors and 11 radiography preceptors.

Data from 80 completed questionnaires (58 graduates and 22 preceptors) were analyzed using the Statistical Package for Social Sciences (SPSSx). Analysis of the data resulted in the following conclusions relating to the didactic phase as perceived by the graduates and the preceptors. Overall, the theory and laboratory practica taught in Hematology, Electrocardiography, General Knowledge, and Anatomy prepared the students adequately for the clinical training phase. In addition, the graduates and the x-ray preceptors expressed satisfaction with the training in the didactic phase. A

salient finding in the weaknesses of the didactic phase was in Clinical Chemistry. Basically, manual Chemistry procedures should be replaced with automated procedures and the Chemistry test menu should be increased.

The findings relating to the clinical phase indicated that the graduates were satisfied with the level of supervision received in both disciplines. A most salient finding was the concern by the preceptors that a more standardized clinical training program should be implemented. As with most programs, however, there are several areas of concern which resulted in primary recommendations for the CLXT program.

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CHAPTER I

THE PROBLEM

Introduction

The health care delivery system in Alberta has undergone tremendous changes over the last several decades due to the ever-changing technological advancements. As in all other medical areas, many of those changes have been most evident in the fields of medical laboratory and medical radiography. Personnel employed in laboratories and radiological departments have contributed greatly to the advancement of modern medicine and the welfare of society.

Until the late 1930's, formal training in medical laboratory technology was non-existent in Canada. The lab and x-ray personnel were shown how to perform a few simple tests "on the job" while working in hospitals. The emphasis was on practical application while theoretical knowledge was not a primary concern. As pointed out by Ryan (1985), the information that rubbed off onto the student, or was picked up "by osmosis" in "just being in the lab", was not the type of instruction or knowledge required in the expanding technological field (p. 15). With the inception of the Combined Laboratory & X-Ray Program in 1954, under the Provincial Department of Health, the training became formalized. This training consisted of a didactic component and a clinical component.

Eventually, educational and political circumstances resulted in the establishment of post secondary technical and vocational institutes throughout the country. The Northern Alberta Institute of Technology (NAIT) is an example of a technical institution that was established in 1963 under the terms and conditions of the Technical and Vocational Assistance Agreement.

It was not until 1975 that the program for the training of combined medical laboratory and radiography technicians became part of those programs offered at NAIT. The program is designed to consist of two phases. Phase one includes an academic year of theoretical and practical training at the institute. Phase two consists of 26 weeks of clinical training at a selected training hospital. Kennedy (1985) in Interorganizational Relationships in Three Allied Health Joint Cooperative Training Programs states:

> Thus, the student in an allied health program often begins training in a College or Institute of Technology, and completes the course requirements for the particular profession in an external clinical or hospital environment. Such programs are referred to as joint cooperative programs. (p.2)

Upon successful completion of the didactic and clinical phases, the student is eligible to write the Provincial Registration Examination, and if successful, receives a certificate as a Combined Laboratory & X-Ray Technician.

Between the years 1975 - 1983, there were two student intakes per academic year. One class registered in September of each year and the next class registered in

January of the following year. Since 1985, the program has graduated one class of students per academic year, with registration taking place in September. To accommodate the two 17 week semesters in an academic year, the class registration was changed in 1989 to the last week in August.

NAIT, the third largest post-secondary institution in Alberta, offers career training in more than 60 full time diploma and certificate programs and 23 apprentice trades. NAIT focuses on equipping students to meet the needs and challenges of a complex and changing economic and technological environment. Consequently, communication, cooperation and articulation between the institution and former students, as well as employers from industry are both necessary and vital. In his structural framework for program evaluation at a state or local level, Franchak (1984) stresses the importance of involving business, industry and former students. Post-secondary institutes recognize that follow-up evaluation is an effective means of keeping programs current and relevant to market needs.

The purpose of this study is to determine the program effectiveness and to investigate graduate employment outcomes. The Combined Laboratory & X-Ray Program has been in place for the past 15 years at NAIT. Since its inception, the program has graduated 534 technicians. How effective the preparation of technicians has been and the perceptions that employed technicians have of the program,

has never been subjected to a formal evaluation. These kinds of data were collected through a follow-up survey of those who have completed the program between the years 1985 and 1989. Best (1986) points out that by conducting follow-up studies on students who have completed a program, one may get some idea of the adequacy or inadequacy of the program.

Problem Statement

The purpose of this study was to identify the strengths and weaknesses of the Combined Laboratory & X-Ray Program as perceived by the graduates and the clinical preceptors; and to determine the employment history and the further education/training of the Alberta Combined Laboratory & X-Ray Technician (CLXT) graduates.

Subproblems

The following subproblems were identified to support the major purpose of the study.

1. The first subproblem was to identify the strengths and weaknesses of the didactic phase of the program, as perceived by the graduates and the clinical preceptors.

2. The second subproblem was to identify the strengths and weaknesses of the clinical phase of the program, as perceived by the graduates and the clinical preceptors.

3. The third subproblem was to identify the employment history of the graduates upon successful completion of the CLXT Program and up to their present employment indicating:

- the different jobs held,
- hospital or medical clinic setting,
- rural or urban setting,
- bed complement of the hospital,
- full time or part time employment.

4. The fourth subproblem was to identify the continuing education courses and advanced training courses undertaken by the CLXT graduates.

Assumptions

The following assumptions were formulated for this study:

1. It was assumed that the researcher would be able to locate and survey the students who graduated over the last five years.

2. It was assumed that the instrument developed for the survey would yield data and information that was relevant.

3. The researcher assumed that the graduates would recall accurately the skills that they learned in the two phases of their training program.

4. It was assumed that those involved in the study

would provide accurate answers to questions on a research instrument that would identify the strengths and weaknesses of the program.

Delimitation

The following delimitation was applied to this study.

The study did not attempt to evaluate the specific competencies or skills developed by successful students of the CLXT curriculum.

Definition of Terms

The following terms are defined to provide the reader with an understanding of these terms. The terms are study specific and apply to this research study.

Clinical phase

Represents the second phase of the two phase program and is conducted in an approved training hospital. The emphasis is on the practical application of the technical components taught in the two disciplines, medical laboratory and medical radiography, during the didactic phase. (Ryan, 1985, p. 11).

Combined Laboratory & X-Ray Technician (CLXT)

"The combined technician is a hospital worker trained to perform laboratory and x-ray work in smaller hospitals that

do not have sufficient volume or range of work to warrant employing both a laboratory technologist and an x-ray technician" (Saskatchewan Health, 1976). A registered combined laboratory & x-ray technician is one who has attained certification by successfully completing the didactic and clinical phases of the CLXT Program, followed by passing the written Provincial Registration Examination. For the purpose of this study both of the definitions apply, thus providing the reader with a more comprehensive definition.

Didactic phase

Represents the first phase of the two phase training program and is conducted at the institute. The emphasis is on the theoretical knowledge required in the two disciplines, laboratory and radiography, with simulated practicals included.

Evaluation

The literature review on the subject of evaluation revealed that there are as many definitions for this term as there are writers who have addressed this topic. The operational definition of evaluation as used in this report is "the process of delineating, obtaining, and providing useful information for judging decision alternatives" (Stufflebeam, 1971, p.xxv).

Preceptors

Registered technologists who are employed in the training hospitals as laboratory or radiography technologists, in a

supervisory capacity, and are responsible for providing instruction and coordination to the combined laboratory & x-ray students in a hospital learning experience.

Significance of the Study

The original and primary focus or purpose of the Laboratory & X-Ray Program was to train technicians to render laboratory and x-ray services in a rural hospital setting. The CLXT graduate plays a unique role in the medical field in that she/he is trained to perform procedures in both the laboratory and x-ray disciplines. In the x-ray department, the technician performs basic radiography, "correctly positioning the patient and x-ray equipment to produce and record images for the purpose of visualizing the extent of disease or injury to a patient" (NAIT, 1990, p .170). In the medical laboratory department, the technician is trained to perform basic laboratory procedures and electrocardiograms.

In Alberta, 90 (73%) of the 123 hospitals have a bed complement of 60 or less. With a further breakdown, we find that 43 (48%) of the 90 hospitals have a bed complement of 30 or less approved beds (Alberta Hospitals and Medical Care, 1987). At inception, the program was designed to serve hospitals with 60 or less beds. It was the intent or purpose of this study to conduct a follow-up survey to determine whether the program was keeping pace with the

rural hospitals services required in an ever-growing and changing medical field.

This study was designed to provide pertinent information regarding the overall program effectiveness. In addition, data was gathered regarding employment and job related courses taken by the graduate since completing the program. Mail-out questionnaires to solicit the opinions of both graduates and their clinical preceptors with some identical or parallel questions to each group were used. Ramer (1973) points out that this is an effective approach for making direct comparisons of the opinions held by the graduates and their preceptors about the quality of the program and the training received by the graduates and their subsequent employment records. Mackie (1981) noted that a follow-up study provides communication between the instructional staff and the graduates of the program and identifies the strengths and weaknesses of the training.

The program scope of practice is presently under review by an Alberta Health Disciplines Board committee with a possible expansion of the curriculum in the future. This study provides pertinent information which can aid in future decision-making in this respect.

Organization of the Thesis

Chapter 1 has presented an overview of the research study under the following topical headings: introduction;

study under the following topical headings: introduction; problem statement; subproblems; assumptions; delimitations; definition of terms; significance of the study and organization of the thesis.

Chapter II is a literature review and is composed of three sections: a comprehensive historical review of the CLXT Program; a review of post-graduation follow-up surveys involving medical occupational graduates, mainly medical laboratory and medical radiography technologists; and lastly a program evaluation search which provided a basis for the conceptual framework of the study.

The third chapter is concerned with the design of the research and the instrumentation used in this particular study. In addition, the method of data collection and analysis is discussed.

The fourth chapter presents an analysis of the data that was collected on the four subproblems of the study. These data and findings were organized as tables for ease of analysis and interpretation.

Chapter V presents a summary of the research findings and relates information concerning the conclusions and recommendations which were formulated from the data analysis of this research study.

CHAPTER II

REVIEW OF RELATED LITERATURE

In Chapter 1 it was noted that little research based information is available on this particular research topic. A number of graduate follow-up surveys have been completed in the medical profession in various medical occupations. The researcher agrees with Bryce (1970) who suggested that one of the major research problems that needs to be addressed in technical training institutions is the "continuing assessment of manpower training needs . . . and the development of means to meet those needs" (p. 373).

This chapter is composed of three sections that reflect the review of the literature related to this study. These sections will have the following organization:

1. First, in order to provide a historical background on the implementation of the program and the overview retracing of the important developments, a comprehensive review of the CLXT program was conducted in this section.

2. The second literature search included a review of follow-up studies of medical laboratory graduates, medical radiologic graduates and other medical occupational graduates. This knowledge proved invaluable in the setting up of the follow-up surveys.

3. In order to gain the necessary understanding and appreciation of program evaluation and its great importance

in education, a final review of literature pertaining to program evaluation was performed. This review also provided a conceptual framework for the structure of the study.

Program Historical Background

To investigate any problem or pursue any interest, it is important to trace that problem of interest to its origins. The process of tracing developments or events appears to be without ending and this statement is reflected by Behling (1980) who stated " . . . as one dimension leads to another, another dimension is soon to follow, and another and another like an endless chain of complex links each as fascinating as the last" (p. 41).

The issue involved in following a problem or interest is to identify each link or development as it becomes apparent.

Inception of the Program

A comprehensive review of the CLXT Program was conducted by the researcher. Program documents and files dating back to 1954 were researched, and in addition, the Kamra (1971) Report was carefully reviewed.

The Combined Laboratory & X-Ray Program was commenced in 1954, by the then Department of Public Health, and was offered at the Jasper Building, Edmonton. In 1972, the program facilities were moved to the Alberta Vocational

Center (AVC), Edmonton under the Department of Health and Social Development. Although the program is still being conducted at AVC, it has been under the jurisdiction of the Medical Sciences Department, at the Northern Alberta Institute of Technology (NAIT) since August, 1975. The transfer was the result of the Government Policy Paper of May, 1974 which placed the responsibility of health manpower with Advanced Education and Manpower.

Purpose of the Program

The purpose or objective of the program is to train technicians to serve the small community hospitals with 15-60 bed complements. The program is unique in that students, on completion of their training are able to perform basic radiography as well as basic laboratory procedures and electrocardiograms. The academic year consists of two semesters, of 17 weeks per semester, followed by a 26 week practicum in a rural training hospital (NAIT Calendar, 1989, p. 89). In his study, Review of Combined Lab & X-Ray Technology, Kamra (1971) stated:

> The program has operated continuously for almost 23 years since its inception, and although a number of changes in its location, format and jurisdiction have occurred, its raison d'etre has remained: the preparation of technicians for employment in the rural hospitals of Alberta. (p. 1)

It is evident from this report that the objective of the program parallels the services required in a large number of the Alberta rural hospitals.

Rationale for the Kamra Review

Between the year of inception in 1954 and the time of the conditional program transfer to NAIT in 1975, there was no record of any curriculum or program evaluation. A key provision under the transfer arrangement required NAIT to undertake a major study to reassess its need and determine the most effective format for program delivery. The following issues were addressed by Kamra (1977) in the research:

1. Assessment of continued need in the rural hospital for the combined laboratory & x-ray technician.
2. Designation of a suitable institutional "umbrella" for program delivery.
3. Improvements in program design and format to overcome apparent deficiencies.
4. Continuing education and employment upgrading to provide opportunities for lateral and vertical mobility of the graduates.
5. Anticipation of trends and directions for future references. (p. 8)

Through the study, recommendations would be provided to the stated issues and to other issues or unintended outcomes. Kamra also focussed on identifying immediate steps to improve the current effectiveness of the didactic and clinical phases of the program.

Findings and Recommendations of the Kamra Review

The study was conducted employing 1) in-house investigation including staff interviews, studying program files and observing physical arrangements in the didactic

program 2) field investigations including business meetings, on-site visits at each of 13 hospitals with interviews conducted with administrators, hospital physicians, and combined technicians. The findings are outlined in brevity: (Kamra, August 1977).

1. The need assessment for the CLXT was projected for a three year period ending in 1980. Findings: A clear and conclusive need for the continuation of the program exists. In general, hospitals with fewer than 50 beds, depend almost exclusively upon the services of the combined technicians for all in-hospital medical laboratory and medical x-ray tests and procedures. Larger hospitals, in the 50-99 bed complement range, employ registered technologists in the laboratory and radiology departments and consequently, combined technicians are employed in supporting roles. Recommendation: A need reassessment should occur at three year intervals, with the next assessment due in 1980/81.

2. Designation of institutional umbrella for program delivery. Findings: Program base in Edmonton represents geographical and demographic centrality and high compatibility with the existing NAIT programs. Recommendations: The combined program should be transferred to NAIT on a permanent basis. However, separate program identity and its primary focus on rural placement should be maintained.

3. Potential improvements in program design and format. Findings: Didactic phase- there was some lack of congruence between curriculum and hospital tasks, however they did not appear too serious. Clinical phase- acknowledged to be deficient. Recommendations: Review training objectives and curricula content and redefine as necessary. Conduct an immediate review and re-organization of the clinical training phase.

4. Continuing education and employment upgrading. Finding: Short seminars were offered within regional areas. Recommendations: Have an increased systematic field liaison and continuing education activities by program instructional staff.

5. Anticipated trends and directions. Finding: No significant new development in the role of the technician is discerned in the near future or next five years. Recommendation: Training design should be

> future oriented and should anticipate innovative trends. (p. 22)

Follow-up Recommendations

The Kamra Review was a comprehensive investigation of the program which provided NAIT with an excellent information base for both the administrators and the educational planners. The institution utilized the findings and recommendations to restructure the clinical phase of the program which was perceived to have deficiencies. Defined criteria, which are to be followed in the selection of training hospitals were outlined. This procedure has greatly improved the quality of the clinical training phase of the program.

Another recommendation was that the program design be future oriented and proactive to future trends. This study will collect data to determine whether the program is current as well as future oriented. It is vital that technical programs be meeting the student needs and the workplace needs. Other education planners concur that it is important that the skills acquired by the students contribute to the economic well-being, both to-day and in the foreseeable future (Thomas, 1987).

Since the completion of the Kamra Review in 1979, there have not been any comprehensive studies conducted on the program. NAIT however, has conducted competency validation studies on the program, with the most recent one being

completed in March, 1988. The Program Validation Studies are related to curricula content and focus on the skills or tasks performed by the technicians.

Follow-up Studies

From a review of the literature, it was found that there exist a number of follow-up studies of medical laboratory programs, medical radiological programs and vocational technical programs in the United States. It was discovered that a number of studies were conducted in Canada on the vocational technical programs, however, a much lesser number was conducted on medical laboratory or radiological programs.

Need and Importance for Follow-up Studies

A crucial need exists for evaluation of post-secondary programs and follow-up studies play a significant role in achieving overall evaluation. The important evaluative role of follow-up studies was cited by Sharp & Krasnegor (1960), nearly three decades ago, who stated:

> Follow-up studies of vocational education program graduates have been demonstrated to be useful tools in the evaluation of training and should be available as a regular input for future program assessment. Those who plan vocational education policies must have . . . data on the employment outcomes and experiences of those who have been trained. (p. 19)

Clarke et al. (1973) stated that "despite the acknowledged need for follow-up studies of occupational graduates, relatively few have been conducted" (p. 41). This situation has improved in the vocational technical programs since Clarke's observation was made. Follow-up studies however, are lacking in the medical laboratory and medical radiology programs. This is reflected in a statement made by Ryan (1984) who pursued a follow-up survey on the Medical Laboratory Technology Program and wrote "This program, under the auspices of the Canadian Society of Laboratory Technologists (C.S.L.T.), has been in existence for nearly fifty years but has never undergone a formalized evaluation process" (p. iv).

The Wisconsin Board of Vocational, Technical and Adult Education (1970) developed guidelines for conducting follow-up studies in order to provide the Wisconsin Districts with guidelines for follow-up studies. This approach provided a standardized and reliable method of gathering information for evaluative purposes as demanded by technological changes. The study provided a brief theoretical rationale for the follow-up studies and detailed instruments for studies at various stages after graduation.

Konrad and Small (1977) noted that "the most consistent rationale for follow-up studies . . . is the need for administrators to have objective information on the degree to which an educational program meets the needs of those it serves" (p. 10). In 1977, three models were developed by

Konrad, Small and a research team in the Department of Educational Administration, University of Alberta. These comprehensive models were designed for a systematic approach to follow-up studies on postsecondary programs on a provincial basis. It is important that a model provide decision-makers with a framework for achieving their specific outcomes. The three models, Needs Identification, Student Flow and Data Generation together provided a conceptual framework for follow-up studies of students at a number of postsecondary institutions. Data base information in follow-up activities may be used for a variety of purposes such as program evaluation, program planning and review and long range planning. The models and the instruments and systems presented in this study may serve as guides in future similar activities. The recommendations in the study included that Advanced Education and Manpower should encourage follow-up surveys through financial support and that they should act as a clearinghouse for all follow-up information by maintaining a record or data base for instruments and methodological approaches. It was well stated by Konrad and Small that "since education is a dynamic process, any follow-up efforts must be responsive to changes in the nature and priorities of goals/needs within the system" (p. 53).

A basic purpose that a follow-up study serves is to provide communication between an institution and its former students. Murphy (1976) stated that:

> Community colleges in the United States, for the past 50 years have been conducting follow-up studies to discover whether former students secured the occupations for which they were trained, to obtain graduates' evaluations and to secure recommendations for improving learning experiences. (p. 41)

Morell (1979) emphasizes that the importance or usefulness of a follow-up study for evaluation purposes be clearly spelled out before a study is conducted. The credibility and value of an evaluative follow-up survey is decreased if its importance cannot be demonstrated.

Post-Graduation Follow-up Studies

Post graduation follow-up studies are, undoubtedly, the most productive of all follow-up studies since they provide information which may be utilized to evaluate the basic purpose of the program, the training of the students, the employment outcomes of the graduates and other factors.

A literature search on follow-up studies for evaluative purposes resulted in 167 citations (hits). From the abstracts that were retrieved, a number of the studies were selected that had implications for the current study and are discussed:

Ryan (1984) conducted a program evaluation on the national program for medical technologists in Canada (C.S.L.T.), in completing the requirements for a Master's Thesis at the University of Alberta. The investigation included 1) a needs assessment survey including all 27 of

the training hospitals in Canada, 2) a student follow-up survey to a population of 2,411 graduates, who graduated between 1982-1984, to provide information regarding program strengths and weaknesses, 3) an employer survey to assess the graduates' performance in the workplace. The choice of evaluation instrument was a mail-out questionnaire in each of the surveys. Some of the findings and recommendations presented by Ryan (1984) following the analysis of the research data are outlined:

1. Only 60 % of the program heads felt that there was sufficient time for all the teachings. The didactic phase of all training programs should be a compulsory minimum of two years. This arrangement would allow for a more rounded curriculum and would provide a better teaching/learning atmosphere.

2. The clinical phase should not be conducted primarily with simulation as stat situations, unrealistic workloads and health care team concept cannot be properly simulated.

3. Almost half of the program heads felt that the Syllabus of Studies did not contain essential theory, competencies or skills needed by the new graduate. The curriculum must continue to remain relevant through a validation process to ensure it is meeting the needs of the graduates and the employer. Employer surveys should be continued in the future.

Scott (1984) carried out a follow-up survey to provide

information for evaluation purposes and long range planning for a radiography program at Bakersfield College, California. Questionnaires requesting information on curriculum and instruction, employment outcomes and continuing education were mailed to 105 graduates, with a 52.4% response rate. The survey included numerical response analysis and a summary of written responses. Since a survey was conducted in 1977, the 1984 survey was used to make some comparisons. The employment records showed that 94.4% of the respondents had obtained employment as a radiographer and 88.2% were working full time. Of those graduates employed, 56.5% were working in an acute hospital and 15.5% were working in a radiologist's office. The respondents gave the program good ratings in course content, classroom experience and clinical experience. In all cases, the 1984 survey ratings on the program were higher than the 1977 survey ratings. Scott concluded that both the 1977 and the 1984 surveys indicated that Bakersfield College runs a quality RT radiography program. Scott suggested that advanced training through continuing education should be offered to radiography graduates.

Spencer (1982) followed up the 186 graduates of the Illinois State University medical technology program to examine job history. The descriptive survey method was used to gather data from a population of 228 graduates, classes 1972-79. He attempted to determine the relationship between "sense of accomplishment" and "career commitment" in job

employment. Through a mail-out questionnaire, usable data were obtained from 170 graduates or 74.6%. Analysis using the Chi-square revealed findings that agree with findings of other studies: 1) those of Gerstenfeld & Whitt, that having challenging work is an important factor of job employment, and 2) those of Maslow's theory that intrinsic needs have to be met to produce job satisfaction. Spencer noted that an environment needs to be created to utilize a range of employee talents. Although the data showed a statistically significant relationship between a sense of accomplishment and career commitment, conclusions should be drawn cautiously because the study focussed on a single program.

Pipes (1982) conducted a survey entitled Evaluation of the Radiography Program at Caldwell Community College & Technical Institute (CCC&TI), North Carolina. The purpose of the study was to facilitate institute and clinical training and to aid in program improvement. Data for the study were obtained by using a questionnaire that was mailed to 66 graduates, 19 employers and 10 student instructors. Pipes reported that: 1) all students after 1977 and 69% of those graduating prior to 1977 were employed in the field of radiography, 2) 89% of the recent graduates and 88% of the earlier graduates rated the program as good or excellent, 3) 33% of the employers rated the CCC&TI graduates as better than other graduates, and 4) specific needs were identified in the areas of instructional and skill training and continuing education. The review of the Pipes survey

proved very beneficial to this research as a similar survey was conducted with graduates and clinical instructors and many commonalities were present.

Program Evaluation

In order to provide a conceptual framework for the structure of the study and to gain the necessary understanding of program evaluation, a review of literature of the various models of program evaluation was performed. Although the process of systematic evaluation was not recognized before 1930, evaluation is not new to man and has a long history. Tyler is often referred to as the father of educational evaluation. Using Tyler's initial contributions as the main reference point, Stufflebeam (1985) identified five major periods commencing with the Pre-Tyler Period, which includes developments before 1930 and spanning the years to the Age of Professionalism, which includes developments from 1973 to the present.

Evaluation has played an increasingly vital role in the development of educational programs in recent years. Because of the large number of educational programs implemented in the United States and Canada in the early 1960's, the need for evaluation was increased (MacKay & Maguire, 1971). The field of educational evaluation has expanded rapidly during the past 15 to 20 years.

Purpose of Program Evaluation

The purpose of program evaluation is to provide professionals with pertinent evaluative feedback to enable them to maintain their services updated, relevant and of high quality through revisions and renewals. Evaluation helps to determine whether the needs of the client as well as the goals of the program are being met. Because of the social, economic and technological changes that we are experiencing, evaluations and reviews are vital to maintaining quality education. In discussing the important role that education will play in our future and changing society, Harman (1979) wrote "In the end, education is our only salvation-education of ourselves toward a fuller understanding of both the evolutionary leap mankind struggles to effect and the requirements for a successful transformation to the trans-industrial society" (p. 144). Poteet (1986) noted that the purpose of an educational program evaluation is to identify the strengths and weaknesses of the program, diagnose problems and improve the overall program. In addition, a systematic program evaluation plan indicates sound rationale for each decision or judgment made.

Evaluation Models

Evaluation models serve a wide variety of purposes and provide the order and structure that is necessary to problem analysis and problem solving. Conceptual models facilitate

problem analysis and solving by enabling the researcher to conceptualize the multiple factors through visualization (Konrad & Small, 1977).

In selecting an appropriate model, an evaluator focusses on one that is applicable, adaptable and meets the needs of the particular program. After an extensive literature review, it was decided that a follow-up technique would be the method selected for the program evaluation in this study. The importance in selecting an appropriate evaluation model and devising an effective follow-up design when conducting an evaluation was recognized as Morell (1979) had stated:

> When designing a follow-up evaluation it is important that the follow-up strategy has distinct advantages which cannot be supplied by any other approach. It can yield information on the staying power of a treatment or a program, it can provide a picture of fluctuations of effects over time, and it can tell us a great deal about unintended consequences. (p. 244)

Many evaluators use an eclectic approach, choosing from various approaches and using their professional experience in designing a specific evaluation. As noted by Worthen (1981), an eclectic evaluator uses a "multiple method" approach in which various methods to obtain various types of information are utilized. There are probably as many evaluation models available as there are programs to be evaluated. Guba & Lincoln (1981), after a review of the literature, said they found over 40 evaluation models sufficiently formalized to appear in the literature since

1967 alone. Wright (1970) contends that there are similarities and commonalities in all the traditional evaluation models. He suggests that the major differences among most definitions and models of program evaluation are primarily those of terminology, emphasis and data recording procedures. Regardless of the evaluation model selected or devised, an evaluation should satisfy certain conditions. Stufflebeam (1985) points out that the Joint Committee Standards advise cooperation between evaluators and clients so that the evaluations satisfy the four main conditions:

> 1. An evaluation should be useful. In general, it should provide not merely feedback about strengths and weaknesses in the object but also direction for improvement.
>
> 2. It should be feasible. Reasonable controls should be taken into account and exerted over political forces that might otherwise subvert the evaluation.
>
> 3. It should be ethical. It should be founded on agreements that ensure that the necessary cooperation will be provided, that the rights of concerned parties will be protected and that the findings will not be compromised. A balanced report revealing both strengths and weaknesses should be provided.
>
> 4. It should be accurate. It should clearly describe the object as it evolved, and in it's context. Strengths and weakness of the evaluation plan, procedures and conclusions should be revealed. The findings provided should be valid, reliable and free from bias. (p. 10)

To understand the field of evaluation, the various authors have attempted to classify evaluation models in different ways. The following literature review will briefly examine several evaluation models. The focus will be on the Stufflebeam CIPP Model, the one selected to

provide the conceptual framework for the structure of this research.

Model for Involving Business, Industry and Labor

An effective model for evaluating post-secondary programs, and especially vocational programs, is the business, industry and labor model discussed by Franchak (1984). The author focusses on institute planning and evaluating vocational programs with business, industry and labor. The model provides a structural framework for the planning tasks and the evaluation tasks and is a comprehensive evaluation process. The planning and evaluation framework consists of broad categories which are divided into smaller detailed steps. The evaluation process encompasses a needs assessment in the initial planning phases of the program, a process evaluation while the program is operating and a product evaluation at the end.

Franchak (1984) views planning and evaluation as inseparable and as integral to the success of programs. The design that is discussed allows for business, industry and labor to participate at any step in the process. A Likert like scale of 1 to 5 may be used to judge the activity importance as well as the degree to which business, industry or labor representatives should be involved in teaching each task.

Fead (1986) points out that educational institutes and

business or industry can work together toward achieving common goals in education through coordination, linkage, collaboration and networking relationships. These kinds of relationships are feasible in the medical programs, such as the Lab & X-Ray Program, because of the joint cooperative nature of the program. Kennedy (1984) wrote that "The education of the students in the medical joint cooperative programs requires the interfacing of two distinct aspects of their training--a school-based theoretical phase and a hospital-based clinical phase" (p. 13). The training hospital can be viewed both as an integral part of the training program but also as business or industry. The reason being that a number of the training hospitals employ the students upon graduation, thus becoming employers in industry.

Institutions evaluating programs together with business, industry and labor can lead to important benefits for both. Fead (1986) concluded that "Improved vocational education can create a supply of better trained and more productive workers to meet the needs of business and industry and enhance economic development" (p. 7).

Competency Profile Development and Program Validation

To determine the validity of a program's curriculum at NAIT, a process called the Competency Profile Development and Program Validation is employed. This procedure was devised in 1975 by the NAIT Program Development Services

(PDS) staff who "modified the DACUM process to provide a consistent, reliable and rational means of fine-tuning curriculum to more accurately reflect the needs of industry" (Worger & Morgan, 1983, p. 60).

A competency profile is generated by industry representatives, consisting of a stratified sample of best practitioners. This profile is an exhaustive list of skills and knowledge that a graduate must possess. The very comprehensive list of skills is sent out to a large sample of NAIT graduates and to potential employers. The graduates are asked to differentiate between the "entry skills" and those skills acquired by a more experienced practitioner. The prospective employers or best practitioners are asked to indicate the level of competence required at the end of one year of working experience. The competency profile of skills established by industry is compared with the actual program curriculum. If the skills match, the program curriculum can be validated.

The analysis of the perceptions of the graduates and the prospective employers will determine the subset of the total skill profile, known as the core of the curriculum. The program curriculum validation process identifies areas of congruence between institute training and industry requirements. Worger & Morgan (1985) wrote that "more importantly, training shortfall and potentially unnecessary overtraining may also be identified" (p. 60). The Program Competency Profile Development and Validation Process which

is conducted on NAIT programs, has enhanced the institutes's reputation of preparing graduates specifically for industry and the work place.

Stake's Countenance Model

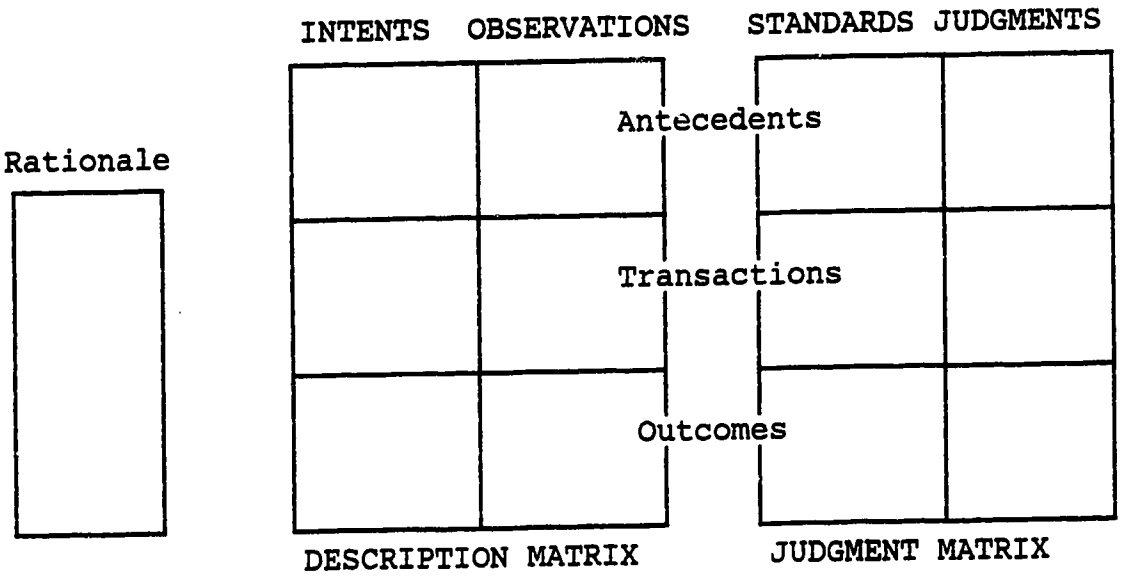
MacKay and Maquire (1971) classify the Stake Model as an eclectic model that focusses on data collection that will answer questions regarding an existing program as well as present additional questions that should be considered in the evaluation. Stufflebeam et al. (1985) note that in his "countenance" paper, Stake advocated comparing intended and actual outcomes and also recommended that antecedent conditions and ongoing transactions, intended and actual be assessed. In addition, Stake believes that a statement of rationale should be included in an evaluation. It should reflect both the philosophy of the program being evaluated and its purposes. Stufflebeam et al. (1985) point out that by countenance, Stake meant "the face of evaluation, the whole picture, an overlay" (p. 212). Stake did not intend to offer an evaluation model but rather an overview of evaluation.

Stake's Model is logical and comprehensive despite the fact that it may appear complex. In the first three cells or compartments of the model, the intentions are presented. See Figure 1. (Stake, 1973)

Intended antecedents- antecedents refer to the relevant background information that exists prior to the teaching and

Figure 1

Robert Stakes's Countenance Model



A Layout of Statements and Data to Be Collected by the Evaluator of an Educational Program

learning experience that may relate to the outcomes, such as the facilities, teachers and students.

Intended transactions- are the countless encounters of the students with other individuals, such as teachers, counselors, parents and other students. This would also include the psychomotor, motivational and attitudinal developments.

Intended outcomes- are the consequences or results of the educational process that are evident and obscure, and short range and long range. Outcomes are closely related to the specific objectives and goals of the program. Outcomes and antecedents are thought to be relatively static events and transactions to be dynamic.

In the second group of cells, Stake considers what actually occurs in each of the cells.

Observed antecedents- refers to the observations and recordings of actual antecedents. This would include a description of the facilities, the teachers and counselors, the activities and the student activities.

Observed transactions- are the activities that actually occur in the day-to-day educational system; student-teacher relation-ship, classroom and practical activities and student interaction and participation.

Observed outcomes- are the immediate or short range observable outcomes at the end of a program; and the long range outcomes which are observable at later dates.

Stake (1973) emphasizes that an assessment of all intended and observed components of a program is necessary in order to make any evaluative judgments. Stufflebeam et al. (1985) point out Stake agreed that judgments should be included in evaluations but that evaluators should report the other person's judgment and withhold their own. This emphasizes the key feature of the Stake Model that evaluators be external to those in the program. This procedure allows the evaluation to have an independence and objectivity that cannot be achieved through an internal evaluation process. Stake contends that individuals directly involved in a program should ultimately make the decisions based on the information obtained from the evaluators.

The description matrix of the Stake Model enables the evaluator to assess the intended and actual goals and the congruency and contingency effects. This kind of information enables judgmental comparisons to be made with respect to absolute standards or relative standards.

Stufflebeam's CIPP Model

The CIPP (Context, Input, Process, Product) Model of evaluation was first introduced in 1971 in the book

Educational Evaluation and Decision Making and authored by Stufflebeam et al. This book was the result of work sponsored by the Phi Delta Kappa (PDK) National Study Committee on Evaluation in 1969. The committee, consisting of D. Stufflebeam, E. Guba, R. Hammond, M. Provus and other members "assessed the state of the art in educational evaluation" and refined the CIPP Model (Stufflebeam, 1985). The principle that underlies the CIPP Model is evident in its definition of evaluation as provided by Stufflebeam et al (1971) who wrote that educational "evaluation is the process of delineating, obtaining and providing useful information for judging decision alternatives" (p. 40).

This definition of evaluation emphasizes that evaluation is a continuing process consisting of delineating, obtaining, and providing information; "and that information obtained should meet criteria of utility and should guide decision making" (Stufflebeam, 1974, p. 121). The three main steps of delineating, obtaining and providing, in fact, provide a basis for a methodology of evaluation. In addition, this definition of evaluation strongly indicates that the purpose of the evaluation is not to make judgments on the merits of a program, but rather to provide services to the decision makers. Thus, frequent reference is made to the CIPP Model as being the "Decision Making Model".

The purpose of evaluation according to Stufflebeam (1985), is to improve rather than to prove. This view is

against views that evaluations should be "witch hunts". Instead, evaluation is seen as a tool intended to improve programs for those people they are intended to serve. This principle is consistent with that presented by Cronbach and Associates (1980). An obvious similarity or relationship exists between the Stufflebeam CIPP and the Scriven (1966) concepts of evaluation. Stufflebeam's decision making and accountability concepts can be equated with Scriven's formative evaluation and summative evaluation, respectively.

The CIPP Model is composed of four types of evaluation, seen as a continuing process. (Stufflebeam, 1974):

1. Context Evaluation- is the most basic type of evaluation. It is usually employed in the planning stage of a program. It serves planning decisions by identifying unmet needs and unused opportunities to address the needs and underlying problems. Context evaluation is systematic overall as it provides a current baseline of information, yet it is ad hoc when foccussed on problems that prevent meeting needs or using opportunities.

2. Input Evaluation- serves structuring decisions by projecting and analyzing alternative program strategies and procedural designs. It is the development of plans based on assessment of human resources, material resources, budgets and procedural designs. Basically, it provides information for determining how to utilize resources to achieve program

objectives. Stufflebeam (1971) stated that "this can be accomplished by identifying and assessing (1) relevant capabilities of the responsible agency, (2) strategies for achieving program goals, and (3) designs for implementing a selected strategy. This information is essential for structuring specific designs to accomplish program objectives" (p. 222).

3. Process Evaluation- serves or feeds the implementing decisions by continuously monitoring the program activities and operation. It provides program decision makers with information required for overcoming procedural difficulties, for making programmed decisions and for interpreting program outcomes. Stufflebeam (1971) summarized that, "under process evaluation, information is delineated, obtained, and reported as often as project personnel require such information . . . especially during the early stages of a project" (p. 232). This information enables decision makers to anticipate and overcome procedural difficulties.

4. Product Evaluation- ascertains the overall effectiveness of a program by assessing the degree to which the objectives have been met and relating them to the content, input and process information. It serves the recycling decisions by identification and assessment of the program evaluation results. Product evaluation may be conducted at the end of a project cycle or as often as

deemed necessary during the project. In the change process, product evaluation provides timely information for deciding to continue, terminate, modify or refocus a program or activity. Stufflebeam (1974) maintains that this particular characteristic was and continues to be "the most unique characteristic of the model" (p. 117).

Summary

This chapter was divided into three sections: program historical background, follow-up studies and program evaluation. In the first section, the intent was to present an overview of the CLXT Program from the time of inception, in 1954, to the present time. In the second section of this chapter, the review of the literature stressed the importance of follow-up studies and the variety of approaches and guidelines for conducting follow-up studies. Ottley (1973) suggested that the unsatisfactory coordination between educational institutions and job markets may be corrected through follow-up studies. Konrad (1977) pointed out that follow-up studies provide information necessary for the process of judging decision alternatives. In Follow Up of AVC Business Students, Mackie (1981) stated:

> The follow-up study may also be conducted to determine the status of a group after some period of time. It offers objective information regarding the current status of the former students, as well as attitudinal and opinion data concerning the graduates' perceptions of the adequacy of their training. (p. 46)

The review also provided valuable information and ideas relevant to the study, on instrument design and data collection and analysis.

Following the sections on the program historical review and the follow-up studies , the last section provided a description of evaluation models proposed for educational evaluation. The Stufflebeam CIPP Model provides a definition of evaluation which includes the three main steps of delineating, obtaining, and providing information for decision making purposes. It appears to be a rather appropriate and comprehensive approach in the evaluation of a medical related program which has been in existence for a number of years. It was selected to provide the conceptual framework for the structure of this research. A conceptual framework provides an organized frame of reference that guides all aspects of instrument design and also facilitates a systematic evaluation process.

CHAPTER III

RESEARCH DESIGN AND INSTRUMENTATION

Research Design

In this chapter, the research methodology utilized will be presented and discussed. The research methods used to gather information related to the study were performed by computer or manually.

A search of the information retrieval system and a review of the standard indexes available in educational research were performed to determine if any follow-up studies had been conducted on students who completed a Lab &/or X-Ray Program at a post-secondary institution. A library search of the standard reference sources included doctoral dissertations, master's theses, professional journals, medical journals and reference books that dealt with program evaluation and follow-up surveys. The references used were the Education Theses and Selected Projects, The Alberta Educational Index, The Canadian Educational Index, The Education Index, Resources in Vocational Education and Social Sciences Citation Index.

A computer search of three data bases, Educational Resources Information Centre (NEW ERIC), Medline and Dissertation Abstracts International was conducted. The NEW ERIC search was conducted at the Herbert T. Coutts Library,

University of Alberta and the Medline and the Dissertation Abstracts International searches were conducted by the Bibliographic Retrieval Services (BRS). Descriptors were selected from the Thesaurus of ERIC Descriptors for the ERIC Data Base search.

From this search 167 citations (hits) were obtained, including journal articles, Eric documents, masters theses, and doctoral dissertations. A review of the abstracts of the citations revealed that minimal research had been completed in Canada on the follow-up of Lab &/or X-Ray graduates. The lack of follow-up studies in these areas and the fact that the Combined Lab & X-Ray Program has never had a follow-up study done surveying graduates and clinical preceptors confirmed the need for the present study.

Conceptual Framework for Follow-up Study

Having reviewed the various evaluation models, the Stufflebeam CIPP Model was utilized for the study. This model is flexible since the four types can be used independently. The product evaluation category of the CIPP model appeared appropriate and was used in the study, because of its realistic approach to the evaluation of an occupational medical training program. Product evaluation considers the overall effectiveness of a program, including intended and unintended effects and positive and negative outcomes, and ascertains the extent to which a program has met the needs of the graduates it serves. Madaus (1983)

argued that:

> Product evaluation often should be extended to assess long-term effects. The main objective of a product evaluation is to ascertain the extent to which the program has met the needs of the group it is intended to serve. In addition, a product evaluation should look broadly at the effects of the program, including intended and unintended effects and positive and negative outcomes. (p. 134)

In addition to utilizing product evaluation to assess the long term effects of a program, Madaus (1983) noted that:

> The basic use of a product evaluation is to determine whether a given program is worth continuing, repeating, and/or extending into other settings. It should also provide direction for modifying the program so it better serves the needs of all members of the target audience and so it becomes more cost effective. (p. 135)

Product evaluation information serves an important purpose in summative evaluation for accountability purposes. It can aid in securing political support and additional funding from the community or funding agencies where warranted. Conversely, it can help in avoiding continued support and wasteful financial investments in a program.

Michael Scriven once stated that "evaluation is nervous making" however, "evaluation is a necessary concomitant of improvement" (Stufflebeam, 1985, p. 184). Stufflebeam (1985) argued that:

> We cannot make our programs better unless we know where they are weak and strong and unless we become aware of better means. We cannot be sure that our goals are worthy unless we can match them to the needs of the people they are intended to serve. We cannot plan effectively if we are unaware of options and their relative merits. And we cannot convince our constituents that we have done good work and deserve continued

> support unless we can show them evidence that we have done what we promised and have produced beneficial results. (p. 184)

The conceptual framework for product evaluation as described by Stufflebeam (1974) and illustrated in Figure 2 provided the direction for this follow-up survey. The CIPP Model is a comprehensive model consisting of four types of decisions, four types of evaluation and three major steps in the evaluation process- delineating, obtaining, and providing (Stufflebeam, 1971). The structure of the conceptual framework presents several important evaluation steps and questions that must be addressed when planning a follow-up evaluation activity. In designing the conceptual framework for the study the three steps in evaluation and the questions that had to be addressed were included:

1. Delineating the information to be collected.

   What questions will be addressed?

The questions which were addressed and formulated were based on the subproblems of the study.

2. Obtaining the information.

   How will the information be obtained?

The required information was obtained from the graduates and the clinical preceptors through the utilization of three questionnaires. The procedures which were followed to collect the information, organize the information, and analyze the data are technical activities and are discussed in the following sections of this chapter.

Figure 2

Evaluation Model for Laboratory & X-Ray Program

Follow-Up Study

Steps in Evaluation	Product Role
Delineating	o What questions will be addressed? - Questions - based on subproblems.
Obtaining	o How will the required information be obtained? - Obtained - from graduates and clinical preceptors.
Providing	o How will the obtained information be reported? - Reported - using frequency distribution tables.

CIPP Model - Product Role

3. Providing the information.

How will the obtained information be reported? The data analysis is presented in frequency distribution tables and the information is reported in Chapter IV of the thesis.

A follow-up study based on CIPP product evaluation would direct the way to any needed improvements in the Lab & X-Ray Program; and also help the institute and the program to gain a better understanding of the needs of the graduate and the marketplace. Stufflebeam (1985) points out that product evaluation gathers information from a broad range of people associated with the program. It provides direction for modification, continuation or termination of a program, thereby, better serving the needs of the target audience.

Information provided by this product evaluation would serve several different stakeholders and government agencies. Included are the Alberta Association of Combined Laboratory & X-Ray Technicians (AACLXT), the Northern Alberta Institute of Technology, the CLXT Program, administrators and clinical preceptors at the training hospitals, the Department of Advanced Education, the Department of Alberta Health and the Alberta Health Disciplines Board. Other audiences to whom the follow-up survey results would be useful are potential CLXT students, CLXT graduates and their potential employers.

Population

The population of the study included two stakeholders, the CLXT graduates and the clinical preceptors. The population of the graduates was limited to those who graduated between November, 1985 and November, 1989 from the Laboratory · Program, N.A.I.T. To identify this population, a f a total of 71 names of graduates was obtained from the Laboratory & X-Ray Program. The addresses of the graduates were checked and updated as required. Information for updating purposes was obtained, with prior permission, from the Registrar of the AACLXT.

The population of the clinical preceptors totaled 22, with 11 preceptors surveyed from the medical laboratory discipline and another 11 preceptors surveyed from the medical x-ray discipline. The release of the names and addresses of the clinical preceptors was approved by the Laboratory & X-Ray Program Head and obtained from the Laboratory & X-Ray Program, NAIT.

Instrumentation

The results of the literature review in evaluation instruments were used as a basis for the choice of a follow-up survey employing the questionnaire instrument as the technique for data collection. According to Konrad (1977) the basic purpose in follow-up surveys is to provide a

communication link between a program and its graduates. Follow-up studies from clinical preceptors can also be utilized to obtain information to facilitate program evaluation. Including the graduates and the clinical preceptors in the study is supported by Christenson (1985) who wrote that an evaluation by graduates or students alone is subject to differing interpretation and response bias, especially on questionnaire items. In addition, reporting responses by students and preceptors on parallel questions allowed for analysis of perceptions of both groups. This approach provided deeper insight into the different areas of the program including the strengths and weaknesses of the didactic and clinical phases.

Questionnaire Design

Questionnaires, interviews and on-site visits were considered as possible methods of data collection. Whereas interviews and on-site visits would provide similar data, the questionnaire was selected because the latter has advantages over the former two. Advantages given by such authorities as Berdie and Anderson (1986), Ary (1985), Bennett and Ritchie (1975), Leedy (1985) and McCallon and McCray (1975) for selecting a questionnaire include: a relatively inexpensive technique to collect data from a large number of subjects; covers a wide geographic area including subjects in diverse locations; may elicit more accurate responses due to confidentiality and anonymity;

allows respondents time to read and contemplate answers with a uniform question presentation and finally it provides for a relatively simple and efficient data collection and analysis. Although a questionnaire has advantages, the author is aware of its limitations, some of these are: 1) a possibility of misinterpretation of the questions by the respondents; 2) the respondents may not answer the questions with integrity; 3) the respondents may not have the interest or ability to provide information crucial in determining the validity of data; 4) the questionnaire may be too lengthy; and 5) the respondents may not consider the study important enough to complete the responses accurately. In addition a potential low response rate may possibly bias the results and jeopardize the validity.

To obtain the appropriate data to meet the purpose of the study and to answer the specific questions raised in the problem statement, a total of three survey questionnaires were developed by the researcher. Two main question types, the closed question and the open-ended question were used. The closed question required the respondent to choose the answer from a given, limited selection while the open-ended question did not suggest any specific response. The majority of the questions in each of the questionnaires was the closed question type.

The graduate questionnaire was designed to collect data related to the four subproblems: the student perceptions, including the strengths and weaknesses of the didactic

component of the Laboratory & X-Ray Program; the student perceptions, including the strengths and weaknesses of the and clinical component of the Laboratory & X-Ray Program; the employment history of the graduates; and further education/training undertaken by the graduates. The graduate questionnaire (see Appendix A) consisted of 56 closed questions and 12 open ended questions.

Two different clinical preceptor questionnaires, one for the medical laboratory preceptors and another one for the medical radiography preceptors were developed. The medical laboratory preceptor questionnaire (see Appendix B) consisted of 20 closed questions and four open ended questions, whereas the medical radiography preceptor questionnaire (see Appendix C) consisted of 19 closed questions and four open ended questions. Both preceptor questionnaires were designed to collect data related to subproblems numbers one and two: the clinical medical laboratory preceptor and the medical radiography preceptor perceptions, including the strengths and weaknesses of the didactic and clinical components of the Laboratory & X-Ray Program, respectively. The majority of the questions in the preceptor questionnaires were basically identically constructed with parallel questions directed to the particular discipline. Likewise, a number of the questions on the graduate questionnaire were parallel questions with the questions on the clinical preceptor questionnaires. All three questionnaires utilized a five point Likert scale of

measurement.

The open ended questions were included to obtain information that possibly may not have been acquired through the sole use of closed questions. The responses obtained from the open ended questions were categorized according to "content analysis" designed by the researcher. A series of dummy tables with appropriate column headings were set up to indicate how the data was to be tabulated.

Pilot Study

Following the procedures and prescriptions in questionnaire design presented by different writers, does not necessarily guarantee that a proposed questionnaire will completely satisfy the objectives of a study. Consequently, it is essential and well worth the time to pretest or pilot test the questionnaire. Ary (1985) wrote that "a trial run or pilot study will, first of all, help the researcher to decide whether or not the study is feasible and whether or not it is worthwhile to continue" (p. 87). In addition to increasing the reliability and validity of responses, the pilot study serves the following purposes:

1. To help determine clarity of the items.
2. To assess comprehensiveness of the questionnaire.
3. To determine whether items are meaningful to the respondents.
4. To formulate general acceptance of sequence, format

and use of questioning techniques.

5. To determine if instructions were adequate.
6. To assess the appropriateness of the instrument.
7. To determine the timeframe for completion of the questionnaire.

A pilot study was conducted with a representative sample of five graduates and four clinical preceptors who were either the same individuals or similar to the individuals who ultimately received the actual questionnaires. Several necessary minor modifications were made to the final questionnaires following the analysis of the suggestions provided by the participants of the pilot study.

Data Collection

Two separate covering letters were prepared to accompany the graduate questionnaire and the preceptor questionnaire, respectively. The covering letters basically contained the following information: explanation for the purpose of the study, the role of the participants and a request for their participation in the study, the length of time it would take for completion of the questionnaire, the required date for completion and the assurance of the confidentiality that would be given to all data provided. A copy of the covering letter prepared for the graduate questionnaire may be found in Appendix D; while a copy of

the covering letter prepared for the accompaniment of the preceptor questionnaire may be found in Appendix E.

The coded graduate questionnaire, together with a self-addressed, stamped envelope was mailed to 71 graduates who graduated between the years 1985 and 1989. Similarly, the respective coded preceptor questionnaire with its covering letter and self-addressed, stamped envelope was mailed to 22 clinical preceptors, 11 of whom were medical laboratory preceptors and 11 of whom were medical radiography or x-ray preceptors. A total number of 93 graduate and clinical preceptor questionnaires were mailed on January 5, 1990.

All the clinical preceptors were contacted by telephone and informed of the study in advance of the questionnaire mail-out. The preceptors displayed an interest in participating in the study; consequently, questionnaires were mailed to the total number of 22 lab & x-ray clinical preceptors.

Data Analysis

Both quantitative and qualitative data were obtained in this descriptive survey study. The type of data that was received from the closed responses on the graduate questionnaire, using the Likert scale was treated as ordinal. The level of measurement for the graduate demographic data and data obtained on a number of questions relating to employment history and advanced education

training was nominal. All closed responses on the preceptor questionnaires utilized a five point Likert scale.

The data was encoded and analyzed with the assistance of a computer analyst from the Faculty of Education, University of Alberta. A frequency program was selected from the Statistical Package for the Social Sciences (SPSSx) to generate frequency distributions and percentages on data received from the preceptor and the graduate questionnaires.

Analyzed quantitative data received from both graduate and preceptor questionnaires were organized into frequency tables and the findings for each question were presented. Qualitative data, in the form of open ended questions, obtained from graduates and preceptors were analyzed and grouped according to content analysis.

The data and findings were summarized at the end of each subproblem as conclusions and the recommendations were drawn from these conclusions.

Timeline

An overview of the timeline is presented in Appendix G to depict the follow-up survey schedule.

Summary

This chapter was divided into two sections: research design and instrumentation. In the first section, the

Stufflebeam CIPP Model was presented as the basis for the development of this research study. The CIPP product evaluation type of evaluation was selected for the conceptual framework of the study.

In the second section, an outline of the research instrumentation was developed. Included was a discussion on the questionnaire, the instrument selected to gather the data. A separate questionnaire was developed for each of the cohorts; the graduates, the clinical medical preceptors and the clinical medical radiography preceptors. All three questionnaires included sections for both closed and open ended responses. In addition to discussing the method of data collection, this section described the analysis of the data.

CHAPTER IV

DATA ANALYSIS

Introduction

This chapter presents an analysis of data collected from the 80 participants, who returned completed questionnaires. The total number of participants was comprised of 58 CLXT graduates, 11 clinical laboratory preceptors and 11 radiography preceptors. A total of three different questionnaires were utilized.

The graduate questionnaire consisted of six parts. The first part consisted of five questions on general information which provided data classified as demographic variables. The second and third parts of the questionnaire provided data on the didactic medical laboratory and the didactic radiography components of the CLXT program, respectively. Parts four and five dealt with the clinical phases of the medical laboratory and radiography components, respectively. Lastly, part six provided data on the employment history and the advanced training undertaken by the CLXT graduates.

The clinical medical laboratory preceptor questionnaire consisted of two parts: the first part was designed to obtain information on the didactic component and the second part to obtain information on the clinical component of the

medical laboratory discipline of the CLXT program. Similarly, the clinical radiography preceptor questionnaire provided data on the didactic component and the clinical component of the medical radiography discipline of the program. A number of the questions included in the three questionnaires were parallel questions.

Problem Statement

It will be recalled from the problem statement in Chapter 1 that the purpose of this study was to identify the strengths and weaknesses of the CLXT program as perceived by the graduates and the clinical preceptors; to determine the employment history and further education/training of the CLXT graduates.

Analysis of the data from the closed questions were organized in frequency distribution tables, while the data from the open ended questions were analyzed and grouped according to content. The data analysis and results were utilized in the discussion of the general information section of the graduate questionnaire and the following four research subproblems of the study:

1. The first subproblem was to identify the strengths and weaknesses of the didactic phase of the CLXT program, as perceived by the graduates and the clinical preceptors.

2. The second subproblem was to identify the strengths and weaknesses of the clinical phase of the CLXT

program, as perceived by the graduates and the clinical preceptors.

3. The third subproblem was to identify the employment history of the graduates upon successful completion of the CLXT program and up to their present employment.

4. The fourth subproblem was to identify the continuing education/training courses undertaken by the CLXT graduates.

Questionnaire Findings

The number of completed graduate questionnaires returned before the deadline date of January 26, 1990 was 43, while the number of completed preceptor questionnaires returned was 21. Three graduate questionnaires were returned because of incorrect addresses, however the investigator was able to obtain correct addresses and mail them well in advance of the deadline. A total of 64 (68.8%) completed questionnaires were returned by the January 26, 1990 deadline. The following follow-up procedures were administered for those participants who failed to meet the established deadline: a follow-up letter found in Appendix F was mailed on February 2, 1990 and telephone contact was made with the clinical preceptor and a number of the graduates. This procedure proved worthwhile and yielded another 16 completed questionnaires. Aggregated the

percentage of response for the two cohorts was 86.0% (80/93). In this total there was 81.6% (58/71) graduates and 100% (22/22) clinical preceptors who returned the questionnaires. These data are found in Table 1.

Table 1

Rate of Return for Each Cohort (N = 93)

Cohort	Cohort Number	Questionnaires Returned	% Return
Graduates	71	58	81.6
Lab Preceptors	11	11	100.0
X-Ray Preceptors	11	11	100.0
Total	93	80	86.0

General Information

Part one of the graduate questionnaire provided general information data on demographic variables. The data in the following tables indicate the responses to part one, the general information section, of the graduate questionnaire.

Table 2 refers to the results from the question which asked the graduates for the year in which they graduated from the CLXT program. These data indicate that the highest number of completed questionnaires (14/14 = 100%) was received from the 1988 class and the lowest number of respondents (10/15 = 66.6%) was the 1986 class. One 1986

graduate had been living outside of Canada until recently and had not been employed as a CLXT during that time. She chose not to respond because of not being able to provide accurate responses. The responses ranged from 66.6% to 100%, with an overall return of 81.6%.

Table 2

Year of Graduation/Questionnaire Returns (N = 58)

Year	Frequency	Total Graduates	Percent
1985	15	17	88.2
1986	10	15	66.6
1987	9	11	81.8
1988	14	14	100.0
1989	10	14	71.4

The data collected from the graduates as to the type of community they grew up in are shown in Table 3. These data indicate that the majority (47/58 = 81%) of the 58 graduates grew up either in a rural/farm or town/small city environment. Only 19% (11/58) of the graduates were raised in a large city.

Table 3

Type of Community You Grew Up In (N = 58)

Type	Frequency	Percent
Rural or farm	25	43.1
Town/small city	22	37.9
Large city	11	19.0

It can be seen from the data in Table 4 that 25 participants (43.1%) would "recommend" and 11 participants (19%) would "highly recommend" the CLXT Program to a friend or relative if she/he was interested in the program. Another 21 participants (36.2%) would recommend the program, but with reservation.

Table 4

Would you Recommend the CLXT Program? (N = 58

Responses	Frequency	Percent
Not recommend	1	1.7
With reservation	21	36.2
Recommend	25	43.1
Highly recommend	11	19.0

The data in Table 5 refer to the results whereby the participants were asked whether they were aware that the CLXT Program was not offered on the NAIT main campus when they applied to take the program.

Table 5

Were You Aware CLXT Program was not Offered on Main Campus? (N = 58)*

Responses	Frequency	Percent
Yes	22	38.6
No	35	61.4

*No response= 1

The majority (61.4%) of the graduates indicated that they were unaware that the program was not offered on the main campus, while 22 (38.6%) graduates responded that they were aware.

Data in Table 6 relate to the results from the question in which the graduates were asked if they thought the CLXT Program should be part of the Main Campus programs.

Table 6

CLXT Program should be Main Campus Program (N = 58)

Responses	Frequency	Percent
Strongly disagree	1	1.7
Disagree	4	6.9
No opinion	7	12.1
Agree	14	24.1
Strongly agree	32	55.2

A salient finding is evidenced from the results which indicate that 46 (14 + 32) participants expressed the opinion that the program should be part of the programs offered on the main campus. Seven participants responded with "no opinion" to the question.

Summary of Graduate General Information Section

Overall, the graduate responses to the general information section of the graduate questionnaire indicated a number of salient findings:

1. The majority (81%) of the graduates were raised in a rural or small city type of community.

2. Thirty six of the total 58 participants would recommend the program to a friend or relative (25 recommend + 11 highly recommend responses).

3. Sixty-one percent (35/57) of the graduates, at the time of application for entrance into the CLXT Program, were unaware that the program was not offered on the Main Campus.

4. Seventy-nine percent (24.1+ 55.2) of the graduates expressed the opinion that the CLXT Program should be offered on the Main Campus.

Subproblem 1

In this section the results of the data analysis referring to the strengths and weaknesses of the didactic phase of the CLXT Program, as perceived by the graduates and the clinical preceptors are discussed. The data analysis on the closed questions, most of which are parallel questions, are organized according to concepts and are presented in frequency distribution tables. The open ended comments are analyzed according to common themes and are presented in frequency tables (see appendices H and I).

The data analysis for Subproblem 1 include Part Two and Part Three of the Graduate Questionnaire and the Didactic Phase Sections from the Medical Laboratory Preceptor Questionnaire and the Radiography Preceptor Questionnaire.

Time

The adequacy of the timeframe in the didactic phase as perceived by the graduates and the preceptors is shown in Tables 7, 8 & 9.

Didactic Phase

Data were collected with questions that asked all three cohorts whether the time allotted in the didactic phase of the program is generally adequate in relation to the material covered. As shown in Tables 7 and 8, the majority (90.9%) of the laboratory preceptors agreed that the time was generally adequate, whereas only 45.5% of x-ray preceptors indicated that the time was adequate. A notable difference was evidenced in the graduates' responses relating to the adequacy of time in the two disciplines. The majority of the graduates responded that the time allotted in medical radiography was adequate, whereas their responses were less positive for the laboratory component.

Table 7

Allotted Time Adequate in Didactic Medical Laboratory

Respondents	Responses	Frequency	Percent
Graduates (N = 58)	disagree	27	46.6
	agree	29	50.0
	strongly agree	2	3.4
Lab Preceptors (N = 11)	disagree	1	9.1
	agree	10	90.9

Table 8

Allotted Time Adequate in Didactic Medical Radiography

Respondents	Responses	Frequency	Percent
Graduates (N = 58)*	disagree	6	10.5
	no opinion	3	5.3
	agree	40	70.2
	str. agree	8	14.0
X-Ray Preceptors (N= 11)	str. disagree	1	9.1
	disagree	5	45.5
	agree	5	45.5

*No response= 1

Both the laboratory and the radiology preceptors were asked if the current didactic phase of 34 weeks is an adequate timeframe for the program. The figures shown in Table 9 of the two cohorts' responses are reversed. Four lab preceptors "disagreed", while seven x-ray preceptors "disagreed" that the timeframe was adequate. Conversely, seven lab preceptors "agreed", while four x-ray preceptors "agreed" that the didactic timeframe was adequate.

Table 9

Current Didactic 34 Week Timeframe Adequate?

Respondents	Responses	Frequency	Percent
Lab Preceptors (N = 11)	disagree	4	36.4
	agree	7	63.6
X-Ray Preceptors (N = 11)	disagree	7	63.6
	agree	4	36.4

Manual and Automated Laboratory Procedures

Data in Tables 10, 11 and 12 show the findings of the graduates and the lab preceptor responses to a three part question which asked about the amount of time spent in the didactic phase on (a) manual hematology procedures, (b) automated hematology procedures and (c) manual clinical chemistry (chem) procedures.

a) Manual Hematology Procedures- The data in Table 10 indicate a great difference in the responses between the two cohorts. The majority of the lab preceptors (90.9%) responded that the time spent on manual hematology was "sufficient", whereas the graduates were not as positive.

Table 10

Time Spent during Didactic Phase on-

Respondents	Manual Hematology	Freq	Percent
Graduates (N = 58)*	too low	2	3.5
	sufficient	33	57.9
	too high	19	33.3
	much too high	3	5.3
Lab Preceptors (N = 11)	too low	1	9.1
	sufficient	10	90.9

*No response= 1

b) Automated Hematology Procedures- The majority of the graduates (46/58) indicated that the time spent in the didactic phase on automated hematology was either "much too low" (22.8%) or "too low" (57.9%), (Table 11), whereas the majority of the lab preceptors (81.8%) indicated that the

time spent on automated hematology was sufficient.

Table 11

Respondents	Automated Hematology	Freq	Percent
Graduates (N = 58)*	much too low	13	22.8
	too low	33	57.9
	sufficient	11	19.3
Lab Preceptors (N = 11)	too low	2	18.2
	sufficient	9	81.8

*No response= 1

c) Manual Clinical Chemistry- An examination of Table 12 reveals some differences in the responses between the two cohorts. A number of graduates indicated that the time spent on manual clinical chemistry procedures was either "too high" or "much too high", whereas none of the preceptors selected either of these two responses. The "sufficient" responses were similar between the graduates (62.1%) and the laboratory preceptors (60.0%).

Table 12

Respondents	Manual Chem	Freq	Percent
Graduates (N = 58)	much too low	1	1.7
	too low	3	5.2
	sufficient	36	62.1
	too high	13	22.4
	much too high	5	8.6
Lab Preceptors (N = 11)*	much too low	1	10.0
	too low	3	30.0
	sufficient	6	60.0

*No response= 1

Procedure Manuals/Textbooks

Data in Tables 13 and 14 refer to the two part questions which asked whether the Laboratory Procedure Manual and the Radiography Procedure Manual were explicit in instructions and useful in practicum sessions.

Table 13

Laboratory Procedure Manual- explicit/useful

Procedure Manual	Responses	Frequency	Percent
Explicit (N= 58)	disagree	1	1.7
	no opinion	1	1.7
	agree	44	75.9
	str. agree	12	20.7
Useful (N= 58)	disagree	2	3.4
	no opinion	1	1.7
	agree	36	62.1
	str. agree	19	32.8

Table 14

Radiography Procedure Manual- explicit/useful

Procedure Manual	Responses	Frequency	Percent
Explicit (N=58)*	no opinion	1	1.8
	agree	36	63.2
	str. agree	20	35.1
Useful (N=58)**	disagree	1	1.8
	no opinion	2	3.5
	agree	28	49.1
	str. agree	26	45.6

*no response= 1
**no response= 1

The responses to the questions indicated that the majority of the graduates were positive in their responses that the Laboratory Procedure Manual was both explicit and useful. Likewise, the majority of the students indicated that the Radiography Procedure Manual was explicit and useful.

Graduates were asked if the textbooks they had purchased for the Medical Laboratory and the Medical Radiography components were useful for the required level of training. The responses in Table 15 indicated that the majority of the graduates (38+6=44) felt the textbooks purchased for the Medical Laboratory component were useful, with a slightly smaller number (28+12=40) responding that the Medical Radiography textbooks were useful.

Table 15

Textbooks useful for Training

Textbooks	Responses	Frequency	Percent
Medical Lab (N = 58)	str. disagree	1	1.7
	disagree	9	15.5
	no opinion	4	6.9
	agree	38	65.5
	str. agree	6	10.3
Radiography (N = 58)*	str. disagree	1	1.8
	disagree	12	21.1
	no opinion	4	7.0
	agree	28	49.1
	str. agree	12	21.1

*no response= 1

Theory

Tables 16, 17, 18 and 19 refer to the responses of a four partquestion which asked the graduates and the lab preceptors whether the level of theory taught in the didactic courses in Hematology, Clinical Chemistry (Clin Chem), Electrocardiography (ECG) and General Knowledge was adequate for the practical application required in the clinical phase. The findings are as follows:

Hematology

The data in Table 16 indicate that both cohorts responded that the theory was adequate. Forty graduates (70.2%) "agreed" and ten graduates (17.5%) "strongly agreed", while seven lab preceptors (63.3%) "agreed" and one preceptor (9.1%) "strongly agreed".

Table 16

Level of Theory Taught - Adequate

Respondents	Hematology	Frequency	Percent
Graduates (N = 58)*	disagree	6	10.5
	no opinion	1	1.8
	agree	40	70.2
	str. agree	10	17.5
Lab Preceptors (N = 11)	disagree	2	18.2
	no opinion	1	9.1
	agree	7	63.6
	str. agree	1	9.1

*no response= 1

Clinical Chemistry

The data in Table 17 show that both cohorts were not as

positive in their responses about the level of theory taught in Clinical Chemistry as compared to the Hematology theory. Only 54.5% of the laboratory preceptors agreed that the level of Clinical Chemistry theory taught was adequate.

Table 17

Respondents	Clin Chem	Frequency	Percent
Graduates (N = 58)*	disagree	11	19.3
	no opinion	8	14.0
	agree	32	56.1
	str. agree	6	10.5
Lab Preceptors (N = 11)	disagree	3	27.3
	no opinion	2	18.2
	agree	6	54.5

*No response= 1

Electrocardiography

Both cohorts, 93.1% of the graduates (60.3% "agreed" and 32.8% "strongly agreed") and 81.8% of the preceptors (63.6% "agreed" and 18.2% "strongly agreed"), responded that the theory was adequate, as shown in Table 18.

Table 18

Respondents	ECG	Frequency	Percent
Graduates (N = 58)	disagree	3	5.2
	no opinion	1	1.7
	agree	35	60.3
	str. agree	19	32.8
Lab Preceptors (N = 11)	disagree	1	9.1
	no opinion	1	9.1
	agree	7	63.6
	str. agree	2	18.2

General Knowledge

Table 19 shows that the majority of the graduates responded that the General Knowledge theory was adequate. The laboratory preceptors' responses were not as positive as the graduates' responses, with 72.7% (63.6% + 9.1%) of the preceptors indicating that the theory was adequate.

Table 19

Respondents	General Knowledge	Frequency	Percent
Graduates (N = 58)*	disagree	5	8.8
	no opinion	4	7.0
	agree	42	73.7
	str. agree	6	10.5
Lab Preceptors (N = 11)	disagree	3	27.3
	agree	7	63.6
	str. agree	1	9 1

*No response= 1

Tables 20, 21, 22 and 23 refer to the responses of a four part question which asked the graduates and the x-ray preceptors whether the level of theory taught in the didactic courses in Anatomy, Image Recording and Quality Assurance, Radiographic Theory and Positioning, and Apparatus and Radiation Protection in the didactic phase is adequate as compared to the practical application required in the training hospital. The findings are as follows:

Anatomy

All the graduates (100%) responded that the level of theory taught in Anatomy was adequate, as shown in Table 20. The x-ray preceptors' responses were not as positive as the

graduates' responses, with 70% of the preceptors indicating that the theory was adequate.

Table 20

Level of Theory Taught - Adequate

Respondents	Anatomy	Frequency	Percent
Graduates (N = 58)*	agree	35	61.4
	str. agree	22	38.6
X-Ray Preceptors (N = 11)**	disagree	3	30.0
	agree	7	70.0

*No response= 1
**No response= 1

Image Recording and Quality Assurance

Seventy percent of the preceptors disagreed, as compared to 15.8% of the graduates who disagreed that the level of theory taught in Image Recording and Quality Assurance was adequate, as shown in Table 21.

Table 21

Respondents	Image Recording	Frequency	Percent
Graduates (N = 58)*	disagree	9	15.8
	no opinion	7	12.3
	agree	36	63.2
	str. agree	5	8.8
X-Ray Preceptors (N = 11)**	disagree	7	70.0
	agree	2	20.0
	str.agree	1	10.0

*No response= 1
**No response= 1

Forty-one graduates (36+5) were positive as compared to only three preceptors (2+1) who were positive in their responses

that the level of theory taught in Image Recording and Quality Assurance was adequate.

Radiographic Theory and Positioning

As indicated by the data in Table 22, the majority of the graduates were positive in their responses. Thirty-two graduates (56.1%) "agreed" and 21 graduates (36.8%) "strongly agreed" that the theory taught was adequate, whereas four x-ray preceptors (36.4%) "agreed" and one preceptor (9.1%) "strongly agreed" that it was adequate. The preceptor responses were split with 45.5% positive responses and 45.5% negative responses.

Table 22

Respondents	Theory/Positioning	Frequency	Percent
Graduates (N = 58)*	disagree	3	5.3
	no opinion	1	1.8
	agree	32	56.1
	str. agree	21	36.8
X-Ray Preceptors (N = 11)	disagree	5	45.5
	no opinion	1	9.1
	agree	4	36.4
	str. agree	1	9.1

*No response= 1

Apparatus and Radiation Protection

As in the previous two tables, a difference in the responses between the two cohorts is noted and shown in the data in Table 23. The graduate responses are positive as compared to the preceptor responses. Forty graduates

(70.2%) responded with "agree" and seven graduates (12.3%) responded with "strongly agree" as compared to the four preceptors (40%) who responded with "agree" responses.

Table 23

Respondents	Apparatus	Frequency	Percent
Graduates (N = 58)*	disagree	8	14.0
	no opinion	2	3.5
	agree	40	70.2
	str. agree	7	12.3
X-Ray Preceptors (N = 11)*	str. disagree	1	10.0
	disagree	4	40.0
	no opinion	1	10.0
	agree	4	40.0

*No response= 1
**No response= 1

Practica

Tables 24, 25, 26 and 27 refer to the findings of the graduates and the laboratory preceptors, when they were asked in a four part question if the laboratory procedures taught in Hematology, Clinical Chemistry, Electrocardiography and General Knowledge in the didactic phase prepared the students with the necessary skills required in the training hospital.

Hematology

The data in Table 24 indicate the graduates felt for the most part, 66.7% "agreed" and 14.0% "strongly agreed", that the lab procedures prepared them with the necessary skills required for the training hospital, while 72.7% of

the lab preceptors "agreed" that the students were prepared for the training hospital. These findings almost parallel the findings discussed and illustrated in Table 16, which deal with the Hematology didactic theory teachings.

Table 24

Did Laboratory Procedures Taught Prepare Students?

Respondents	Hematolgy	Frequency	Percent
Graduates (N = 58)*	str. disagree	2	3.5
	disagree	6	10.5
	no opinion	3	5.3
	agree	38	66.7
	str. agree	8	14.0
Lab Preceptors (N = 11)	disagree	2	18.2
	no opinion	1	9.1
	agree	8	72.7

*No response= 1

Clinical Chemistry

The responses shown in Table 25 are not as positive as those shown for the Hematology practicum in Table 24.

Table 25

Respondents	Clin Chem	Frequency	Percent
Graduates (N = 58)*	str. disagree	2	3.5
	disagree	14	24.6
	no opinion	4	7.0
	agree	31	54.4
	str. agree	6	10.5
Lab Preceptors (N = 11)	disagree	2	18.2
	no opinion	2	18.2
	agree	7	63.6

*No response= 1

It is evident from the "agree" and "strongly agree" responses that both cohorts, 64.9% (54.4% + 10.5%) of the graduates and 63.6% of the preceptors, had similar views regarding the didactic preparation of the student in Clinical Chemistry. The data in Table 17 (theory) and Table 25 (necessary skills), reflect similar findings in the Clinical Chemistry didactic teachings.

Electrocardiography

A very salient finding is noted by the data in Table 26. All 58 of the graduates and ten of the lab preceptors indicated that the didactic phase prepared the students with the necessary skills for ECG performance in the hospital. These findings complement the findings in Table 18 that present the ECG theory teachings.

Table 26

Respondents	ECG	Frequency	Percent
Graduates (N = 58)	agree	40	69.0
	str. agree	18	31.0
Lab Preceptors (N = 11)	no opinion	1	9.1
	agree	8	72.7
	str. agree	2	18.2

General Knowledge

As shown in Table 27, the responses made by the preceptors were positive, with the graduates' responses being somewhat less positive. Nine lab preceptors (81.8%)

"agreed" that the lab procedures taught in General Knowledge prepared the student for the training hospital while 43 (38+5) graduates agreed.

Table 27

Respondents	General Knowledge	Frequency	Percent
Graduates (N = 58)	str. disagree	1	1.7
	disagree	7	12.1
	no opinion	7	12.1
	agree	38	65.5
	str. agree	5	8.6
Lab Preceptors (N = 11)	disagree	1	9.1
	no opinion	1	9.1
	agree	9	81.8

The data in Tables 28, 29, 30 and 31 refer to the findings of a four part question in which the graduates and the x-ray preceptors were asked if the radiographic procedures taught during practicum in the didactic phase in Anatomy, Image Recording and Quality Assurance, Radiographic Theory and Positioning, and Apparatus and Radiation Protection prepared the students with the necessary skills required in the training hospital.

Anatomy

The data in Table 28 reveal a difference in the findings between the two cohorts. All the graduates (57/57= 100%) indicated that the procedures taught in Anatomy prepared the students with the skills required in the training hospital. Seven x-ray preceptors (70%) "agreed"

and three preceptors (30%) "disagreed" that the procedures taught prepared the students for the training hospital. These findings are very similar to those shown in Table 20, which relate to the adequacy of the anatomy theory taught in the didactic phase.

Table 28

Did Procedures Taught Prepare Students?

Respondents	Anatomy	Frequency	Percent
Graduates (N = 58)*	agree	42	73.7
	str. agree	15	26.3
X-Ray Preceptors (N = 11)**	disagree	3	30.0
	agree	7	70.0

*No response= 1
**No response= 1

Image Recording and Quality Assurance

A difference in the responses is evidenced in Table 29 between the graduates and the x-ray preceptors. A total of 39 graduates responded that the practicum in the didactic phase prepared the student with the necessary skills. Thirty four graduates (59.6%) responded with "agree" responses and five graduates (8.8%) responded with "strongly agree" responses. The preceptors' responses were negative in comparison to the responses selected by the graduates. Seven preceptors (70%) "disagreed" as compared to seven graduates (12.3%) who "disagreed" that the didactic phase prepared the students with the necessary skills required in

the training hospital. Similar findings referring to the theory aspect of this course are shown in Table 21.

Table 29

Respondents	Image Recording	Frequency	Percent
Graduates (N = 58)*	disagree	7	12.3
	no opinion	11	19.3
	agree	34	59.6
	str. agree	5	8.8
X-Ray Preceptors (N = 11)**	disagree	7	70.0
	agree	2	20.0
	str.agree	1	10.0

*No response= 1
**No response= 1

Radiographic Theory and Positioning

The two cohorts responded with a notable difference in their perceptions regarding the preparation of the students during the practicum in the didactic phase. As shown in Table 30, the graduates' responses were positive as compared to the preceptors' responses.

Table 30

Respondents	Theory/Positioning	Frequency	Percent
Graduates (N = 58)*	disagree	3	5.3
	no opinion	2	3.5
	agree	40	70.2
	str. agree	12	21.1
X-Ray Preceptors (N = 11)	disagree	5	45.5
	agree	5	45.5
	str. agree	1	9.1

*No response= 1

Fifty two graduates indicated the didactic phase prepared

the students, with 40 graduates "agreeing" and 12 graduates strongly agreeing"; compared with the five preceptors "agreeing" and one preceptor "strongly agreeing".

Apparatus and Radiation Protection

As evidenced in the three previous frequency tables and radiography practicum discussions, a notable difference in the responses between the graduates and the preceptors is shown in Table 31. The responses made by the graduates are positive as compared to the responses selected by the preceptors.

Table 31

Respondents	Apparatus	Freq	Percent
Graduates (N = 58)*	disagree	4	7.0
	no opinion	5	8.8
	agree	41	71.9
	str. agree	7	12.3
X-Ray Preceptors (N = 11)**	str. disagree	1	10.0
	disagree	5	50.0
	no opinion	1	10.0
	agree	3	30.0

*No response= 1
**No response= 1

Semi-Automated Clinical Chemistry

Graduates and laboratory preceptors were asked if the basic clinical chemistry procedures within the practicum should also be taught as automated or semi-automated procedures.

From the data in Table 32, it is most evident that both cohorts agreed the basic clinical chemistry procedures should be taught as semi-automated procedures. The graduates responded with 36.2% "agree" responses and 58.6% "strongly agree" responses for a total of 94.8%. All of the laboratory preceptors (100%) indicated that the chemistry procedures should also be taught as semi-automated procedures. The data compiled from the graduate open-ended comments also indicate that semi-automated chemistry procedures are not being taught (Appendix H).

Table 32

Basic Chemistry also taught as Semi-Automated Procedure

Respondents	Semi-Automated	Frequency	Percent
Graduates (N = 58)	disagree	2	3.4
	no opinion	1	1.7
	agree	21	36.2
	str. agree	34	58.6
Lab Preceptors (N = 11)	agree	5	45.5
	str. agree	6	54.5

Equipment

All the cohorts' responses indicating whether the equipment in the didactic phase is representative of the workplace equipment are shown in Tables 33-37.

Medical Laboratory

The data in Tables 33, 34 and 35 refer to the findings

whereby both cohorts were asked whether the equipment, the Toa Sysmex CC-150 and the Coag-a-mate, used in the didactic phase is representative of the equipment used in the (a) training hospital, (b) the hospital laboratories (labs) and (c) the clinic laboratories that they have worked in.

a) Training Hospital- All of the laboratory preceptors (100%) responded that the equipment was representative of that used in the training hospital, as shown in Table 33. There was a considerable variation in the graduates' responses, with their overall responses being less positive than the responses of the preceptors.

Table 33

Equipment used in didactic phase- representative

Respondents	Training Hospital	Frequency	Percent
Graduates (N = 58)*	str. disagree	2	3.6
	disagree	9	16.1
	no opinion	6	10.7
	agree	28	50.0
	str. agree	11	19.6
Lab Preceptors (N = 11)**	agree	9	90.0
	str. agree	1	10.0

*No response= 2
**No response= 1

b) Hospital Laboratories- The data in Table 34 indicate that 61.1% of the graduates (35.2% "agreed" and 25.9% "strongly agreed") while 72.7% of the lab preceptors (63.6%) "agreed" and 9.1% "strongly agreed") responded that the equipment was representative of that used in hospital

laboratories they have worked in. Similar findings between the cohorts were noted in the "no opinion" response.

Table 34

Respondents	Hospital Labs	Frequency	Percent
Graduates (N = 58)*	str. disagree	2	3.7
	disagree	8	14.8
	no opinion	11	20.4
	agree	19	35.2
	str. agree	14	25.9
Lab Preceptors (N = 11)	disagree	1	9.1
	no opinion	2	18.2
	agree	7	63.6
	str. agree	1	9.1

*No response= 4

c) Clinic Laboratories- A notable difference in the findings is indicated in Table 35, between the graduate (17% "agree" and 13.2% "strongly agree") and the lab preceptor (70% "agree") responses. A large number of graduates (49.1%) and three lab preceptors (30%) responded with "no opinion".

Table 35

Respondents	Clinic Labs	Frequency	Percent
Graduates (N = 58)*	str. disagree	3	5.7
	disagree	8	15.1
	no opinion	26	49.1
	agree	9	17.0
	str. agree	7	13.2
Lab Preceptors (N = 11)**	no opinion	3	30.0
	agree	7	70.0

*No response= 5
**No response= 1

Medical Radiography

The data in Tables 36 and 37 present the responses of the graduates and the x-ray preceptors to a two part question to determine if the equipment (automatic film processor, film/screen combinations, x-ray machines) used in the didactic phase is representative of that used in the (a) training hospital and (b) the hospital radiology departments.

a) Training Hospital- The data in Table 36 show that the graduates were positive as compared to the preceptors in indicating that the equipment used in the didactic phase was representative of that used in the hospital. Forty-nine graduates "agreed" and seven graduates "strongly agreed", as compared with the four x-ray preceptors who "agreed" and one preceptor who "strongly agreed". Five of the preceptors selected "disagree" for the response.

Table 36

Equipment used in didactic phase- representative

Respondents	Training Hospital	Frequency	Percent
Graduates (N= 58)*	no opinion	1	1.8
	agree	49	86.0
	str. agree	7	12.3
X-Ray Preceptors (N= 11)	disagree	5	45.5
	no opinion	1	9.1
	agree	4	36.4
	str. agree	1	9.1

*No response= 1

b) Hospital Radiology Departments (Depts) - As with the data shown in Table 36, the findings presented in Table 37 also show that the graduates' responses were positive as compared to the preceptors' responses. Four preceptors (36.4%) "disagreed", whereas only four graduates (7.4%) "disagreed" that the equipment was representative.

Table 37

Equipment used in didactic phase- representative

Respondents	Hospital Depts	Frequency	Percent
Graduates (N= 58)*	disagree	4	7.4
	no opinion	12	22.2
	agree	33	61.1
	str. agree	5	9.3
X-Ray Preceptors (N= 11)	disagree	4	36.4
	no opinion	1	9.1
	agree	5	45.5
	str. agree	1	9.1

*No response= 4

Career Ladder Concept

All three cohorts: the graduates, the clinical laboratory preceptors and the clinical radiography (x-ray) preceptors were asked a parallel question: Should a career ladder concept, with core courses offered during the first year at NAIT, be considered for the NAIT Health Sciences programs?

The graduates (lab component and x-ray component) definitely appeared more interested in a career ladder concept than did the laboratory preceptors and the x-ray

preceptors as shown in Table 38. The graduates responded with 46.6% "agree" and 27.6% "strongly agree" responses in the lab component and 47.3% "agree" and 23.6% "strongly agree" responses in the x-ray component. The responses of the lab preceptors and the x-ray preceptors were not as positive as the graduates' responses. A large number of x-ray preceptors (50%) and laboratory preceptors (45.5%) responded with a "no opinion" response.

Table 38

Career Ladder Concept should be Considered

Respondents	Responses	Frequency	Percent
Graduates (N = 58) Lab	str. disagree	1	1.7
	disagree	3	5.2
	no opinion	11	19.0
	agree	27	46.6
	str. agree	16	27.6
Graduates (N = 58)* X-Ray	str. disagree	1	1.8
	disagree	4	7.3
	no opinion	11	20.0
	agree	26	47.3
	str. agree	13	23.6
Lab Preceptors (N = 11)	disagree	2	18.2
	no opinion	5	45.5
	agree	3	27.3
	str. agree	1	9.1
X-Ray Preceptors (N = 11)**	no opinion	5	50.0
	agree	4	40.0
	str. agree	1	10.0

*No response= 3
**No response= 1

Satisfaction with Didactic Training

The data shown in Table 39 refer to the responses of all three cohorts about the overall satisfaction with the didactic phase as related to the tasks and skills required by the employer.

A variation in the graduates' responses is evident in both the laboratory and the x-ray components. The graduates expressed more satisfaction with the x-ray component than with the laboratory component. "Excellent" was selected by 21.1% of the graduates, "good" was selected by 61.4% and 15.8% selected "moderate".

Table 39

Overall Satisfaction with Didactic Training

Respondents	Responses	Frequency	Percent
Graduates Lab (N = 58)	very poor	1	1.7
	poor	3	5.2
	moderate	16	27.6
	good	34	58.6
	excellent	4	6.9
Graduates X-Ray (N = 58)*	poor	1	1.8
	moderate	9	15.8
	good	35	61.4
	excellent	12	21.1
Lab Preceptors (N = 11)	moderate	6	54.5
	good	5	45.5
X-Ray Preceptors (N = 11)	poor	2	18.2
	moderate	5	45.5
	good	4	36.4

*No response= 1

Overall, the graduates appeared satisfied with the training in both components as related to employer requirements. The preceptor responses were less varied than the graduate responses. The x-ray preceptors indicated less satisfaction with the didactic training than the laboratory preceptors.

Communication

The responses regarding the communication between the NAIT staff and the hospital preceptors are shown in Tables 40, 41 and 42.

NAIT Staff and Hospital Preceptors

The laboratory preceptors and the x-ray preceptors were asked to determine if there is a need for increased communication between the NAIT staff and the hospital preceptors. The data presented in Table 40 show that an overwhelming number of lab preceptors indicated a need for increased communication.

Table 40

Need for Increased Communication- NAIT Staff and Preceptors

Respondents	Responses	Frequency	Percent
Lab Preceptors (N = 11)	no opinion	1	9.1
	agree	8	72.7
	str. agree	2	18.2
X-Ray Preceptors (N = 11)	disagree	3	27.3
	agree	5	45.5
	str. agree	3	27.3

Likewise, the x-ray preceptors felt there was a need for increased communication, with five preceptors (45.5%) selecting "agreed" responses and three preceptors (27.3%) selecting "strongly agreed" responses.

The data in Table 41 show the findings to the question which asked the laboratory preceptors and the x-ray preceptors about the communication between NAIT and the hospital in assisting the overall program in keeping current with new developments in the workplace. The findings reveal a difference in the responses by the two cohorts. The x-ray preceptors selected more responses that were positive than the laboratory preceptors. Three laboratory preceptors (27.3%) felt that the communication was "poor".

Table 41

Communication in Assisting Program in Keeping Current

Respondents	Responses	Frequency	Percent
Lab Preceptors (N = 11)	poor	3	27.3
	moderate	5	45.5
	good	3	27.3
X-Ray Preceptors (N = 11)	poor	1	9.1
	moderate	7	63.6
	good	2	18.2
	excellent	1	9.1

A parallel question was asked to determine the frequency of communication between the NAIT staff and the

hospital preceptors as perceived by the preceptors.

Table 42

Frequency of Communication between NAIT Staff and Preceptors

Respondents	Responses	Frequency	Percent
Lab Preceptors (N = 11)	seldom	2	18.2
	sometimes	6	54.5
	often	3	27.3
X-Ray Preceptors (N = 11)	seldom	2	18.2
	sometimes	8	72.7
	often	1	9.1

The data in Table 42 indicate that communication occurs more "often" between the NAIT staff and the laboratory preceptors (27.3%) than between the NAIT staff and the x-ray preceptors (9.1%). Overall, communication between the NAIT staff and the preceptors, both in medical laboratory and in x-ray, does not occur frequently.

Graduate Open Ended Comments- Didactic Phase

The open ended comments as perceived by the graduates on the didactic phase of the medical laboratory and medical radiography components of the CLXT Program, are presented in tabular form in Appendix H. It should be noted that the total number of graduate responses may not correspond directly with the number of graduates participating in the study since these are open ended responses. Some graduates may have chosen not to answer this question and other graduates may have made one or more comments in these

sections of the questionnaire. The graduates' common comments have been grouped according to major themes and are presented in frequency tables. Comments made by more than one respondent are included in the major theme groupings.

The data in Appendix H present the important strengths and weaknesses of the didactic phase of the medical laboratory component of the CLXT Program as perceived by the graduates.

The data in Appendix H present the important strengths and weaknesses of the didactic phase of the x-ray component of the CLXT Program as perceived by the graduates.

Preceptor Open Ended Comments- Didactic Phase

The open ended comments indicated by the medical laboratory preceptors and the medical radiography preceptors on the didactic phase of the CLXT Program, are presented in tabular form or as verbatim responses in Appendix I. The total number of preceptor responses in these tables may not correspond directly with the number of preceptors participating in the study since these are open ended responses. Some preceptors may have elected not to respond to this question, whereas others may have included several comments in these sections of the questionnaire. The preceptors' common comments have been grouped in major themes and are presented in frequency tables.

The data in tabular form in Appendix I present the important strengths and weaknesses of the medical laboratory

component of the CLXT Program as perceived by the laboratory preceptors. All the preceptor comments were grouped into main topics and are shown in frequency tables.

The important strengths of the didactic phase of the x-ray component of the program as perceived by the x-ray preceptors are presented in Appendix I. All the open ended comments were grouped according to common themes and are shown in tabular form.

The important weaknesses of the didactic phase of the x-ray component of the program as perceived by the x-ray preceptors were recorded and are presented as verbatim responses in Appendix I. A variation of open ended comments, all different, were made by the respondents.

Summary of Responses - Strengths in Didactic Phase

The following summary will first describe the salient findings of the strengths of the didactic phase in the medical laboratory component and the x-ray component of the CLXT Program, as perceived by the graduates, the laboratory preceptors and the x-ray preceptors. This summary will be followed by the salient findings of the weaknesses of the didactic phase in the laboratory component and the x-ray component as perceived by the graduates, the laboratory preceptors and the x-ray preceptors. The following is a summary of the strengths in the didactic phase.

1. The laboratory preceptors (90.9%) were very positive as compared to the graduates (53.4%) when

responding about the adequacy of the time allotment in the laboratory component of the didactic phase in relation to the material covered (Table 7). The graduates' responses, however were positive as compared to the x-ray preceptors' responses regarding the adequacy of time (Table 8).

2. The majority of the laboratory preceptors responded that the time spent on semi-automated hematology in the didactic phase was sufficient, whereas the graduate responses were not as positive (see Table 11).

3. Overall, the majority of the graduates felt that both the Medical Laboratory Manual and the Radiography Procedure Manual used in the didactic phase were explicit and useful (Table 14).

4. There was general consensus by the graduates and the preceptors that the Hematology theory and the Hematology laboratory practicals taught are adequate for the practical application required in training hospitals (Tables 16, 24 & Appendix H).

5. The majority of the graduates and the preceptors indicated that the level of theory taught in ECG's was adequate for clinical training (Table 18); also, the lab practicals prepared the students with the skills required in ECG's in the clinical phase (see Table 26).

6. The majority of the graduates and the preceptors indicated that the level of theory and the laboratory procedures taught in General Knowledge in the didactic phase prepared the students for the practical application required

in the training hospital (see Tables 19 and 27).

7. All the graduates (57/57) and the majority of the preceptors said the Anatomy theory and the positioning practicals in Anatomy in the didactic phase were adequate for clinical training, however the preceptors were not as positive as the graduates (Tables 20, 28 & Appendices H & I).

8. The graduates indicated it was important that both manual and semi-automated hematology procedures were taught (Appendix H).

9. Overall, the graduates felt that the radiographic practica were useful, well covered and the allotted time for practica was adequate (Appendix H).

10. The x-ray preceptors felt that the students had a good basic preparation for the clinical phase of training (Appendix I).

11. All the medical laboratory preceptors and a large number of the graduates responded that the semi-automated equipment used in the didactic phase is representative of that used in the training hospital (Table 33).

12. It is evident that the graduates felt positive that the radiography equipment used in the didactic phase is representative of equipment used in the training hospital (Table 36).

13. An overall satisfaction with the didactic training, as related to the tasks/skills required by the employer in medical laboratory, was expressed by the

majority of the graduates and the lab preceptors. Likewise, satisfaction with the didactic training, as related to employment requirements in radiology departments, was expressed by a majority of the graduates and a number of the x-ray preceptors. The x-ray preceptors were not as positive as the graduates (Table 39).

14. The responses by the x-ray preceptors (10/11) to indicate the communication between NAIT and the hospital preceptors in keeping the overall program current with new developments in the workplace were favourable. The laboratory preceptors did not feel as positive about the communication as the x-ray preceptors (Table 41).

Summary of Responses - Weaknesses in Didactic Phase

A summary of the weaknesses of the didactic phase is outlined:

1. A salient finding was drawn from the preceptors' responses to a question which asked whether the current 34 week didactic timeframe was adequate for the program. Seven laboratory preceptors (63.6%) "agreed", whereas only four x-ray preceptors (36.4%) "agreed" that the time was adequate. Overall, the responses were not positive (Table 9).

2. The Clinical Chemistry teachings in the didactic phase appear to be inadequate. Only 66.6% of the graduates and 54.5% of the preceptors responded that the Clinical Chemistry theory taught was adequate (Table 17); and 64.9%

of the graduates and 63.6% of the preceptors responded that the lab procedures taught prepared the students with the skills required in the clinical phase (Table 25).

3. Both cohorts, 94.8% of the graduates and all the preceptors (11/11) responded that the basic Clinical Chemistry tests should also be taught as semi-automated procedures in the didactic phase (see Table 32).

4. The laboratory preceptors felt that Clinical Chemistry is too limited in the number of test procedures and that the Clinical Chemistry theory is also too limited (Appendix I).

5. A number of the laboratory preceptors commented that the students have difficulty in relating clinical lab findings to disease conditions (Appendix I).

6. It is evident that the graduates felt there were too few semi-automated Hematology practicals and too many manual Hematology practicals scheduled in the didactic phase (Table 11 & Appendix H).

7. A number of the x-ray preceptors disagreed that the theory and the practicals taught in Image Recording and Q.A. were adequate for the clinical training phase (Tables 21 and 29). Some graduates commented that the information given in Q.A. was inadequate (Appendix H).

8. A number of the graduates indicated that insufficient time was spent on trauma and emergency cases. In addition, not including fluoroscopy and portable radiography in the didactic phase was noted as a weakness in

the program (Appendix H).

9. The majority of the laboratory preceptors (10/11) indicated a need for increased communication between NAIT staff and the laboratory preceptors. A smaller number of x-ray preceptors (8/11) indicated this need. (Table 40).

Subproblem 2

The results of the data analysis referring to the strengths and weaknesses of the clinical phase of the CLXT Program, as perceived by the graduates and the preceptors are discussed in this section. The data analysis on the closed questions, most of which are parallel questions, are presented in frequency distribution tables. The open ended comments are analyzed according to common themes and are presented in frequency distribution tables or as verbatim responses (see appendices J and K).

The data analysis for Subproblem 2 include Part Four and Part Five (Clinical Phases) of the Graduate Questionnaire and the Clinical Phase Sections from the Medical Laboratory Preceptor Questionnaire and the Medical Radiography Preceptor Questionnaire.

NAIT/Hospital

The responses indicated by the hospital preceptors relating to the adequacy of the NAIT visits made to the hospitals; the coordination between NAIT and the hospitals;

the direction provided by NAIT to the hospitals and the need for preceptor in-service or professional development programs are indicated in Tables 50-53.

NAIT Visits

The data in Table 43 refer to the responses of the graduates, the laboratory preceptors and the x-ray preceptors to determine whether the NAIT visits to the hospitals in student follow-up were adequate. Overall, the graduates were not as positive as either of the preceptor groups. Twenty-six graduates (26/58) responded that the visits were either "very poor" or "poor" in the laboratory component and twenty-five graduates (25/56) responded the visits were "very poor" or "poor" in the x-ray component. Two laboratory preceptors (20.0%) and two x-ray preceptors (18.2%) selected "poor". The laboratory preceptors appear to be the most satisfied group of the cohorts with 40% "moderate" and 40% "good" responses selected as compared with the x-ray preceptors who selected "moderate" (72.7%) and "good" (9.1%).

Table 43

NAIT Visits to Hospital- Adequate

Respondents	Responses	Frequency	Percent
Graduates (N= 58) Lab	very poor	6	10.3
	poor	20	34.5
	moderate	20	34.5
	good	9	15.5
	excellent	3	5.2
Graduates (N= 58)* X-Ray	very poor	5	8.9
	poor	20	35.7
	moderate	19	33.9
	good	9	16.1
	excellent	3	5.4
Lab Preceptors (N= 11)**	poor	2	20.0
	moderate	4	40.0
	good	4	40.0
X-Ray Preceptors (N= 11)	poor	2	18.2
	moderate	8	72.7
	good	1	9.1

*No response= 2
**No response= 1

Coordination and Collaboration

The data in Table 44 show the findings of the graduate responses to determine the coordination and collaboration between the institute and the training hospital in medical laboratory and medical radiography. The responses selected by the graduates are similar for the two disciplines. The majority of the responses ranged from "moderate" to "good" to "excellent".

Table 44

Coordination between Institute and Training Hospital

Respondents	Responses	Frequency	Percent
Graduates (N= 58) Lab	very poor	2	3.4
	poor	9	15.5
	moderate	23	39.7
	good	21	36.2
	excellent	3	5.2
Graduates (N= 58)* X-Ray	very poor	2	3.5
	poor	5	8.8
	moderate	18	31.6
	good	27	47.4
	excellent	5	8.8

*No response= 1

NAIT Direction Provided

The data in Table 45 reveal the responses of the medical laboratory and the medical radiography preceptors on the direction provided by NAIT to the hospital regarding the clinical phase of student training.

Table 45

NAIT Direction Provided for Clinical Training

Respondents	Responses	Frequency	Percent
Lab Preceptors (N= 11)	poor	2	18.2
	moderate	7	63.6
	good	2	18.2
X-Ray Preceptors (N= 11)*	poor	2	20.2
	moderate	4	40.0
	good	4	40.0

*No response= 1

The x-ray preceptors' responses ("good" 40%) were more positive than the responses selected by the laboratory preceptors ("good" 18.2%). Two lab preceptors and two x-ray preceptors responded that the direction provided was "poor".

In-service Programs

An examination of Table 46 reveals the findings of the laboratory preceptors and the radiography preceptors regarding the need for hospital preceptors to participate in NAIT in-service programs or professional development. All the responses selected by the two cohorts are identical, with the majority of the preceptors indicating a need for NAIT in-service or professional development programs.

Table 46

Preceptors Participate in NAIT In-Service Programs

Respondents	Responses	Frequency	Percent
Lab Preceptors (N= 11)	no opinion	2	18.2
	agree	6	54.5
	str. agree	3	27.3
X-Ray Preceptors (N= 11)	no opinion	2	18.2
	agree	6	54.5
	str. agree	3	27.3

Student Preparation

The data to indicate the student preparation in the clinical phase for the skills required in the workplace and the preparation for the Provincial Registration examination

are presented in Tables 47-51.

Medical Laboratory

The data in Tables 47, 48 and 49 refer to the findings of the graduates and the laboratory preceptors to determine the relevancy between the tasks performed in the training hospital in (a) Hematology, (b) Clinical Chemistry, and (c) the remaining laboratory tasks, and the practical application required in the medical laboratories.

a) Hematology- The data in Table 47 reveal similar positive findings where 19% of the graduates and 18.2% of the lab preceptors selected "excellent", and 58.6% of the graduates and 54.5% of the preceptors selected "good" to indicate the relevance in Hematology tasks.

Table 47

Relevancy of Tasks- Training Hospital and Medical Labs

Respondents	Hematology	Frequency	Percent
Graduates (N= 58)	poor	2	3.4
	moderate	11	19.0
	good	34	58.6
	excellent	11	19.0
Lab Preceptors (N= 11)	moderate	3	27.3
	good	6	54.5
	excellent	2	18.2

b) Clinical Chemistry- The data in Table 48 indicate that graduates' responses were positive as compared to the responses of the preceptors. Four laboratory preceptors

selected "poor" while eight graduates selected "poor" and one graduate selected "very poor".

Table 48

Respondents	Clinical Chem	Frequency	Percent
Graduates (N= 58)	very poor	1	1.7
	poor	8	13.8
	moderate	21	36.2
	good	25	43.1
	excellent	3	5.2
Lab Preceptors (N= 11)	poor	4	36.4
	moderate	5	45.5
	good	2	18.2

c) **Remaining laboratory tasks-** The responses of the two cohorts to indicate the relevancy of other remaining laboratory tasks are shown in Table 49. Both the graduates and the preceptors felt that the remaining laboratory tasks were relevant to the practical application required in the medical laboratories. The responses ranged from "moderate" to "good" to "excellent" with only two graduates selecting "poor".

Table 49

Respondents	Other Tasks	Frequency	Percent
Graduates (N= 58)*	poor	2	3.5
	moderate	11	19.3
	good	37	64.9
	excellent	7	12.3
Lab Preceptors (N= 11)	moderate	4	36.4
	good	6	54.5
	excellent	1	9.1

*No response= 1

Medical Radiography

The data in Table 50 indicate the relevancy between the tasks performed by the student in the training hospital and the practical tasks performed in the medical radiology departments. The responses of the graduates and the preceptors were positive, indicating that the tasks performed in the training hospital were relevant to those required in the medical radiology departments.

Table 50

Relevancy of Tasks- Training Hospital and Radiology Departments

Respondents	Responses	Frequency	Percent
Graduates (N= 58)*	poor	2	3.6
	moderate	10	17.9
	good	37	66.1
	excellent	7	12.5
X-Ray Preceptors (N= 11)	moderate	4	36.4
	good	7	63.6

*No response= 2

Provincial Registration Examination

The data in Table 51 present the findings to the question whereby the graduates were asked to indicate whether the clinical phase of training prepared them adequately for the Provincial Registration Examination in medical laboratory and medical radiography. The positive responses selected were similar for both disciplines. Thirty-four graduates responded that the clinical training

in medical laboratory prepared them for the Provincial Examination, with 28 graduates (50.9%) "agreeing" and six graduates (10.9%) "strongly agreeing". Thirty-three graduates responded that the clinical training in medical radiography prepared them for the Provincial Examination, with 25 graduates (48.1%) "agreeing" and eight graduates (15.4%) "strongly agreeing". "No opinion" was selected by 16 graduates (29.1%) in the medical laboratory section and by 17 graduates (32.7%) in the medical radiography section of the questionnaire.

Table 51

Prepared Adequately for Provincial Examination

Respondents	Responses	Frequency	Percent
Graduates (N= 58)* Lab	disagree	5	9.1
	no opinion	16	29.1
	agree	28	50.9
	strongly agree	6	10.9
Graduates (N= 58)** X-Ray	disagree	2	3.8
	no opinion	17	32.7
	agree	25	48.1
	strongly agree	8	15.4

*No response= 3
**No response= 6

Time

The data in Table 52 present the graduate and laboratory preceptor responses to indicate whether the 13 week clinical training phase in Medical Laboratory provides adequate time to meet competency standards. The responses

selected by the graduates were positive as compared to the preceptors' responses. Forty-five graduates indicated that the timeframe was adequate, with 39 graduates (67.2%) "agreeing" and six graduates (10.3%) "strongly agreeing". The laboratory preceptor findings differed somewhat from the graduate findings. Only six preceptors (54.5%) "agreed", while three preceptors (27.3%) "disagreed" and one preceptor (9.1%) "strongly disagreed".

Table 52

Medical Lab Clinical Phase- Timeframe Adequate

Respondents	Responses	Frequency	Percent
Graduates	disagree	9	15.5
(N= 58)	no opinion	4	6.9
Lab	agree	39	67.2
	strongly agree	6	10.3
Lab Preceptors	str. disagree	1	9.1
(N= 11)	disagree	3	27.3
	no opinion	1	9.1
	agree	6	54.5

The graduate and radiography preceptor responses, indicating whether the 13 week timeframe in Medical Radiography is adequate, are shown in Table 53. There was a difference of opinion between the two cohorts. The graduates' responses were positive with 28 graduates (49.1%) "agreeing" and nine graduates (15.8%) "strongly agreeing". Only three x-ray preceptors (27.3%) "agreed" that the time was adequate.

Table 53

Medical X-Ray Clinical Phase- Timeframe Adequate

Respondents	Responses	Frequency	Percent
Graduates (N= 58)* X-Ray	str. disagree	1	1.8
	disagree	14	24.6
	no opinion	5	8.8
	agree	28	49.1
	str. agree	9	15.8
X-Ray Preceptors (N= 11)	str. disagree	3	27.3
	disagree	4	36.4
	no opinion	1	9.1
	agree	3	27.3

*No response= 1

Training

The data on clinical training as related to the level of supervision, the availability of supervisor assistance, the student certification responsibility, the adequacy of quizzes, and the importance of student work output are shown in Tables 54-61.

Level of Supervision

The data in Table 54 indicate the adequacy of the supervision received at the training hospital. The graduate responses are positive for both disciplines. Overall, the graduates appeared satisfied with the level of supervision they obtained in the training hospitals.

Table 54

Level of Supervision in Hospital was Adequate

Respondents	Responses	Frequency	Percent
Graduates (N= 58)* Lab	disagree	5	8.8
	no opinion	2	3.5
	agree	31	54.4
	strongly agree	19	33.3
Graduates (N= 58)** X-Ray	disagree	7	12.3
	no opinion	2	3.5
	agree	33	57.9
	strongly agree	15	26.3

*No response= 1
**No response= 2

Supervisor Assistance

The responses of the graduates to indicate whether they were able to get assistance from a supervisor, when assistance was required, are shown in Table 55. The responses for the two disciplines were very similar and the general consensus was that assistance was available.

Table 55

Able to get Supervisor Assistance

Respondents	Responses	Frequency	Percent
Graduates (N= 58) Lab	str. disagree	1	1.7
	disagree	5	8.6
	no opinion	1	1.7
	agree	26	44.8
	str. agree	25	43.1
Graduates (N= 58)* X-Ray	str. disagree	2	3.5
	disagree	4	7.0
	agree	27	47.4
	str. agree	24	42.1

*No response= 1

In radiography, 51 respondents also indicated they received assistance, with 27 graduates "agreeing" and 24 graduates "strongly agreeing".

Certification Responsibility

The findings to determine whether student certification requirements, (a) in peripheral blood smears and (b) clinical chemistry quality check (Q.C.) samples, should continue to be the responsibility of the hospital preceptors versus the NAIT instructors are outlined in Tables 56 & 57.

a) Peripheral Blood Smears- As indicated in Table 56, there was a difference of opinion between the graduates and the preceptors regarding who should be responsible for student certification requirements. It is evident that the majority of the graduates felt the peripheral blood smear evaluation should continue to be the responsibility of the hospital preceptors versus the NAIT instructors.

Table 56

Student Certification- Lab Preceptor Responsibility

Respondents	Blood Smears	Frequency	Percent
Graduates (N= 58) Lab	disagree	5	8.6
	no opinion	8	13.8
	agree	32	55.2
	strongly agree	13	22.4
Lab Preceptors (N= 11)	disagree	5	45.5
	agree	5	45.5
	str. agree	1	9.1

Conversely, only six preceptors (54.5%) concurred.

b) **Clinical Chemistry Quality Check (Q.C.) Samples-** The data in Table 57 indicate that the majority of the graduates (46/58) responded that the hospital should be responsible for student certification. Thirty- six (62.1%) "agreed" and 10 graduates (17.2%) "strongly agreed"; as compared to six laboratory preceptors (54.5%) who "agreed". Overall, the findings were similar to the findings presented in Table 56 on peripheral blood smears. The hospital preceptors do not appear to feel that student certification requirements should be a hospital responsibility.

Table 57

Respondents	Chemistry Q.C.	Frequency	Percent
Graduates (N= 58) Lab	disagree	4	6.9
	no opinion	8	13.8
	agree	36	62.1
	strongly agree	10	17.2
Lab Preceptors (N= 11)	disagree	4	36.4
	no opinion	1	9.1
	agree	6	54.5

The data in Table 58 show the responses of the graduates and the x-ray preceptors regarding whether the student certification should continue to be the responsibility of the hospital x-ray preceptors versus the NAIT instructors. A salient finding is drawn from the data which is consistent with the findings in the medical

laboratory component presented in Tables 56 and 57. The graduate responses definitely indicate that the student certification requirements should be the responsibility of the hospital preceptors versus the NAIT instructors. The preceptor responses are consistently less positive than the responses of the graduates.

Table 58

Student Certification- X-Ray Preceptor Responsibility

Respondents	Responses	Frequency	Percent
Graduates (N= 58)* X-Ray	disagree	4	7.0
	no opinion	5	8.8
	agree	35	61.4
	strongly agree	13	22.8
X-Ray Preceptors (N= 11)	disagree	3	27.3
	no opinion	2	18.2
	agree	5	45.5
	str. agree	1	9.1

*No response= 1

Quizzes

The data in Tables 59 and 60 show the ratings by the graduates and the preceptors on the number of quizzes or examinations (exams) given for student feedback at the training hospital. The findings on the (a) medical laboratory component and (b) the medical radiography component are as follows:

a) Medical Laboratory (Lab)- As shown in Table 59, the ratings of the two cohorts are quite different. The majority of the graduates selected "sufficient" (62.1%),

followed by "too low" (29.3%). The majority of the preceptors selected "too high" (63.6%) and "sufficient" (36.4%). It is difficult to explain why the preceptors feel the number of quizzes given at the hospital are too high because they themselves prepare and administer the quizzes.

Table 59

Number of Quizzes/Exams given at Training Hospital

Respondents	Medical Lab	Frequency	Percent
Graduates (N= 58) Lab	much too low	3	5.2
	too low	17	29.3
	sufficient	36	62.1
	too high	1	1.7
	much too high	1	1.7
Lab Preceptors (N= 11)	sufficient	4	36.4
	too high	7	63.6

b) Medical Radiography- As shown in Table 60, there was a variation in the graduate ratings on the number of quizzes and examinations given at the hospital.

Table 60

Respondents	Radiography	Frequency	Percent
Graduates (N= 58)* X-Ray	much too low	4	7.0
	too low	11	19.3
	sufficient	36	63.2
	too high	5	8.8
	much too high	1	1.8
X-Ray Preceptors (N= 11)	much too low	2	18.2
	too low	3	27.3
	sufficient	6	54.5

*No response= 1

The majority of the graduates (63.2%) selected "sufficient" while six preceptors (54.4%) selected "sufficient". A number of the x-ray preceptors (5/11) indicated the number of quizzes was either "much too low" (18.2%) or "too low" (27.3%).

Student Work Output

The data in Table 61 present the findings to the question whereby the laboratory and radiography preceptors were asked to indicate the importance of student output for the department to function properly. Three x-ray preceptors (27.3%) selected "important" while one laboratory preceptor (9.1%) selected "important". Two x-ray preceptors (18.2%) indicated the work output was "essential" while one laboratory preceptor (9.1%) responded with "essential". The majority of the laboratory preceptors (72.7%) indicated that the student work output was "useful".

Table 61

Student Work Output for Department Function

Respondents	Responses	Frequency	Percent
Lab Preceptors (N= 11)	limited importance	1	9.1
	useful	8	72.7
	important	1	9.1
	essential	1	9.1
X-Ray Preceptors (N= 11)	not required	1	9.1
	useful	5	45.5
	important	3	27.3
	essential	2	18.2

Graduate Open Ended Comments (Clinical Phase)

The open ended comments as perceived by the graduates on the clinical phase of the medical laboratory and medical radiology components of the CLXT Program, are presented in tabular form in Appendix J. Since these are open ended comments, the total number of graduate responses may not correspond directly with the number of graduates participating in the study. Some participants may have elected not to answer these questions and other participants may have made one or more comments in these sections of the questionnaire. The common responses have been grouped according to major themes and are presented in frequency distribution tables.

The data in Appendix J present the important strengths and weaknesses in the clinical phase of the medical laboratory component of the CLXT Program as perceived by the graduates.

The important strengths and weaknesses in the clinical phase of the x-ray component of the program, as perceived by the graduates, are outlined in tabular form in Appendix J.

Preceptor Open Ended Comments (Clinical Phase)

The important strengths and weaknesses of the clinical phase of the program, as perceived by the laboratory preceptors and the x-ray preceptors were recorded and are presented as verbatim comments. Because the comments made by the preceptors were all varied, it was not feasible to

group and present them in frequency distribution tables. Consequently, all the comments are presented as verbatim responses (see Appendix K).

The important strengths and weaknesses of the clinical phase of the medical laboratory component of the program as perceived by the medical laboratory preceptors are presented as verbatim responses in Appendix K.

A number of different strengths and weaknesses of the clinical phase of the x-ray component of the program, as perceived by the x-ray preceptors, were recorded and are presented as verbatim in Appendix K.

Summary of Responses- Strengths in Clinical Phase

The salient findings of the strengths of the clinical phase in the laboratory component and the x-ray component of the CLXT Program, as perceived by the graduates, laboratory preceptors and x-ray preceptors are summarized. This summary will be followed by the salient findings of the weaknesses of the clinical phase in the laboratory component and the x-ray component as perceived by the graduates, the laboratory preceptors and the x-ray preceptors. A summary of the strengths of the clinical phase is as follows:

1. The coordination and collaboration between the institute and the training hospital in medical laboratory and medical radiography was rated from "moderate" to "good' to "excellent" by the majority of the graduates. The responses selected were similar for the two disciplines

(Table 44).

2. There was general consensus by the graduates and the preceptors that the hematology tasks performed in the training hospital were relevant to those performed in the medical laboratories- workplace (Table 47).

3. The majority of the graduates and the laboratory preceptors indicated that the remaining laboratory tasks performed in the training hospital were relevant to tasks required in the medical laboratories (Table 49).

4. All the preceptors and the majority of the graduates (96.4%) indicated that the tasks performed in the training hospitals were relevant to those required in the radiology departments in the workplace (Table 50).

5. A number of the graduates and preceptors commented that the clinical training phase provides realistic workplace experience in a hospital environment and actual clinical laboratory setting (Appendices J & K). Similar findings were noted for the medical radiography component (Appendices J & K).

6. A number of graduates (38.1%) commented that the clinical phase provides experience in both routine and non-routine procedures in the medical laboratory (Appendix J).

7. A large number of the graduates (77.5%) indicated that the 13 week timeframe in the medical laboratory component was adequate to meet competency standards (Table 52). The laboratory preceptors' responses differed from the graduates' responses, with 54.5% of the preceptors

indicating the time was adequate.

8. Overall, the graduates appeared satisfied with the level of supervision they received in the training hospital in both the medical laboratory and x-ray departments (Table 54).

9. There was general consensus by the graduates that assistance from a supervisor or instructor was available when it was required in medical laboratory as well as in medical radiography (Table 55).

10. The majority of the graduates responded that evaluation of peripheral blood smears and clinical chemistry Q.C. samples for certification purposes in medical laboratory should continue to be the responsibility of the hospital preceptors versus the NAIT instructors. Similar findings were noted for the medical radiography component (Tables 56, 57 & 58).

Summary of Responses- Weaknesses in Clinical Phase

1. A number of the medical laboratory preceptors called for a more standardized clinical training program to be implemented under the direction of NAIT. Also, more information on Provincial Examinations should be made available to hospital preceptors (Appendix K).

2. Likewise, a number of the x-ray preceptors commented that a more standardized clinical training program, for all training hospitals to follow, should be implemented and directed by NAIT. Quiz and examination

packages should be prepared and provided by NAIT (Appendix K).

3. A number of the graduates (25.9%) commented that minimal or no automated chemistry procedures were taught in the clinical training phase (Appendix J).

4. Some of the x-ray preceptors commented that heavy workloads in busy departments do not allow sufficient time for teaching students (preceptor verbatim responses- Appendix K). Overall, the x-ray preceptors feel the clinical training period is too short (Table 53 & Appendix K).

5. Five x-ray preceptors (45.5%) responded that student work output is "important" or "essential" for the department to function (Table 61). It is important that educators recognize that a balance between "learning" and "work output" is essential in any medical training program.

Subproblem 3

The results of the data analysis relating to the employment history of the graduates, upon successful completion of the CLXT Program and up to their present employment, are discussed in this section. The data analysis for Subproblem 3 include Part Six, questions one to twelve, of the Graduate Questionnaire. The data analysis on the closed questions are presented in frequency distribution tables. The comments from the open ended questions are categorized according to themes and are shown in frequency distribution tables or as verbatim responses. The number of graduate responses in these tables may not correspond directly with the number of graduates participating in the study. Some participants may have elected not to answer these questions and other participants may have made one or more comments.

Employment

The responses by the CLXT graduates on employment related to the different jobs held; a hospital or medical clinic setting; a rural or an urban setting; the bed complement of the hospital and full time or part time employment are reported in this section (Tables 62-74 and verbatim responses).

Questionnaire Responses

The data in Table 62 present the responses of the

graduates indicating whether they are presently employed as a CLXT. Forty-one graduates (70.7%) are employed as CLXT's and 17 graduates (29.3%) are not employed as CLXT's.

Table 62

Presently employed as a CLXT

Respondents	Responses	Frequency	Percent
Graduates (N= 58)	yes	41	70.7
	no	17	29.3

The responses in Table 63 indicate the various positions held by the graduates. Thirty-one graduates are employed in "lab & x-ray" positions, eight graduates are in "lab" positions, and two graduates are in "other" positions. None of the graduates are in an "x-ray" position. Two participants who selected "other" are employed as a lab & x-ray assistant and as a department head pursuing a subject hematology R.T.

Table 63

Position held as a CLXT (N= 41)

Respondents	Responses	Frequency	Percent
Graduates (N= 58)	lab & x-ray	31	75.6
	lab	8	19.5
	other	2	4.9

The responses in Table 64 indicate other positions held by the graduates who are not employed as CLXT's. The majority of the graduates in other positions are employed as lab assistants.

Table 64

Other Positions held by Graduates (N= 17)*

Positions	Frequency	Percent
Lab Assistant	5	55.6
Laboratory Technologist	2	22.2
Medical Secretary	1	11.1
Family Business	1	11.1

*No response= 8

The responses of the graduates who were not employed as a CLXT by choice are shown in Table 65.

Table 65

Not Employed as a CLXT by choice (N= 17)

Respondents	Responses	Frequency	Percent
Graduates (N= 58)	yes	7	41.2
	no	10	58.8

The graduates who answered that they are not employed as CLXT's responded with the following verbatim comments:

> I am enrolled in the Medical Laboratory Technology Program.
>
> I decided to specialize and completed the Medical Laboratory Technology Program.
>
> I am now involved in a family business because CLXT positions were not available.

Presently, I am at university and work summer relief shifts as a CLXT quite often.

I am completing the Medical Laboratory Technology Program.

Am still seeking full-time employment as a CLXT.

There were not any CLXT openings and I needed work.

Presently, I am living in a town where there are not any CLXT jobs.

I applied for CLXT jobs but was unsuccessful.

The responses referring to the employment status of the graduates as CLXT's are shown in Table 66. Twenty-one graduates are employed full-time, 17 graduates are employed part-time and three graduates are employed on a casual basis. The data in Table 66 also indicate whether the employment of the graduates is permanent or temporary. Permanent positions were held by majority of the graduates.

Table 66

Employment Status as CLXT

Respondents	Responses	Frequency	Percent
Graduates (N= 41)	full-time	21	51.2
	part-time	17	41.4
	casual	3	7.3
(N= 41)*	permanent	32	84.2
	temporary	6	15.8

*No response= 3

The number of hours that each CLXT is employed monthly is

outlined in Table 67. The hours vary from 20 to 176.

Table 67

Number of Hours Employed Monthly as a CLXT (N= 41)

Hours	Freq	Hours	Freq
20	1	124	2
23	1	130	1
34	1	135	1
35	1	140	3
37	1	146	1
38	1	150	4
40	1	151	1
62	1	155	3
65	1	160	3
80	2	162	1
90	1	163	1
93	1	168	1
94	1	175	1
96	1	176	1
117	1		
*No response= 1			

The primary setting of the graduates' present employment is indicated in the data in Table 68. Rural hospitals employ the largest number of CLXT's (49%), followed by the urban clinics (26.5%).

Table 68

Primary Setting of Present Employment

Respondents	Responses	Frequency	Percent
Graduates (N= 58)*	rural hospital	24	49.0
	urban hospital	6	12.2
	rural clinic	2	4.1
	urban clinic	13	26.5
*No response= 9	other	4	8.2

The graduates were asked to state the bed complement of the hospital in which they were employed. The bed numbers ranged from 10 to 1500 beds, with the majority of the graduates (81.8%) working in hospitals with bed complements ranging from 10 to 80 beds, as shown in Table 69.

Table 69

Bed Complement of Hospital (N= 58)*

Beds	Freq	%	Beds	Freq	%
10	3	9.1	45	1	3.0
17	1	3.0	50	3	9.1
20	1	3.0	80	2	6.1
25	4	12.1	125	1	3.0
27	1	3.0	300	1	3.0
30	5	15.2	400	1	3.0
34	1	3.0	550	1	3.0
35	3	9.1	585	1	3.0
37	1	3.0	1500	1	3.0
41	1	3.0			

*No response= 25

The bed numbers ranged from 10 to 1500 beds, with the majority of the graduates (81.8%) working in hospitals with bed complements ranging from 10 to 80 beds, as shown in Table 69.

The graduates' responses showing their interest in working in rural employment or in urban employment are presented in Table 70. Thirty graduates (55.6%) showed more interest in rural employment, while twenty-four graduates (44.4%) were more interested in urban employment.

Table 70

Interested in Rural or Urban Employment

Respondents	Responses	Frequency	Percent
Graduates (N= 58)*	rural	30	55.6
	urban	24	44.4

*No response= 4

The data in Table 71 indicate the graduates' responses to the statement that they did not experience much difficulty in obtaining employment as a CLXT after their graduation. Thirty-three graduates indicated that they did not experience much difficulty, with 24 graduates "agreeing" and nine graduates "strongly agreeing". Seventeen graduates indicated they experienced difficulty with ten graduates "disagreeing" and seven graduates "strongly disagreeing".

Table 71

Not Much Difficulty in Obtaining CLXT Employment

Respondents	Responses	Frequency	Percent
Graduates (N= 58)*	str. disagree	7	12.3
	disagree	10	17.5
	no opinion	7	12.3
	agree	24	42.1
	str. agree	9	15.8

*No response= 1

The graduates' responses indicating that they are paid an adequate salary commensurate with their educational background are shown in Table 72. The majority of the participants responded that they were paid adequately.

Table 72

Adequate Salary Commensurate with Education

Respondents	Responses	Frequency	Percent
Graduates (N= 58)*	str. disagree	1	1.8
	disagree	3	5.3
	no opinion	12	21.1
	agree	33	57.9
	str. agree	8	14.0

*No response= 1

The graduates were asked to indicate whether they would choose the CLXT Program again, if they could start over. The data in Table 73 show that 30 graduates responded they would take the program again, with 22 graduates "agreeing" and eight graduates "strongly agreeing". Nearly one third of the graduates responded with negative responses.

Table 73

Would Choose CLXT Program again

Respondents	Responses	Frequency	Percent
Graduates (N= 58)	str. disagree	6	10.3
	disagree	13	22.4
	no opinion	9	15.5
	agree	22	37.9
	str. agree	8	13.8

The graduates who responded that they would not take the CLXT Program again, if they were starting their education over, were asked to name the career choices they would make. The career choices were recorded and are outlined in a frequency distribution table in Table 74.

Table 74

Career Choices Made by Graduates (N= 58)*

Career	Freq	Percent
Medical Laboratory Technology	16	48.4
Medical X-Ray Technology	6	18.2
Nursing	5	15.2
Business Administration	1	3.0
Dental Hygienist	1	3.0
Electronics	1	3.0
Pharmacy	1	3.0
Respiratory Technology	1	3.0
President of U.S.A.	1	3.0

*No response= 25

Summary of Graduate Responses

The salient findings relating to the employment history of the graduates are summarized follows:

1. The majority of the graduates (70.7%) are employed as CLXT's (Table 62).

2. The majority of the graduates (75.6%) are employed in lab & x-ray positions and 19.5% of the graduates are working in laboratory positions (Table 63).

3. A number of the graduates (41.4%) responded that they are working part-time, and only 51.2% are employed in full-time CLXT positions (Table 66).

4. Rural hospitals employ the largest number (49.0%) of the CLXT's, followed by urban clinics (26.5%) (Table 68).

5. The majority of the graduates (81.8%) work in hospitals with bed complements ranging from 10 to 80 beds (Table 69).

6. The majority of the graduates (71.9%) indicated that the salary was adequate commensurate with their education (Table 72).

Subproblem 4

The data analysis on the continuing education/advanced training courses are discussed in this section. The data analysis for Subproblem 4 include Part Six, questions 13 to 18, of the Graduate Questionnaire. The responses on the closed questions are shown in frequency distribution tables. The comments from the open ended questions were recorded and are presented in frequency tables or as verbatim responses. The number of graduate responses in these tables may not correspond directly with the number of graduates who participated in the study. Some participants may have elected not to answer these questions and other participants may have made one or more comments.

Continuing Education/Advanced Training

The continuing education/advanced training taken by the graduates are presented in Tables 75-79 and also as verbatim

responses.

Questionnaire Responses

The graduates were asked to list any CLXT employment related continuing education courses or advanced training courses they had taken since graduation. The names of the courses taken by the graduates were recorded and are presented in Table 75 and illustrated in Figure 3. It is evident that the electrolyte course (electrolytes, flames, ISE's) is the one most frequently taken by the graduates, followed by cardiology, hematology and mobile radiography.

Table 75

Post CLXT Courses Taken (1885- 1990) (N= 58)

Course	Frequency	Percent
Electrolytes	22	44.9
Cardiology (ECG)	11	22.4
Hematology	6	12.2
Mobile Radiography	5	10.2
Cardio-pulmonary resuscitation	3	6.1
Spirometry	2	4.1

The data in Table 76 present the graduates' responses showing whether continuing their employment was dependent on taking a course/s. The majority of the graduates (80%) responded that continuing their employment was not dependent on taking a course/s.

Figure 3

Post CLXT Courses Taken (1985-1990)

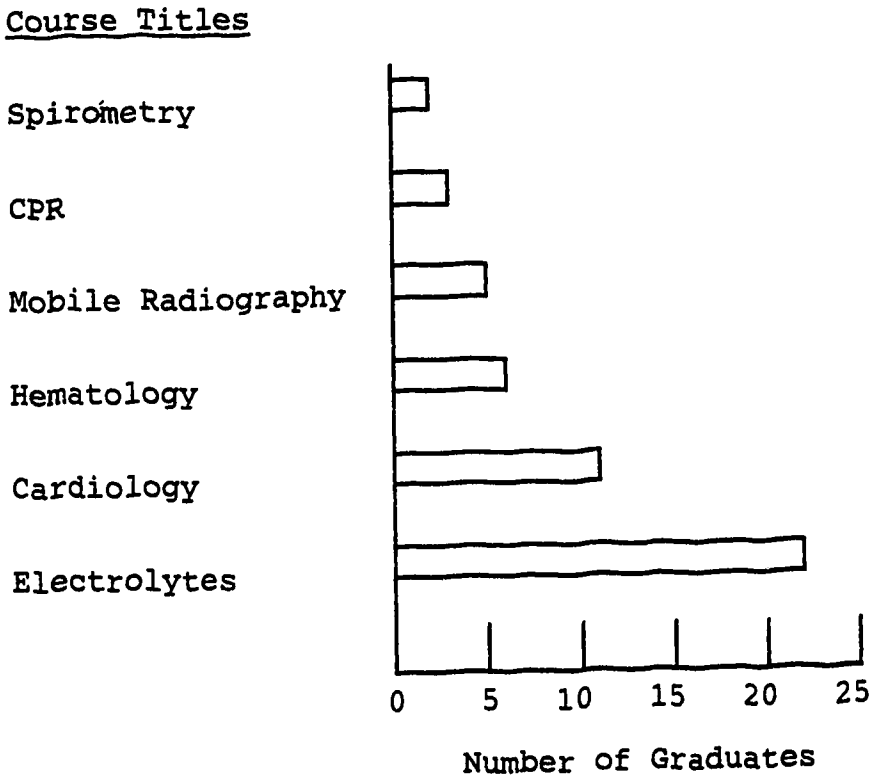


Table 76

Continuing Employment Dependent on taking Courses/s

Respondents	Responses	Frequency	Percent
Graduates (N= 58)*	yes	9	20.0
	no	36	80.0

*No response= 13

The graduates were also asked to include open-ended comments with this same question. The following responses are the verbatim responses:

> I was hired on the basis that I take the electrolyte course.
>
> The hospital was purchasing an electrolyte analyzer and we were required to take the course.
>
> No, but it certainly was the route to take in order to use the electrolyte analyzer.
>
> Yes, it was highly suggested that I take the electrolyte course.
>
> Strongly suggested that I take the portable radiography course in order to continue with on-call duty.
>
> Electrolyte course is a necessity in the lab I work in.
>
> The electrolyte course enabled me to take call and to continue with my job.
>
> After I accepted the job, I soon needed to take the electrolyte course.

The data in Table 77 present the graduates' responses showing whether obtaining new employment was dependent on taking a course/s. The majority of the graduates (81.8%) responded that obtaining new employment did not depend on

taking any courses.

Table 77

Obtaining Employment Dependent on taking Courses/s

Respondents	Responses	Frequency	Percent
Graduates (N= 58)*	yes	8	18.2
	no	36	81.8

*No response= 14

Open-ended comments were included by some of the graduates in answering this same question and are presented verbatim:

> In order to be on call, I had to take the electrolyte course and the mobile radiography course.
>
> I got a new job and was given one year to take the electrolyte course and the mobile radiography course.
>
> When a position becomes available, I can work permanent full-time because of taking the mobile radiography course.

The graduates were asked whether any of the post CLXT courses should be part of the NAIT CLXT Program. A salient finding is evident in the data presented in Table 78, with 48 graduates (96.0%) indicating a positive response.

Table 78

Should Post Graduate CLXT Courses be Part of NAIT Program?

Respondents	Responses	Frequency	Percent
Graduates (N= 58)*	yes	48	96.0
	no	2	4.0

*No response= 8

The graduates were asked to identify any post graduate CLXT courses, as courses that they perceived should be a part of the NAIT CLXT Program. The names of the courses were recorded and are presented in Table 79.

Table 79

Post Graduate CLXT Courses- Part of NAIT Program N= 58)

Course	Freq	Percent
Electrolytes	46	55.4
Cardiac Enzymes	14	16.9
Mobile Radiography	8	9.6
Cardio-Pulmonary Resuscitation	5	6.0
Basic Automated Chemistry	4	4.8
Fluoroscopy	4	4.8
Basic Abnormal ECG Interpretation	1	1.2
Basic Microbiology	1	1.2

The last question on the Graduate Questionnaire asked the graduates to include any related comments relevant to the study. The graduate comments are presented as verbatim responses in Appendix L.

Summary of Graduate Responses

The notable findings relating to the continuing education/advanced training courses, taken by the CLXT graduates, are summarized and presented as follows:

1. A number of different courses were taken as post graduate CLXT courses. It was most evident that the electrolyte course was the course taken by the greatest number of graduates (44.9%), followed by the cardiology

course (22.4%) and the hematology course (12.2%) (Table 75).

2. The graduates' responses indicated that continuing their employment was not dependent on taking a course/s. In addition, the majority of the graduates (81.8%) responded that obtaining employment was not dependent on taking a course/s (Tables 76 and 77).

3. The majority of the graduates (81.8%) felt that CLXT post graduate courses should be part of the NAIT CLXT Program. The findings revealed that 55.4% of the graduates felt the electrolyte course should be included in the NAIT Program, followed by a cardiac enzyme course (16.9%) and mobile radiography (9.6%) (Tables 78 and 79).

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

This chapter presents the summary, conclusions and recommendations of the study. The summary section includes the purpose, literature review, research methodology and data analysis. The conclusions section comprises the conclusions which are derived from the major findings and the recommendations are presented in the third section.

Summary

Purpose of the Study

The purpose of this study was to identify the strengths and weaknesses of the Combined Laboratory & X-Ray Program as perceived by the graduates and the clinical preceptors, and to determine the employment history and the further education and advanced training of the Alberta Combined Laboratory & X-Ray Technician graduates who successfully completed the program over the last five years. Four subproblems were identified to support the major purpose of the study.

Literature Review

The second chapter of this study provided a review of the related literature that included an overview of the

historical background of the CLXT Program and a review of follow-up studies of medical laboratory and medical radiography graduates. The final section of the related literature included a review on evaluation theories and models and program evaluation. From a review of the literature it became evident that very limited research was completed on follow-up studies of medical and radiography graduates. From the major evaluation theories that were reviewed, Stufflebeam's CIPP Model was selected. Stufflebeam et al. (1971) wrote that educational "evaluation is the process of delineating, obtaining and providing useful information for judging decision alternatives" (p. 40).

Instrumentation

Questionnaires were used as the research instrument to collect data for the study. Three different questionnaires, one each for the graduates, the medical laboratory preceptors and the medical radiography preceptors were developed and piloted. Minor modifications were made to the final questionnaires following the analysis of the pilot study. Two main question types, the closed question and the open-ended question were used. A five point Likert scale was utilized for the closed question responses.

Population

The population for the study included the CLXT

graduates, who graduated between 1985 and 1989, and all the clinical preceptors. Questionnaires were mailed to 71 graduates and 22 clinical preceptors. Aggregated, the percentage of response for the two cohorts was 86.0%. In this total, there were 81.6% graduates (58/71) and 100% preceptors who returned the questionnaires (Table 1).

Data Analysis

The data obtained from the closed questions were analyzed using a frequency program from the Statistical Package for the Social Sciences (SPSSx) and presented in frequency and percentage tables. Open-ended comments were analyzed according to content analysis, grouped into major themes and presented in frequency distribution tables or as verbatim responses.

Conclusions

The findings from the graduate and clinical preceptor questionnaires have all been amalgamated in this section and the major findings have been carefully considered in making the conclusions. The data will be discussed in terms of the four subproblems.

Subproblem 1

The first subproblem was to identify the strengths and weaknesses of the didactic phase of the program, as

perceived by the graduates and the clinical preceptors. A number of major findings in the strengths of the didactic phase were identified.

Laboratory Component: There was general consensus by the graduates and the laboratory preceptors that the Hematology theory and practicum, the ECG theory and practicum, and the theory and procedures taught in General Knowledge are adequate for the practical application required in the training hospitals. (Tables 16, 18, 19, 24, 26 & 27).

X-Ray Component: Satisfaction with the didactic training, as related to employment requirements in the workplace, was expressed by the majority of the graduates; however the x-ray preceptors were less positive (Table 39). It was evident that the majority of the graduates felt that the Radiography Procedure Manual was both explicit and useful (Table 14). The findings indicate that all the graduates (57/57) and the majority of the x-ray preceptors responded that the Anatomy theory and the positioning practicum in anatomy were adequate for clinical training (Tables 20 & 28).

The following conclusions regarding the strengths of the didactic phase were based on the major findings of the study:

1. Overall, the theory and the laboratory practica taught in Hematology, Electrocardiography and General Knowledge adequately prepared the students for the clinical

phase in the laboratory component of the program.

2. The graduates and x-ray preceptors indicated that students were adequately prepared in Anatomy for training.

3. Overall, the majority of the graduates expressed satisfaction with the didactic training in both disciplines in relation to employment skills required in the workplace. The preceptors indicated less satisfaction than the graduates.

The major findings of the weaknesses in the didactic phase of the program are addressed.

Laboratory Component: The teachings in Clinical Chemistry theory and practicum were inadequate to prepare the students for the clinical phase, according to the laboratory preceptor responses (Tables 17 & 25). A weakness was noted by both cohorts, with (94.8%) of the graduates and all the preceptors indicating that the basic Clinical Chemistry tests should also be taught as semi-automated procedures in the didactic phase (Table 32). In addition, a number of the laboratory preceptors indicated that the Clinical Chemistry content was too limited in test procedures and in theory (Appendix I). A number of the graduates felt that too few semi-automated and too many manual hematology practicals were scheduled in the didactic phase (Appendix H). Another weakness, a need for increased communication between NAIT staff and the laboratory preceptors, was expressed by the majority of the laboratory

preceptors (Table 40).

X-Ray Component: The majority of the x-ray preceptors disagreed that the current 34 week didactic phase in the program was adequate. A number of the x-ray preceptors (70%) disagreed with the statement that the theory and practica taught in Image Recording and Quality Assurance were adequate (Tables 21 & 29). A number of the graduates and x-ray preceptors indicated that insufficient time was spent on trauma and emergency cases (Appendices H & I). Not teaching fluoroscopy and mobile radiography was also noted as a weakness in the program by the graduates (Appendix H).

The following conclusions on the weaknesses in the didactic phase of the program were based on the major findings of the study:

1. A salient finding in the weakness of the didactic phase was that the three basic chemistry tests taught as manual procedures were not also taught as semi-automated procedures.

2. Overall, it was concluded that the Clinical Chemistry theory and the basic clinical chemistry tests taught in the didactic phase- bilirubin, glucose and urea nitrogen, were too limited in number.

3. Another weakness noted in the didactic phase was that an insufficient number of semi-automated practicals and too many manual hematology practicals were scheduled .

Subproblem 2

The second subproblem was to identify the strengths and weaknesses of the clinical phase of the program, as perceived by the graduates and the clinical preceptors. The major findings relating to the strengths of the clinical phase are presented.

Laboratory Component: There was general consensus by both cohorts that the hematology tasks performed in the training hospital were relevant to those performed in the workplace (Table 47). That peripheral blood smears and clinical chemistry Q.C. samples, for student certification purposes, continue to be the responsibility of the hospital preceptors versus the NAIT instructor, was indicated by the majority of the graduates (Tables 56 & 57). A number of the graduates and preceptors commented that the clinical training provides realistic workplace experience in a hospital environment and actual clinical setting. Generally, the laboratory preceptors felt that the clinical training provided an accurate reflection of the real workplace (Appendices J & K).

X-Ray Component: Overall, the graduates and the preceptors felt that the tasks performed in the training hospitals were relevant to those tasks and skills required in the workplace (Table 50). The majority of the graduates indicated that student certification should continue to be a responsibility of the hospital preceptors (Table 58).

Laboratory & X-Ray Components: There was general

consensus by the graduates that the level of supervision received at the training hospitals, in both the laboratory department and the x-ray department, was adequate; and that supervisor assistance was available when required (Tables 54 & 55).

The following conclusions on the strengths of the clinical phase were derived from the major findings of the study:

1. There was general consensus that the hematology tasks performed in the training hospitals in the laboratory component were relevant to those tasks and skills required in the medical laboratories.

2. Overall, the graduates and the preceptors felt that the tasks performed in the training hospitals in the x-ray component were relevant to those tasks and skills required in the radiology departments.

3. The graduates indicated that the level of supervision in both the laboratory and the x-ray departments was adequate; and that supervision was available when it was required.

4. A salient finding was that the graduates indicated that the training hospitals should continue with the responsibility of student certification in peripheral blood smears and clinical chemistry Q.C. samples in the laboratory component; as well as continue with this responsibility in the x-ray component.

The major findings in the weaknesses of the clinical phase are presented.

Laboratory Component: A number of the graduates commented that minimal or no automated chemistry procedures were taught in the clinical phase (Appendix J). There was an overall indication by the preceptors that student teaching time was limited because of heavy workloads. They felt that more has to be done for the hospitals by NAIT. A notable weakness perceived by the preceptors was that the program was not standardized. Also, insufficient information was available on the Provincial Registration Examination (Appendix K).

X-Ray Component: The x-ray preceptors called for a more standardized clinical training program, to be implemented and directed by NAIT. Also, they felt that quiz/examination packages should be provided to the x-ray preceptors by NAIT (Appendix K). It was indicated by the x-ray preceptors that the clinical training phase was too short (Table 53).

The following conclusions on the weaknesses of the clinical phase were derived from the major findings of the research:

1. A notable weakness revealed was that none or very minimal teaching occurs in automated clinical chemistry procedures.

2. Student teaching time in both the laboratory and the x-ray departments was somewhat limited because of heavy

patient workloads.

3. A salient finding was that a more standardized clinical training program should be implemented under the direction of NAIT. In addition, the Provincial Registration Examination Syllabus should be provided to all preceptors in order that appropriate teachings are done in preparing the students for the examination.

4. The x-ray preceptors expressed the need for quiz/examination packages to be prepared by NAIT staff and provided to the hospital x-ray preceptors.

Subproblem 3

Subproblem 3 was to identify the employment history of the graduates upon successful completion of the CLXT Program and up to their present employment. These major findings relating to the employment history of the graduates were formulated.

The majority of the graduates (70.7%) were working as CLXT's (Table 62). Also, the majority of the graduates (75.6%) were employed in lab & x-ray positions and 19.5% of the graduates were employed in lab positions. None of the graduates were employed in only x-ray positions (Table 63). Rural hospitals employed the largest number (49.0%) of the CLXT's, followed by urban clinics (26.5%) (Table 68). The bed complement of the hospitals that the majority of the graduates (81.8%) worked in, ranged from 10 to 80 beds. (Table 69). A number of graduates indicated that their

employment was part-time employment as a CLXT (Table 66). The salary of the graduates was adequate commensurate with the education.

The following conclusions were derived from the major findings of the research:

1. The majority of the graduates were employed as CLXT's and were working in CLXT positions.

2. The largest number of CLXT's were employed in rural hospitals, followed by urban clinics, whereas the smallest number of graduates were employed in rural clinics.

3. The majority of the graduates were employed in hospitals with 10-80 bed complements.

4. Concern was expressed by a number of graduates that it was difficult to obtain full-time employment as a CLXT.

Subproblem 4

Subproblem 4 was to identify the continuing education courses and advanced training courses undertaken by the CLXT graduates. The major findings in identifying these courses are addressed.

It was most evident that the electrolyte course was the course taken by the greatest number of graduates (49.0%), followed by the cardiology course (22.4%) (Table 75). The graduates indicated that continuing their employment was not dependent on taking a course/s. However, 20% of the graduates who had to take a courses/s to continue

with their employment, completed both the electrolyte and mobile radiography courses (Table 76). The majority of the graduates felt that the CLXT post graduate courses should be part of the NAIT Program, with 55.4% indicating that the electrolyte course should be included and 16.9% indicating that a course on cardiac enzymes should be included in the curriculum (Table 79).

On the basis of the major finings, the following conclusions are presented:

1. A salient finding was that the electrolyte course was the one taken by the greatest number of graduates.

2. Although the majority of the graduates were able to continue their employment without taking any courses, the graduates who had to pursue further education took the electrolyte course and the mobile radiography course.

Recommendations

Primary recommendations for the didactic and the clinical phases of the CLXT Program will be presented in this section. Related recommendations for the didactic and the clinical phases and recommendations for further research will follow.

Didactic Phase- Primary Recommendations

This category will include those recommendations based directly on the findings and conclusions derived from this study. It is recommended that in the didactic phase:

1. The 34 week CLXT Program at NAIT should be expanded in content and extended in length to allow for enrichment of the program.

2. Manual hematology and coagulation procedures should be de-emphasized in the practicum and the focus should be placed on teaching semi-automated hematology and coagulation testing. More information and student practice on maintenance and trouble-shooting the instrumentation should be included in the hematology course.

3. The basic clinical chemistry tests which are taught as manual procedures should also be taught as semi-automated procedures in the laboratory component.

4. The curriculum in the CLXT Program should be expanded to include additional chemistry tests such a electrolytes in the laboratory component and mobile radiography in the x-ray component.

5. The theory and practica teachings in Image Recording and Quality Assurance should be enhanced in the didactic phase to meet the practical application required in the clinical phase.

Clinical Phase- Primary Recommendations

The following primary recommendations were formulated for the clinical phase:

1. All training hospitals should include the teaching of automated clinical chemistry procedures.

2. Because the student teaching time in both the

laboratory and x-ray disciplines is limited in the clinical phase due to heavy patient workloads, the clinical training should be extended.

3. A more standardized and formalized clinical training program should be implemented under the direction of NAIT, whereby all training hospitals teach to a minimal level. This minimal level should be adequate to meet the competency performance of the tasks as outlined in the Provincial Registration Examination Syllabus.

4. Each hospital preceptor be provided with a Provincial Registration Examination Syllabus, and that each student be provided with the same and a sample examination question package to enable adequate student preparation for the examination.

5. The NAIT staff prepare a standard quiz/examination package that would be made available to the x-ray preceptors, as concern was expressed by a number of clinical x-ray preceptors for this need.

Related Recommendations

Although not based specifically on the findings gathered during this study, these recommendations are based on the observations and personal experiences of the researcher. During the last 15 years, the researcher has been involved directly with the CLXT Program, in the capacity of a medical laboratory instructor.

1. The curriculum in the didactic phase and the

training in the clinical phase be enriched. The enrichment should be to a level; whereby, the purpose of the program, which is to serve the small community hospital with a 15-60 bed complement, is fulfilled.

2. The clinical training phase be reviewed with the possibility of a more centralized type of training program being implemented in the future. Utilizing four or five training hospitals, as compared to the present 10-12 training hospitals, would provide for a more standardized and formalized training program. The preceptors would be directly responsible for the teaching of the students, with perhaps, some scheduled tutorials, etc. This approach would help to alleviate the problem expressed by the busy preceptors who presently appear to be lacking the time to adequately teach the students.

The conceptual framework utilized for this study is based on the product evaluation process of the Stufflebeam CIPP model. The product evaluation "provides timely information for deciding to continue, terminate, modify or refocus a program or activity" (Stufflebeam, 1974, p. 117). Based on the theory of the product evaluation process of the CIPP Model and with careful consideration in making related recommendations, the author recommends that the CLXT Program continue; however, modifications should be made within the didactic and clinical phases.

Recommendations for Further Research

1. If the CLXT Program is modified and enriched, it is recommended that a study be replicated within two or three years to study the effectiveness of the modified program. The CLXT Program is a program with a number of perceived strengths and weaknesses. An enriched curriculum would result in a program that is more aligned with the workplace needs.

2. It is recommended that strategic planning or proactive research be conducted in the CLXT program, with a futures study conducted to determine where the program will fit in the medical milieu of the future. Because of some similarities in the basic content of the curricula between the CLXT Program, the Medical Laboratory Technology Program (R.T) and the Medical X-Ray Technology Program (R.T.), it is important to explore articulation- collaboration, cooperation and coordination amongst the three NAIT programs in future planning and research.

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APPENDIX A

Graduate Questionnaire

COMBINED LABORATORY & X-RAY TECHNICIAN PROGRAM

GRADUATE QUESTIONNAIRE

PART ONE - GENERAL INFORMATION

1. Name of respondent (for follow-up purposes).

_____

Please circle only one response per question.

2. In what year did you graduate from the CLXT program?

1985	1986	1987	1988	1989
1	2	3	4	5

3. While you were growing up, what kind of community did you generally live in?

Rural or farm	Town or small city	Large city
1	2	3

4. Would you recommend the CLXT Program to a friend or relative if she/her was interested in the program?

Not recommend	Recommend with reservation	Recommend	Highly recommend
1	2	3	4

5. Were you aware that the CLXT Program was not offered on the Main Campus when you applied?

Yes	No
1	2

6. In your opinion, the CLXT Program should be part of the programs offered on the Main Campus.

Strongly disagree	Disagree	No opinion	Agree	Strongly agree
1	2	3	4	5

DIDACTIC PHASE OF COMBINED LABORATORY & X-RAY PROGRAM

INTRODUCTION:

The **didactic** phase of the CLXT program, conducted at the Northern Alberta Institute of Technology (NAIT), is designed to provide the student with adequate theoretical knowledge and basic skills in two disciplines. These combined disciplines are medical laboratory and medical radiography.

PART TWO - MEDICAL LABORATORY COMPONENT OF PROGRAM

DIDACTIC PHASE:

Based on your perceptions of the **didactic** Medical **Laboratory** program, please respond to each statement as accurately as possible by circling only one response per question.

Strongly disagree	**Disagree**	**No Opinion**	**Agree**	**Strongly agree**
1	2	3	4	5

1.	The time allotted in the didactic phase in Medical Laboratory in relation to the amount of material covered was generally adequate.	1	2	3	4	5
2.	The Medical Laboratory Procedure Manual was:					
	a) explicit in procedural instructions.	1	2	3	4	5
	b) useful in practicum sessions	1	2	3	4	5
3.	The textbooks you were required to purchase for Medical Laboratory were useful for your required level of training.	1	2	3	4	5
4.	In general, the level of theory taught in the didactic phase, as compared to the theoretical knowledge required in practical application in the clinical phase, is adequate in:					
	a) Hematology	1	2	3	4	5
	b) Clinical Chemistry	1	2	3	4	5
	c) Electrocardiography	1	2	3	4	5
	d) General Knowledge	1	2	3	4	5
5.	The laboratory procedures taught in the didactic phase prepared you, the student, with the necessary skills required in the training hospital in:					
	a) Hematology	1	2	3	4	5
	b) Clinical Chemistry	1	2	3	4	5
	c) Electrocardiography	1	2	3	4	5
	d) General Knowledge	1	2	3	4	5

		SD	D	N	A	SA
6.	In general, the equipment (Toa Sysmex CC-150 and Coag-a-mate) used in the didactic phase is representative of that used:					
	a) in the training hospital	1	2	3	4	5
	b) in hospital laboratories that you have worked in	1	2	3	4	5
	c) in the clinic laboratories that you have worked in	1	2	3	4	5
7.	The basic clinical chemistry procedures should also be taught as semi-automated procedures.	1	2	3	4	5
8.	A career ladder concept, with core courses offered in the first year at NAIT, should be considered for the NAIT Health Sciences programs.	1	2	3	4	5

Much too low	Too low	Sufficient	Too high	Much too high
1	2	3	4	5

9.	The amount of time spent during the didactic phase on:					
	a) manual hematology procedures is	1	2	3	4	5
	b) automated hematology procedures is	1	2	3	4	5
	c) manual clinical chemistry procedures is	1	2	3	4	5

Very poor	Poor	Moderate	Good	Excellent
1	2	3	4	5

10.	Your overall satisfaction with the didactic training as related to the tasks and skills required by employers is	1	2	3	4	5

11. List what you feel are the important strengths of the existing didactic phase of the Medical Laboratory component of the CLXT Program.

_____

_____

_____

_____

_____

_____

12. List what you feel are important weaknesses of the existing didactic phase of the Medical Laboratory component of the CLXT Program.

_____

_____

_____

_____

_____

_____

PART THREE - RADIOGRAPHY COMPONENT OF PROGRAM

DIDACTIC PHASE:

Based on your perceptions of the **didactic** Medical **Radiography** program, please respond to each statement as accurately as possible by circling only one response per question.

Strongly disagree 1	**Disagree** 2	**No Opinion** 3	**Agree** 4	**Strongly agree** 5

1. The time allotted in the didactic phase in Medical Radiography in relation to the amount of material covered was generally adequate. 1 2 3 4 5

2. The Medical Radiography Procedure Manual was:

   a) explicit in procedural instructions 1 2 3 4 5
   b) useful in practicum sessions 1 2 3 4 5

3. The textbooks you were required to purchase for Medical Radiography were useful for your required level of training. 1 2 3 4 5

		SD	D	N	A	SA
4.	In general, the level of theory taught in the didactic phase, as compared to the theoretical knowledge required in practical application in the clinical phase, is adequate in:					
	a) anatomy	1	2	3	4	5
	b) image recording and quality assurance	1	2	3	4	5
	c) radiographic principles and positioning	1	2	3	4	5
	d) apparatus and radiation protection	1	2	3	4	5
5.	The radiological procedures taught during practicum in the didactic phase prepared you, the student, with the necessary skills required in the training hospital in:					
	a) anatomy	1	2	3	4	5
	b) image recording and quality assurance	1	2	3	4	5
	c) radiographic theory and positioning	1	2	3	4	5
	d) apparatus and radiation protection	1	2	3	4	5
6.	In general, the equipment (automatic film processor, film/screen combinations, X-ray machines) used in the didactic phase is representative of that used in:					
	a) the training hospital	1	2	3	4	5
	b) the hospital radiology departments that you have worked in	1	2	3	4	5
7.	A career ladder concept, with core courses offered in the first year at NAIT, should be considered for the NAIT Health Sciences programs.	1	2	3	4	5

Very poor	Poor	Moderate	Good	Excellent
1	2	3	4	5

8.	Your overall satisfaction with the didactic training in Medical Radiography as related to the tasks and skills required by employers is	1	2	3	4	5

9. List what you feel are the important strengths of the existing didactic phase of the Medical Radiography component of the CLXT Program.

_____

_____

_____

_____

10. List what you feel are the important weaknesses of the existing didactic phase of the Medical Radiography component of the CLXT Program.

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_____

CLINICAL PHASE OF COMBINED LABORATORY & X-RAY PROGRAM

INTRODUCTION:

The clinical phase of the CLXT Program follows the didactic phase. The clinical phase, reinforced with clinical experiences, is conducted at training hospital.

PART FOUR - MEDICAL LABORATORY COMPONENT OF PROGRAM

CLINICAL PHASE:

Based on your perceptions of the clinical Medical **Laboratory** program, please respond to each statement as accurately as possible by circling only one response per question.

Very poor	Poor	Moderate	Good	Excellent
1	2	3	4	5

1. During the clinical phase, how adequate were the NAIT visits to the hospital in student follow-up? 1 2 3 4 5

		VP	P	M	G	E
2.	In general, the relevancy between the tasks performed in the training hospital and the practical application required in medical laboratories in:					
	a) Hematology is	1	2	3	4	5
	b) Clinical Chemistry is	1	2	3	4	5
	c) the remaining laboratory tasks is	1	2	3	4	5
3.	The coordination and collaboration between the institute and the training hospital in medical laboratory is:	1	2	3	4	5

Strongly disagree	Disagree	No Opinion	Agree	Strongly agree
1	2	3	4	5

4.	The level of supervision received at the training hospital was adequate.	1	2	3	4	5
5.	In general, whenever I required assistance from a supervisor or instructor, I was able to get it.	1	2	3	4	5
6.	The clinical phase of training prepared you adequately for the provincial examinations.	1	2	3	4	5
7.	In your opinion, the current clinical training phase, consisting of 13 weeks, in Medical Laboratory is adequate to meet basic competency standards.	1	2	3	4	5
8.	In your opinion, student certification requirements should continue to be the responsibility of the hospital preceptors versus the NAIT instructors in:					
	a) peripheral blood smears	1	2	3	4	5
	b) clinical chemistry quality check samples	1	2	3	4	5

Much too low	Too low	Sufficient	Too high	Much too high
1	2	3	4	5

9.	The number of quizzes or examinations given at the training hospital, for student progress feedback was	1	2	3	4	5

10. Identify what you feel are the important strengths of the existing clinical phase of the Medical Laboratory component of the CLXT Program.

_____

_____

_____

_____

_____

_____

11. Identify what you feel are the important weaknesses of the existing clinical phase of the Medical Laboratory component of the CLXT Program.

_____

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PART FIVE - RADIOGRAPHY COMPONENT OF PROGRAM

CLINICAL PHASE:

Based on your perceptions of the clinical Medical **Radiography** program, please respond to each statement as accurately as possible by circling only one response per question.

Very poor	**Poor**	**Moderate**	**Good**	**Excellent**
1	2	3	4	5

1. During the clinical phase, how adequate were the NAIT visits to the hospital in student follow-up? 1 2 3 4 5

		VP	P	M	G	E
2.	In general, the relevancy between the tasks performed in the training hospital and the practical application required in medical radiology departments is	1	2	3	4	5

Much too low	Too low	Sufficient	Too high	Much too high
1	2	3	4	5

3.	The number of quizzes or examinations given at the training hospital for student progress feedback was	1	2	3	4	5

Strongly disagree	Disagree	No Opinion	Agree	Strongly agree
1	2	3	4	5

4.	The level of supervision received at the training hospital was adequate.	1	2	3	4	5
5.	In general, whenever I required assistance from a supervisor or instructor, I was able to get it.	1	2	3	4	5
6.	The clinical phase of training prepared you adequately for the provincial examinations.	1	2	3	4	5
7.	In your opinion, the current clinical training phase, consisting of 13 weeks, in Medical Radiography is adequate to meet basic competency standards.	1	2	3	4	5
8.	In your opinion, student certification requirements should continue to be the responsibility of the hospital preceptors versus the NAIT instructors.	1	2	3	4	5

Very poor	Poor	Moderate	Good	Excellent
1	2	3	4	5

9.	The coordination and collaboration between the institute and the training hospital in Medical Radiography is	1	2	3	4	5

10. Identify what you feel are the important strengths of the existing clinical phase of the Medical Radiography component of the CLXT Program.

_____

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11. Identify what you feel are the important weaknesses of the existing clinical phase of the Medical Radiography component of the CLXT Program.

_____

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_____

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_____

PART SIX - EMPLOYMENT HISTORY

Please circle only one response per question. Fill in the blank space if applicable to your response.

1. Are you presently employed as a CLXT?

Yes	No
1	2

2. If your response is yes, what position do you hold?

Lab & X-ray	Lab	X-Ray	Other (specify)
1	2	3	4 _____

3. If your response to question #1 is no:

   a) what is your employment? _____
   b) did you not seek employment as a CLXT by choice?
   Yes **No**
   1 2 Comment: _____

4. ment status as a CLXT is
   time **part-time** **casual**
   1 2 3

   b) **permanent** **temporary**
   1 2

5. How many hours per month are you employed as a CLXT? _____

6. The primary setting of your present employment is
   rural hospital **urban hospital** **rural clinic** **urban clinic** **other (specify)**
   1 2 3 4 5 _____

7. If you are presently employed in a hospital, state the bed complement. _____

8. You are more interested in working in
   rural employment **urban employment**
   1 2

	Strongly disagree	**Disagree**	**No Opinion**	**Agree**	**Strongly agree**
	1	2	3	4	5
9. You did not experience much difficulty in obtaining employment as a CLXT after graduation.					1 2 3 4 5
10. You feel you are paid an adequate salary commensurate with your educational background and ability.					1 2 3 4 5
11. If you could start over, you would choose the CLXT Program again.					1 2 3 4 5

12. If you would not choose the CLXT Program again, what career choice would you make? _____

13. List any CLXT employment related continuing education or advanced training courses you have taken since graduating from the CLXT Program.

Course	Year taken
_____	_____
_____	_____
_____	_____
_____	_____

14. Did continuing your employment depend on you taking a course or courses?

Yes **No**
1 2 Comment: _____

15. Did obtaining new employment depend on your taking a course or courses?

Yes **No**
1 2 Comment: _____

16. In your opinion, should any of the courses offered as post CLXT courses be part of the NAIT CLXT program?

Yes **No**
1 2

17. If your response to question #16 is yes, identify the course/s.

_____

_____

_____

_____

18. If you have any related comments to make, please do so.

_____

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THANK YOU KINDLY FOR YOUR ASSISTANCE IN PARTICIPATING IN THIS STUDY

APPENDIX B

Medical Laboratory Preceptor Questionnaire

PERCEPTOR QUESTIONNAIRE

MEDICAL LABORATORY COMPONENT OF CLXT PROGRAM

The didactic phase of the program, conducted at Northern Alberta Institute of Technology (NAIT), is designed to provide the student with adequate theoretical knowledge and basic skills in combined medical laboratory and x-ray technology.

Based on your perceptions of the **didactic** Medical Laboratory program, please respond to each statement as accurately as possible by circling only one response per question.

DIDACTIC PHASE:

Strongly disagree	Disagree	No Opinion	Agree	Strongly agree
1	2	3	4	5

1.	In your opinion, the time allotted in the didactic phase in Medical Laboratory in relation to the amount of material covered is generally adequate.	1 2 3 4 5
2.	In general, the level of the theory taught in the didactic phase as compared to the practical application required in the clinical phase is adequate in:	
	a) Hematology	1 2 3 4 5
	b) Clinical Chemistry	1 2 3 4 5
	c) Electrocardiography	1 2 3 4 5
	d) General Knowledge	1 2 3 4 5
3.	The laboratory procedures taught in the didactic phase prepared the student with the necessary skills required in the training hospital in:	
	a) Hematology	1 2 3 4 5
	b) Clinical Chemistry	1 2 3 4 5
	c) Electrocardiography	1 2 3 4 5
	d) General Knowledge	1 2 3 4 5

		SD	D	N	A	SA
4.	The basic clinical chemistry procedures should also be taught as semi-automated procedures.	1	2	3	4	5
5.	In general, the equipment (Toa Sysmex CC-150 and Coag-a-mate) used in the didactic phase is representative of that used:					
	a) in the training hospital	1	2	3	4	5
	b) in hospital laboratories that you have worked in	1	2	3	4	5
	c) in the clinic laboratories that you have worked in	1	2	3	4	5
6.	In your opinion, the current didactic phase of 34 weeks is an adequate timeframe for the program.	1	2	3	4	5
7.	There is a need for increased communication between the NAIT staff and the hospital preceptors.	1	2	3	4	5
8.	A career ladder concept, with core courses offered in the first year at NAIT, should be considered for the NAIT Health Sciences programs.	1	2	3	4	5

Much too low	Too low	Sufficient	Too high	Much too high
1	2	3	4	5

9.	Based on the student's initial practical performance, the amount of time spent during the didactic phase in:					
	a) manual hematology procedures appears tobe	1	2	3	4	5
	b) automated hematology procedures appears to be	1	2	3	4	5
	c) clinical chemistry procedures appears to be	1	2	3	4	5

Very poor	Poor	Moderate	Good	Excellent
1	2	3	4	5

10.	Your overall satisfaction with the didactic phase as related to the tasks and requirements in the clinical phase is	1	2	3	4	5
11.	The communication between NAIT and the hospital in assisting the overall program in keeping current with new developments in the workplace is	1	2	3	4	5

Never	Seldom	Sometimes	Often	Always
1	2	3	4	5

12. Communication between the NAIT staff and the hospital preceptors occurs 1 2 3 4 5

13. Identify what you feel are the important strengths of the existing didactic phase of the Medical Laboratory component of the CLXT Program.

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14. Identify what you feel are the important weaknesses of the existing didactic phase of the Medical Laboratory component of the CLXT Program.

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CLINICAL PHASE OF MEDICAL LABORATORY COMPONENT

INTRODUCTION:

The clinical phase of the CLXT Program follows the didactic phase. The clinical phase, reinforced with clinical experiences, is conducted at a training hospital.

CLINICAL PHASE:

Based on your perceptions of the clinical Medical Laboratory program, please respond to each statement as accurately as possible by circling only one response per question.

Very poor	Poor	Moderate	Good	Excellent
1	2	3	4	5

1. During the clinical phase, how adequate were the NAIT visits to the hospital in student follow-up? 1 2 3 4 5

2. In general, the relevancy between the tasks performed in the training hospital by the student and the practical application required in medical laboratories:

   a) in Hematology is 1 2 3 4 5
   b) in Clinical Chemistry is 1 2 3 4 5
   c) in the remaining laboratory tasks is 1 2 3 4 5

3. In your opinion, the direction provided by NAIT to the hospital regarding the clinical phase of student training is 1 2 3 4 5

Strongly disagree	Disagree	No Opinion	Agree	Strongly agree
1	2	3	4	5

4. In your opinion, the current clinical training phase, consisting of 13 weeks, in Medical Laboratory is adequate. 1 2 3 4 5

5. There is a need for hospital preceptors to participate in NAIT in-service programs or professional development. 1 2 3 4 5

6. In your opinion, student certification requirements should continue to be the responsibility of the hospital preceptors versus the NAIT instructors in:	SD	D	N	A	SA
a) peripheral blood smears	1	2	3	4	5
b) clinical chemistry quality check samples	1	2	3	4	5

Essential	Important	Useful	Of limited importance	Not required
1	2	3	4	5

7. In general, for the department to function adequately, the student work output is	1	2	3	4	5

Much too low	Too low	Sufficient	Too high	Much too high
1	2	3	4	5

8. In general, the number of quizzes or examinations given to the student at the training hospital, for student progress evaluation appears	1	2	3	4	5

9. Identify what you feel are the important strengths of the existing clinical phase of the Medical Laboratory component of the CLXT Program.

_____

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10. Identify what you feel are the important weaknesses of the existing clinical phase of the Medical Laboratory component of the CLXT Program.

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THANK YOU KINDLY FOR YOUR ASSISTNACE IN PARTICIPATING IN THIS STUDY

APPENDIX C

Medical Radiography Preceptor Questionnaire

PRECEPTOR QUESTIONNAIRE

MEDICAL RADIOGRAPHY COMPONENT OF CLXT PROGRAM

INTRODUCTION:

The didactic phase of the program, conducted at the Northern Alberta Institute of Technology (NAIT), is designed to provide the student with adequate theoretical knowledge and basic skills in combined medical laboratory and x-ray technology.

Based on your perceptions of the **didactic** Medical Radiography program, please respond to each statement as accurately as possible by circling only one response per question.

DIDACTIC PHASE:

Strongly disagree	Disagree	No Opinion	Agree	Strongly agree
1	2	3	4	5

1. In your opinion, the time allotted in the didactic phase in Medical Radiography in relation to the amount of material covered is generally adequate. 1 2 3 4 5

2. In general, the level of the theory taught in the didactic phase as compared to the practical application required in the clinical phase is adequate in:

   a) anatomy 1 2 3 4 5
   b) image recording and quality control 1 2 3 4 5
   c) radiographic theory and positioning 1 2 3 4 5
   d) apparatus and radiation protection 1 2 3 4 5

3. The radiographic procedures taught during practicum in the didactic phase prepared the student with the necessary skills required in the training hospital in:

   a) anatomy 1 2 3 4 5
   b) image recording and quality control 1 2 3 4 5
   c) radiographic theory and positioning 1 2 3 4 5
   d) apparatus and radiation protection 1 2 3 4 5

		SD	D	N	A	SA
4.	In general, the equipment (automatic film processor, film/screen combination and X-ray machines) used in the didactic phase is representative of that used:					
	a) in the training hospital	1	2	3	4	5
	b) in radiology departments	1	2	3	4	5
5.	In your opinion, the current didactic phase of 34 weeks is an adequate timeframe for the program.	1	2	3	4	5
6.	There is a need for increased communication between the NAIT staff and the hospital preceptors.	1	2	3	4	5
7.	A career ladder concept, with core courses offered in the first year at NAIT, should be considered for the NAIT Health Sciences programs.	1	2	3	4	5

Very poor	Poor	Moderate	Good	Excellent
1	2	3	4	5

8.	Your overall satisfaction with the didactic phase as related to the tasks and requirements in the clinical phase is	1	2	3	4	5
9.	The communication between NAIT and the hospital in assisting the overall program in keeping current with new developments in the workplace is	1	2	3	4	5

Never	Seldom	Sometimes	Often	Always
1	2	3	4	5

10.	Communication between the NAIT staff and the hospital preceptors occurs	1	2	3	4	5

11. Identify what you feel are the important strengths of the existing didactic phase of the Medical Radiography component of the CLXT Program.

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12. Identify what you feel are the important weaknesses of the existing didactic phase of the Medical Radiography component of the CLXT Program.

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CLINICAL PHASE OF MEDICAL RADIOGRAPHY COMPONENT

INTRODUCTION:

The clinical phase of the CLXT Program follows the didactic phase. The clinical phase, reinforced with clinical experiences, is conducted at a training hospital.

CLINICAL PHASE:

Based on your perceptions of the **clinical** Medical Radiography program, please respond to each statement as accurately as possible by circling only one response per question.

Very poor 1	**Poor** 2	**Moderate** 3	**Good** 4	**Excellent** 5

1. During the clinical phase, how adequate were the NAIT visits to the hospital in student follow-up? 1 2 3 4 5

2. In general, the relevancy between the tasks performed in the training hospital by the student and the practical application required in medical radiology departments is: 1 2 3 4 5

3. In your opinion, the direction provided by NAIT to the hospital regarding the clinical phase of student training is 1 2 3 4 5

Much too low	Too low	Sufficient	Too high	Much too high
1	2	3	4	5

4. In general, the number of quizzes or examinations given to the student at the training hospital, for student progress evaluation appears 1 2 3 4 5

Strongly disagree	Disagree	No Opinion	Agree	Strongly agree
1	2	3	4	5

5. There is a need for hospital preceptors to participate in NAIT in-service programs or professional development. 1 2 3 4 5

6. In your opinion, the current clinical training phase in Medical Radiography, consisting of 13 weeks, is adequate for the student to meet competency standards. 1 2 3 4 5

7. In your opinion, student certification requirements should continue to be the responsibility of the hospital preceptors versus the NAIT instructors. 1 2 3 4 5

Essential	Important	Useful	Of limited importance	Not required
1	2	3	4	5

8. In general, for the department to function adequately, the student work output is 1 2 3 4 5

9. Identify what you feel are the important strengths of the existing clinical phase of the Medical Radiography component of the CLXT Program.

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10. Identify what you feel are the important weaknesses of the existing clinical phase of the Medical Radiography component of the CLXT Program.

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THANK YOU KINDLY FOR YOUR ASSISTANCE

IN PARTICIPATING IN THIS STUDY

APPENDIX D

Graduate Questionnaire Covering Letter

January 5, 1990

Dear Graduate:

At the present time, I am an instructor in the Combined Laboratory & X-Ray Technician (CLXT) Program at the Northern Alberta Institute of Technology. In addition to my teaching duties in the program, I am completing the requirements for my Master's Degree at the University of Alberta. Because of both of these interests, I have elected to do a follow-up study of the 1985-89 graduates of the CLXT program.

Because you were one of these students, I am seeking your assistance and cooperation in this follow-up study. The purpose of the study is to identify the strengths and weaknesses of the CLXT Program as perceived by the graduates and the clinical preceptors; and to determine the employment history of the CLXT graduates. Your participation and personal input is very important and will contribute most significantly to the overall study of the program and ultimately to the program itself.

To help you answer quickly, the majority of questions require that you circle the number of your choice. The open-ended questions have spaces provided for your comments.

It would be appreciated if you would take time from your busy schedule to complete this questionnaire, which should take approximately twenty five minutes of your time.

After you have completed the questionnaire, please place it in the enclosed self-addressed envelope and return it by January 26, 1990. A number appears on each questionnaire for follow-up purposes. Letters will be mailed or telephone calls will be placed to those who do not respond to the initial request.

All information provided by you will be treated as strictly confidential and will be available to me only. In appreciation for your efforts and cooperation, a research abstract of the study will be available at the CLXT Program for those who participated.

If you have any questions, please do not hesitate to contact me at the CLXT Program at 427-2348.

Thank you kindly for your time and cooperation. Without you, this study would not be possible.

Sincerely,

Joanne Ritchie (Ms.)
Medical Laboratory Instructor

APPENDIX E

Preceptor Questionnaire Covering Letter

January 5, 1990

Dear :

At the present time, I am an instructor in the Combined Laboratory & X-Ray Technician (CLXT) Program at the Northern Alberta Institute of Technology. In addition to my teaching duties in the program, I am completing the requirements for my Master's Degree at the University of Alberta. Because of both of these interests, I have elected to do a follow-up study of the 1985-89 graduates of the CLXT program.

Because you are involved in the clinical phase of the CLXT Program, I am seeking your assistance and cooperation in this follow-up study.

The purpose of the study is to identify the strengths and weaknesses of the CLXT Program as perceived by the graduates and the clinical preceptors; and to determine the employment history of the CLXT graduates. Your participation and personal input is very important and will contribute most significantly to the overall study of the program and ultimately to the program itself.

To help you answer quickly, the majority of questions require that you circle the number of your choice. The open-ended questions have spaces provided for your comments.

It would be appreciated if you would take time from your busy schedule to complete this questionnaire, which should take approximately fifteen minutes of your time.

After you have completed the questionnaire, please place it in the enclosed self-addressed envelope and return it by January 26, 1990. A number appears on each questionnaire for follow-up purposes. Letters will be mailed or telephone calls will be placed to those who do not respond to the initial request.

The survey is completely anonymous and all information provided by you will be treated as strictly confidential and will be available to me only. In appreciation for your efforts and cooperation, a research abstract of the study will be available at the CLXT Program for those who participated.

If you have any questions, please do not hesitate to contact me at the CLXT Program at 427-2348.

Thank you kindly for your time and cooperation. Without you, this study would not be possible.

Sincerely,

Joanne Ritchie (Ms.)
Medical Laboratory Instructor

APPENDIX F

Follow-Up Letter

February 2, 1990

Ms. Joanne Ritchie
10215 - 108 Street
Edmonton, Alberta
T5J 1L6

Dear

In early January 1990, I mailed you a questionnaire seeking your cooperation to be involved in a follow-up study. The responses from this questionnaire are to provide information in identifying the strengths and weaknesses of the Combined Laboratory & X-ray Program (CLXT) as perceived by the graduates.

There was a January 26, 1990 deadline date given, however, I would still like to have your questionnaire returned. Please take the time from your busy schedule to complete it and return it in the stamped, self-addressed envelope which I enclosed.

To date, 64 (68.8%) of the questionnaires have been completed and returned. It is important that I hear from as many CLXT graduates as possible. I am most anxious to have your participation in the study.

If you did not receive the questionnaire, please contact me at the CLXT Program at 427-2348.

Thank you kindly for your assistance.

Sincerely,

Joanne Ritchie (Ms)
Medical Laboratory Instructor

APPENDIX G

TIMELINE

OVERVIEW OF TIMELINE

	Completion Date
Thesis Committee Approval	June 30/89
Pilot Study	
Instrument designed	July 30/89
Data analyzed & interpreted	October 15/89
Instrument modified	November 30/89
Instrument mailed to population	January 5/90
Data collected and screened	
Including follow-up telephone	
calls and letters	March 15/90
Data analyzed	April 27/90
Data analysis discussion	July 31/90
Conclusion section	August 18/90
Compile all sections	August 31/90
Thesis revision	September 28/9(
THESIS COMPLETED	October 1/90

APPENDIX H

Graduate Responses to Open Ended Questions on the Didactic Phase of the CLXT Program

Strengths of Didactic Phase of Lab Component as Perceived by Graduates (N= 58)

Responses	Freq	%
Manual and semi-automated hematology procedures taught	16	22.8
Theory well taught/sufficient depth	14	20.0
Lab practicals well organized and useful	10	14.3
Appropriate length of time spent on blood smears (Slide sets)	8	11.4
Well organized program with good theory/practical format	5	7.1
Good instructors (helpful)	5	7.1
Basic lab procedures well taught	4	5.7
ECG theory and practicum well taught	4	5.7
Frequent quizzes- helpful for learning	2	2.9
Excellent procedure manual	2	2.9

Weaknesses of Didactic Phase of Lab Component as Perceived by Graduates (N= 58)

Responses	Freq	%
Insufficient number of semi-automated hematology practica	24	27.9
Semi-automated chemistry procedures not taught	26	30.2
Too many manual hematology practicals	6	7.0
Lab component of program is too short	6	7.0
No introduction to names of frequently ordered chemistry tests (SMA, lipids, etc.)	4	4.6
Insufficient number of chemistry tests taught	3	3.5
Inadequate teaching of blood smear interpretation	5	5.8
Hematology slide set- poor quality	3	3.5
Abnormal ECG tracing interpretation not taught	3	3.5
Interpretation of clinical results not taught (correlation of patient results to patient condition)	3	3.5
Insufficient maintenance/troubleshooting on automated equipment	3	3.5

Strengths of Didactic Phase of X-Ray Component as Perceived by Graduates (N= 58)

Responses	Freq	%
Clinical radiographic practica were useful and well covered	19	31.1
Anatomy theory was well taught	14	23.0
Adequate time allotted for practica	12	19.7
Procedure manual was very useful	7	11.4
Program meets employment needs	4	6.5
Organization/format of program was very good	3	4.9
Good selection of updated equipment	2	3.3

Weaknesses of Didactic Phase of X-Ray Component as Perceived by Graduates (N= 58)

Responses	Freq	%
Insufficient time spent on trauma and emergency cases	10	26.3
Fluoroscopy is not taught	9	23.7
Inadequate information in Q.A.	6	15.8
Portable radiography is not taught	4	10.5
Inadequate teaching in alternative views	4	10.5
Insufficient time spent on barium enemas	3	7.9
Inadequate information on daily maintenance of equipment	2	5.3

APPENDIX I

Preceptor Responses to Open Ended Questions on the Didactic Phase of the CLXT Program

Strengths of Didactic Phase of Lab Component as Perceived by Lab Preceptors (N= 11)

Responses	Freq	%
Students provided with very good theoretical background in Hematology, Urinalysis and General Knowledge	5	45.4
Students taught good basics in practical Hematology and Urinalysis	4	36.4
Very adequate training in ECG's	2	18.2

Weaknesses of Didactic Phase of Lab Component as Perceived by Lab Preceptors (N= 11)

Responses	Freq	%
Clinical Chemistry- too limited in test procedures (include electrolytes, enzymes)	4	19.0
Lack of automation in Clinical Chemistry	3	14.3
Clinical Chemistry theory is too limited	3	14.3
Students unable to relate clinical lab findings to disease conditions	3	14.3
Insufficient emphasis on semi-automation in Hematology	2	9.5
Inadequate level of theory taught in Hematology	2	9.5
Student not adequately prepared for hospital situations/experiences (emotionally, communication skills)	2	9.5
Students weak in doing blood smears (differentials, morphologies)	2	9.5

Strengths of Didactic Phase of X-Ray Component as Perceived by X-Ray Preceptors (N= 11)

Responses	Freq	%
Good basic preparation given for clinical phase	3	42.8
Anatomy/positioning and radiographic theory well taught	2	28.5
NAIT instructors are committed to the program and its students	1	14.3
Students are keen to begin clinical phase	1	14.3

Weaknesses of Didactic Phase of X-Ray Component as Perceived by the X-Ray Preceptors

The following responses are the x-ray preceptors' verbatim responses:

Critiques: Students should be able to critique their own films. Initiative: Students do not appear to be taught to take the initiative when duties must be performed in the department- must always be told what to do.

The scope of practice has increased to include examinations for which the students have little or no training. I don't think students are fully aware of the consequences of a dual role in the hospitals today.

More information on trauma cases and on nursing care is required (i.e. drugs on emergency cart, CPR).

Lack of information on description of anomalies and diseases found on x-rays. Student would be more interested in the cases if they could identify the abnormalities.

Pathology is not well covered. In image recording, not much is known about chemistry and films. Students lack in communication skills and arrive at the hospital not knowing how to talk with patients. Lacking in patient preparation for certain exams.

Because these students could be working alone in small hospital departments, I feel they should learn more on positioning obliques on various anatomical parts.

Not enough time is allowed for the didactic phase.

Students are lacking in determining what went wrong when they produce a poor radiograph.

Some students are not emotionally prepared to deal with sick people but hopefully this will improve during the clinical phase.

Students have limited knowledge about equipment operation (i.e. triple phase currents, purpose of focal spot sizes, technique selection, etc.). Too little emphasis is placed on Q.A.

APPENDIX J

Graduate Responses to Open Ended Questions on the Clinical Phase of the CLXT Program

Strengths of Clinical Phase of Lab Component as Perceived by Graduates (N= 58)

Responses	Freq	%
Provides realistic workplace experience in a hospital environment	22	50.0
Supervision/assistance available when required	8	18.2
Clinical strength was teaching hospital and supervisor	7	15.9
Used semi-automated chemistry instrumentation	4	9.1
Reinforces didactic phase of training	3	6.8

Weaknesses of Clinical Phase of Lab Component as Perceived by Graduates (N= 58)

Responses	Freq	%
No/minimal automated chemistry taught	7	25.9
Clinical training is too short	5	18.5
Insufficient number of quizzes/exams	4	14.8
No quizzes/exams were given	3	11.1
Teaching staff have poor communication and teaching skills	3	11.1
Chemistry Q.C. marking by NAIT was ineffective	3	11.1
Insufficient communication between NAIT and training hospital	2	7.4

Strengths of Clinical Phase of X-Ray Component as Perceived by Graduates (N= 58)

Responses	Freq	%
Experience in both routine and non-routine procedures	16	38.1
Helpful and encouraging instructors	11	26.1
Provides real workplace experience	10	23.8
Experience with trauma patients and mobile radiography	3	7.1
Provides exposure to alternate equipment	2	4.8

Weaknesses of Clinical Phase of X-Ray Component as Perceived by Graduates (N= 11)

Responses	Freq	%
Clinical training phase is too short	5	27.8
Insufficient practice on special views and tests (IVP's, barium enemas, stats)	4	22.2
Clinical training is not standardized	3	16.7
On call experience is insufficient	2	11.1
No quizzes/exams were given	2	11.1
Limited mobile radiography was taught	2	11.1

APPENDIX K

Preceptor Responses to Open Ended Questions on the Clinical Phase of the CLXT Program

Strengths of the Clinical Phase of the Medical Laboratory Component as Perceived by the Laboratory Preceptors

The following responses are laboratory preceptor verbatim responses:

Students are able to learn how medical laboratories are run in the field.

Generally, most rural hospitals provide an accurate reflection of the real workplace and introduce the student to a possible career ladder in rural areas.

We offer the student a very comprehensive clinical training. Because of the volume of testing the students are doing, they become quite proficient by the end of their training.

Students are given practical experience and subjected to the real world.

Students are able to get experience in a clinical setting.

Students help to keep the hospital staff current.

Opportune time to relate theory to practical lab work.

The student is able to appreciate and learn how one must organize their work. You sometimes must be able to do many tasks at the same time or within a short time period.

Weaknesses of the Clinical phase of the Medical Laboratory Component as Perceived by the Laboratory Preceptors

The following outlined preceptor comments are verbatim responses:

Time available for training students in the laboratory is limited, therefore students must be serious about learning.

Clinical instructors have insufficient experience or direction in training students.

Rural laboratories are generally so busy getting work done that often, not a lot of time can be spent with a student. Additional student time is not captured on the Government Workload Unit Reporting System. Changes should be made.

We should have a more standardized clinical training program that all training hospitals follow. Clinical instructors need more help from NAIT on developing teaching skills.

Hospital preceptors generally have little knowledge of the CLXT Provincial Examination and therefore cannot reinforce information.
Clinical phase training varies greatly from place to place- a lack of uniform standards. Time dedicated to students varies depending on the hospital and how busy the hospital is at a particular time.

Training period is too short. Manual chemistry procedures should no longer be done!

Would like to see more exacting NAIT guidelines regarding what is to be taught and with approximate time allotments.

I feel that with our growing workload, the student (especially at the beginning) is lost. Our work comes first and the student comes second. I am trying to improve the situation but we have very limited spare time for teaching. This should be done at NAIT. More has to be done for the hospitals by NAIT.

Strengths of the Clinical Phase of the X-Ray Component as Perceived by the X-Ray Preceptors

The following comments are the x-ray preceptor verbatim responses:

Students are encouraged to put their theory into practice from the beginning of their clinical training and to attempt to solve/answer questions and problems on their own. The clinical instructor always supervises, however I am a firm believer in learning by doing.

A hands-on situation and experience in any learning situation is essential and important. Complements the theory and bookwork.

The workloads are greater and the procedures are more extensive at training hospitals than at NAIT. The clinical instructors are R.T.'s or technicians with higher education.

Students are able to get a variety of examinations and the workload is heavy enough that they are able to get the practice needed to improve their skills.

Students learn about patient care, the overall functioning of a department including clerical, patient preparations and follow-up of patients.
Also, learn critiquing of films. Working with patients is somewhat different from working with phantoms, therefore critiquing is different.

Students have the opportunity to get experience with several different technicians (get different ideas).

I believe the clinical phase to be a very important part of the student training. It gives the student self-confidence and the opportunity to work in real life situations but have direct supervision at the same time. I don't believe they should be used as an alternate worker but rather as a student.

The important strength is getting an adjusted, motivated and adequately trained student to perform the required duties. If this is not present, then any other strengths of the clinical phase become irrelevant.

There is a strong emphasis on patient care which is so important for the practicum.

Weaknesses of the Clinical Phase of the X-Ray Component as Perceived by the X-Ray Preceptors

The following outlined weaknesses are the x-ray preceptor verbatim responses:

Although students practice positioning in the didactic phase of training, they seem so unsure of themselves when they arrive at the hospital.
Knowledge on equipment operation is too limited; it is so busy in the department that I just have enough time to explain positioning and technique selection. I feel that when students complete their training, they still don't understand the physics behind the operation and should have more in the didactic phase.
I FEEL X-RAY IS TOO SPECIALIZED A FIELD TO ONLY KNOW THE BASICS. A new graduate should be under the supervision of an R.T. for at least a year.

Students don't seem to be aware when they start the program that their chances of getting a job as a CLXT are very limited. I think they should know the facts before they start the program.

I don't feel competent enough in the area of follow-up quizzes and lectures. I would like NAIT instructors to send out a planned and common quiz program for all the hospital preceptors to follow. This will enable me to follow what their students should cover. I feel we should offer only the facilities and patients, with most of the 13 weeks being planned by the NAIT staff.

I feel there should be more of a general package with quizzes, exams and questions provided to the hospital preceptors. I don't have time to compose these at the hospital because of work and Quality Assurance.

I feel that six additional weeks is a necessity in order for the students to be ready for the workplace.

Students are time consuming at the beginning of their training and sometimes difficult to deal with in a busy department.
A department with AEC sometimes hinders the students, as it does not teach them to use judgement.

I feel there should be more on call duty, especially for accident cases. In order for the student to achieve this,

the length of the clinical phase would have to be extended.

There are no allowances in the clinical training phase for the slower student.
The student training is geared for employment in the small hospital or clinic. Therefore, the clinical training should be done at a small hospital employing CLXT's.

Time to spend with the student always seems to be lacking as workloads continually increase and staffing decreases. A lot is often left up to the student to learn, which is initially quite difficult.

APPENDIX L

Graduate Related Comments Relevant to the Study

Graduate Verbatim Comments

I feel that both Lab and X-Ray are weak in the Didactic Phase in teaching students how to deal with hospital staff, handle phone calls and deal with representatives from supply and equipment companies- they can be very bold!
The program is good, but requires more time in didactic and clinical phases. We need more instruction in working with the elderly and difficult patients.

I feel the course is too broad, and most material should be covered in more depth.

I feel the didactic phase should be 18 months, with the clinical phase at 6 months. The survival of this course depends entirely on it being enriched.

I really feel that a course to prepare students for trauma and accident cases should be included in the program. Also, dealing with death and terminally ill patients should be included and presented by a person educated in this field.

I feel that electrolytes and cardiac enzymes should be included in the program and that the program should be lengthened.

It is important that all training hospitals have their students on call as all rural hospitals require this service.

Eliminate the Society's Provincial Examination and have a NAIT Provincial Examination. It is not efficiently run presently.

Up until recently, I was employed as a CLXT but on a part-time basis. It seems difficult to find a full-time job as a CLXT and this is frustrating. I didn't have a problem obtaining employment in remote areas, but there are problems getting jobs elsewhere. Is the program becoming obsolete? The Lab & X-Ray personnel are enthusiastic about having CLXT's in employment, however some employers do not hire CLXT's.

I feel this program should be on the NAIT Campus. We didn't have the same good equipment in training and didn't get involved in as many activities as students on Main Campus.

I feel this questionnaire was excellent and thorough and I sincerely hope the findings will benefit the CLXT Program.

There should be more information in general knowledge, instrumentation and professional practices (legal aspects, dealing with patients).

Overall, the course is good but it should be extended in order that students get more practice and have some confidence before going out into the workforce.

I think that overall the course was very good and interesting. The Provincial Registration Examination should be written during the last week of clinical training, rather than two months later.

I enjoyed the CLXT Program and I enjoy my work, however I would not recommend the program unless it becomes more automated. Doctors want CLXT's to do electrolytes and hospitals are no longer doing any manual tests. It is becoming difficult to find a job.

I am happy with my job in the southern part of the province. I am able to use all the training and education I received and will be working full-time in the summer.

The electrolytes are becoming an important part of the rural hospital laboratories. Since the main objective should be to teach theory and practical on instruments used in these settings, it would be useful for all future CLXT's to study this and automation in the NAIT Program.