SELECTION OF APPROPRIATE CONTENT AREAS AND TOPICS FOR A COMMUNITY COLLEGE LEVEL PRINTING PROGRAM: A NEEDS ASSESSMENT APPROACH

by

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Dissertation submitted to the Faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

in

Vocational and Technical Education

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June 13, 1988

Blacksburg, Virginia
Selection of Appropriate Content Areas and Topics
For a Community College Level Printing Program:
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(ABSTRACT)

The problem in this research was to derive and prioritize
program content areas and topics for a community college level
printing program appropriate to the needs of the printing industry in
Halifax County, Nova Scotia, Canada. This prioritized list will provide
guidance during curriculum development.

The needs assessment executed in this study was a Beta-type
needs assessment. The methodology used in this study was a
telephone interview technique utilizing a questionnaire developed on
the basis of in-person interviews with key informants in the printing
profession.

As a result of this study, curriculum guidelines were offered for a
community college level printing program. Within these guidelines,
the broad content area of press operations was given the highest
priority, with almost one-half (45%) of the curriculum devoted to
press course offerings in press operations. The broad content area of pre-press operations was given the second highest priority, with approximately one-third (33%) of the curriculum devoted to course offerings in pre-press operations. The broad content area of post-press was given the least priority, with less than one-quarter (22%) of the curriculum devoted to course offerings in post-press operations.

Curricular emphasis of specific topic areas within these broad content areas were also examined, and recommended curricular emphasis was given for these topic areas. In addition demographic information regarding the size and scope of the printing industry in Halifax County was reported.
ACKNOWLEDGEMENTS

I would like to express my gratitude to the following individuals who provided assistance in the completion of this research. The members of my graduate committee deserve special thanks: Dr. William E. Dugger, whose encouragement, support and constructive criticism were greatly appreciated; Dr. Mark Sanders, whose attention to detail and thorough editing during all phases of the project proved invaluable; Dr. J. Michael Adams who's clear vision regarding the importance of research in education guided every aspect of the project; Dr. Charles Pinder, whose faith in the researcher and the importance of the research problem was a constant source of motivation; and Dr. James LaPorte, who added his voice to the committee in the eleventh hour.

In addition I would like to thank the many printers, printing educators, and printing suppliers who contributed the information needed to complete this work.

Finally, I would like to thank my wife, Karen, for her insistence on doing things the right way.
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CHAPTER 1
STATEMENT OF PROBLEM

Background

In June of 1987, a White Paper released by the Honorable Edmund Morris, Minister of the Department of Advanced Education and Job Training initiated the development of a community college system for the Province of Nova Scotia. The system will provide community-based, post-secondary level vocational education for specific vocational areas in need of qualified workers in the Province.

The first community college in the system is to be established in Halifax County, a region of approximately 300,000 people, encompassing the sister cities, Halifax and Dartmouth, as well as the towns of Bedford and Sackville.

The decision to establish the first community college in Halifax County was a logical one. The area is the most densely populated in the Province and contains the head offices for most of the industries located not only in the Province of Nova Scotia, but in the surrounding Atlantic Provinces. In addition, Halifax County is not only rich in financial resources, with the highest tax base in the Province, but is also rich in educational facilities, with five universities located within the County boarders.

The Department of Advanced Education and Job Training is currently making decisions about what type of programs will be offered at each proposed location in the community college system.
After informal discussions with several printing leaders in the Halifax County area, this researcher concluded that a vocational-level printing curriculum would be a valuable asset to the proposed Halifax County community college curriculum. At the start of this study there was no opportunity for college level printing education in the Province. Neither graphic arts, printing, nor communications coursework was offered through any college in the Province. The nearest college level facility which offered printing education was located in Ontario.

Extensive conversations with local printing managers, members of the local branch of the Canadian Printing Industries Association, and officials in the Department of Advanced Education and Job Training encouraged this researcher to pursue research to determine the components appropriate to a community college printing program for Halifax County.

The Printing Industry in Halifax County

Information compiled from records of the Nova Scotia Department of Manpower and Immigration, the Halifax Board of Trade, and the Canadian Printing Industries Association indicated that there were 59 firms in Halifax County listed in the category of Printing, Publishing and Allied Industries. Most of these firms were small concerns; few employed more than 20 employees in printing production. In addition to being small, these concerns were limited in the types of operations that they could perform. No printers in the
province had electronic color separation facilities. Most printers in the County offered some type of binding, typically saddle stitching or adhesive binding. Most printers offered some type of typesetting and layout services, either in-plant or on a subcontract basis; few printers offered design services. There was only one web printing installation, located at the Halifax Herald newspaper plant. While the county did have one flexographic plate manufacturing plant, no flexographic printing was done in the Province. The typical printer in the County had one or more duplicator presses and the related equipment needed to assemble and plate small printing jobs. While several printers had two-color presses, there were only three, four-color presses in the county. Most high quality process color work was sent out of the Province for separation and printing.

Purpose of Study

The purpose of this study was to identify and prioritize, through needs assessment, a list of printing content areas and topics appropriate in printing education for the proposed Halifax County Community College. This prioritized list may subsequently be used to develop curriculum for a printing program.

Need for Study

Information from Canada Manpower and Immigration revealed that despite the small size and fragmented nature of the printing industry in the County, individuals with printing skills were in fairly
constant demand. Employers in the County who were seeking qualified printing personnel were forced either to hire individuals away from other local printing establishments, or to recruit personnel from other provinces, often seeking qualified workers as far away as Ontario and British Columbia.

The expense of recruiting and/or training new employees was a constant demand on employers' resources. It seemed reasonable to assume, therefore, that a printing curriculum for the proposed Halifax County Community College would be a valuable asset to both employers seeking qualified personnel for printing and to students seeking vocational skills which were in demand in the Halifax area.

Research Questions

Considering the perceived importance of a community college printing program for Halifax County, and the fact that there were no established curriculum development guidelines for such a program, program developers should address two questions:

1. What are the appropriate content areas for a community college level vocational printing curriculum for Halifax County?

2. What topic areas should be covered within each of these content areas?
Definitions

1. Community College -- an educational institution designed to provide occupational, career, and technical education and job training beyond the secondary level.

2. Community College Level Vocational Printing Program -- a two-year community college curriculum designed to prepare students for skilled trades specifically needed by the regional printing industry.

3. Content Area -- a broad area of curriculum content. In a printing program, a broad area such as "pre-press operations" can be considered a content area.

4. Topic Area -- a specific topic or skill taught within a broad content area. In a printing program, "typesetting and layout" can be considered a topic area included in the broader content area of "pre-press operations."

Assumptions

1. A community college printing program should teach skills which are actually required in the surrounding community.

2. Employers' estimates of the importance of specific employee skills can be used to identify topics which should be taught in a community college level program.
Limitations

1. This study was limited geographically to the Halifax County, consisting of the sister cities Halifax and Dartmouth and the towns of Bedford and Sackville in the Province of Nova Scotia.

2. This study was designed and executed to develop a community college vocational printing program specifically for the Halifax County area. The results of this study remain primarily generalizable to that program, and must be considered in the context of the printing industry in Halifax County.
CHAPTER II
REVIEW OF LITERATURE

Purpose and Scope of Literature Review

The purpose of this review of literature was twofold: (1) to determine if needs assessment techniques could be utilized for establishing and prioritizing the broad content areas and topics areas appropriate to a community college printing program and, if so, (2) to derive a methodology for conducting a needs assessment to establish and prioritize these content areas and topics.

Needs Assessment as a Tool in Curriculum Development

Many researchers have explored the potential of needs assessment techniques for curriculum development. These researchers have focused on a number of different applications for needs assessment. English and Kaufman (1975) and Knox, A.B. (1977) focused on theories and models for utilizing needs assessment in curriculum development. Smith (1977) performed a needs assessment to develop a community college outreach program. Bowling (1984) used a needs assessment approach in an examination of the Knoxville, Tennessee labor market to develop a post secondary graphic arts program for the state technical institute at Knoxville. Epstein (1983) followed a needs assessment approach to develop curriculum for Jewish education. Reagan and Clark (1984) applied needs assessment to consumer education curriculum development.
Satterfield (1986) utilized needs assessment to determine the perceived inservice education needs of local special education administrators in the state of Oregon.

Implicit in these studies was an agreement with Smith (1985) that needs assessment can provide:

... fundamental information for setting goals and for establishing program objectives ... descriptions about the clients and clients' needs, which programmers can use to implement positive changes in programs, to understand the changing patterns in the educational needs of clients, and to set priorities in terms of selecting new programs, expending money or hiring faculty. (p. 29)

Indeed, most researchers who utilize needs assessment would agree with English and Kaufman (1975) that "the process of needs assessment should precede... writing behavioral objectives for teachers or students, or curriculum development" (pp. 4-5). Yet, according to Pennington and Green (1976) "most [curriculum] planners give lip service to the importance of needs assessment, but very few follow through" (p. 20).

Witkin (1977), along with many other needs assessment researchers, has identified an understanding of Roger A. Kaufman's work as fundamental to either their theoretical framework, methodology, or application for needs assessment (Blau, 1973; Burks, 1973; Bruno, 1975; Dederick and Sturge, 1975; Norton and Eastman, 1981; Rimmer, 1981; Kuh). Kaufman was among the first researchers
to propose needs assessment techniques as an integral part of educational planning. Moreover, in developing his theory, Kaufman cast aside all preconceived notions about what education should be, how it should be organized, and how it should be delivered. Unhampered by these constraints, Kaufman was able to develop a complete and cogent theory, which was later formalized into a needs assessment model (English and Kaufman, 1975). Kaufman's theory and model are inclusive of all needs assessment applications for curriculum development, and almost all techniques which can be employed in a needs assessment. However, models are, by design, theoretical (Boshier 1979). And while researchers can rely on a model for providing a theoretical framework, rarely does a model offer a methodology that is applicable in a particular situation or for a particular study group. Boshier (1979) describes this limitation of a model quite succinctly, as follows:

Guidance provided by models is rarely direct and unequivocal. Typically they provide hints rather than explicit directives for theory building which result in extension or modification of the original model. Despite these qualities a successful model can lead to a general understanding of a domain of inquiry through constituent theories. Models are a reified representation of reality . . . Providing the model can spawn theories which enhance abilities to understand, predict and control the phenomenon, it does not matter if a skeletal version of
reality is presented. . . . But irrespective of whether models present a comprehensive or pared-down view of reality, they ultimately should guide data collection. (p. 23)

Thus a review of literature designed to derive a methodology for a particular needs assessment must go beyond a review of needs assessment theories and models, and review actual needs assessment applications and techniques within a specific domain of inquiry.

A Theory, Model, and Taxonomy for Needs Assessment

As Witkin (1977) points out, "there has been a proliferation of models, . . . for assessing educational needs in various institutional settings and levels." Most of these models "draw on the pioneering work of Kaufman (1972), who placed it [needs assessment] in the context of systematic educational planning" (p. 5). Pioneering efforts were indeed undertaken by Kaufman in 1972 to develop a theoretical framework for educational system planning, which he called a "system approach," and for utilizing needs assessment as an integral element in this approach.

Working under the auspices of the Association for Supervision and Curriculum Development in Washington, D.C., English and Kaufman (1975) produced a general model for the application of needs assessment in curriculum development. This model is based on Kaufman's earlier theoretical work. Kaufman's system approach, the
theoretical framework from which English and Kaufman's model developed, will be discussed briefly.

The System Approach to Curriculum Development

Kaufman came to the forefront in educational planning with the publication of his system approach in his book, *Educational System Planning* (1972). Kaufman (1979) defines his system approach as:

A formal planning and doing process which intends to identify and meet defined, validated, and justified needs. It includes the identification of problems based upon needs, the determination of solution requirements and the identification of solution alternatives, the selection of solution strategies and tools, determination of performance effectiveness and efficiency, and the revision of any or all of the previous steps and outcomes (at any time in the process) based upon the extent to which the designed system has met the validated needs (p. 346).

Thus Kaufman's system approach contains six basic steps, each of which corresponds to one of the six functions in curriculum development identified by Kaufman (1972):

1. Identification of problem based upon needs;
2. Determination of solution requirements and identification of solution alternatives;
3. Selection of solution strategies from among alternatives;
4. Implementation of selected methods and means;
5. Determination of performance effectiveness; and
6. Revision as required.

Function 1: Identify Problem Based on Needs

A curriculum plan can only proceed in the light of clear outcome goals. Thus the first step in curriculum development is a determination of the desired outcomes of the curriculum. These desired outcomes are then compared to current performance. Areas where current performance does not reflect desired performance (outcomes) are identified as "gaps" or "needs" to be eliminated through curriculum development. During Function 1, learning gaps are identified, placed in priority order, and the most important are selected for action. The gaps reflect goals to be met through curriculum development. Kaufman (1979) states that the basic tool for determining curriculum goals is needs assessment which:

makes few assumptions about solutions or even about institutions which are currently in place and operating (such as training organizations, federal or state agencies, schools, or school districts) and only attempts to identify gaps in societal outcomes to which alternative methods (such as education or training) might be responsive (pp. 38-39).
Highly generalized curriculum outcomes, which Kaufman calls "mission statements" can be derived during needs assessment. For example, at this stage the planner might determine that a gap exists between outcomes such as ability to survive and contribute in the external world, as compared to current survival ability. This gap can be written into a mission statement relating to students' ability to survive and contribute in the external world. The mission statement then becomes one of the goals of the curriculum. The amount of resources devoted to meeting this goal depends on the priority of this goal in relation to other goals developed during the needs assessment.

**Function 2: Determine Solution Requirements and Identify Solution Alternatives**

Once gaps are identified and goals prioritized, the curriculum planner must determine what is required to move from the current outcomes to the desired outcomes. Kaufman (1972, 1977, and 1979) agrees with Popham (1966) and Mager (1975) that behavioral objectives, which phrase outcome statements in measurable terms, are a useful tool for determining these solution requirements and for providing direction when selecting among alternative solutions. The generation of behavioral objectives is based on mission, function and task analysis which produce detailed specifications for success requirements in meeting each goal. Each individual objective is stated with a performance requirement. Possible methods for meeting this
performance requirement are listed, along with the advantages and disadvantages of each method.

Recall that in completing Function 1, no assumptions about goals were made, thus the feasibility of reaching identified goals was not considered. In accomplishing Function 2, feasibility becomes an issue. The act of stating goals as behavioral objectives with suggested solutions must take the constraint of feasibility into consideration. There are some goals which, while important, cannot be easily expressed in measurable terms. An example would be the goal that students become "more loving people." Few researchers would attempt to measure the extent of a student's love. There may also be performance outcomes for which, as Kaufman (1979) states, "there is not a single possible method-means" (p. 40). Such goals must either be eliminated or reserved for later review during curriculum development, when possible methods for meeting them may become apparent.

**Function 3: Select Solution Strategies From Among Alternatives**

After completing Functions 1 and 2, the curriculum planner has a list of prioritized goals, under each of which is a cluster of behavioral objectives and suggested strategies for meeting these objectives. Function 3 in curriculum development is the selection of the best possible solution strategies. These are those methods and means which are most efficient and effective in meeting the objectives, and those which will work well in combination with other selected
solution strategies. Kaufman (1972, 1977 and 1979) recommends tools such as systems analysis, cost-effectiveness analysis, and Program Planning and Budgeting Systems (PPBS) for accomplishing this task.

**Function 4: Implement Selected Methods and Means**

The first three functions described above are crucial to Kaufman's system approach. It is only after these functions are completed that needs have been identified, performance requirements listed, and methods selected. Kaufman faults most approaches to curriculum development because they ignore the first three functions and start instead with Function 4. In this context, Pennington and Green (1976) warn that "although programs may be well planned and evaluated in depth, without baseline data indicating a need for such an effort the program may be providing learning opportunities for needs the target [population] never had" (p 21).

There is some reason to speculate that curriculum planners often start with Function 4 because, in many instances, the information to be derived during Function 1, 2, and 3 already exists. Most curriculum planners operate within some organizational structure which dictates goals and frequently performance objectives as well. Competency-based curriculum materials provided by state education departments are a case in point. Where such goals and objectives are mandated, there is little value for the curriculum planner in steps leading to goal and/or objective determination and prioritization.
Whether goals and objectives are predefined, or derived by the curriculum planner, the fourth function in the system approach involves the implementation of the methods and means selected: the design of the curriculum; the testing and, if necessary, modification of methods and means; the selection of resources; the training of staff; and the development of curriculum materials. The remaining two functions involve curriculum evaluation and revision.

Function 5: Determine Performance Effectiveness

Performance effectiveness can be evaluated after the curriculum has been set in motion and enough time has elapsed for it to have an impact on the target population. Based on behaviors displayed by this population (test results, observation, follow-up studies), curriculum effectiveness is evaluated. This evaluation, often called "summative evaluation," is made by comparing the actual results achieved by the learners, to the established performance requirements. Where these requirements are met, methods-means must be maintained. Where performance requirements are not met, methods-means must be revised.

Function 6: Revise as Required

In Kaufman's system approach, revision is an on-going process. Curriculum revision is based on discrepancies between actual results and performance requirements determined during evaluation in Function 5. Revision may also be needed to meet new goals and
objectives. Formative evaluation is suggested as an appropriate tool for identifying needs during curriculum revision and suggesting possible alternative methods for meeting these needs.

**The Discrepancy Analysis Needs Assessment Model**

The system approach to curriculum development provided the theoretical framework around which English and Kaufman's (1975) needs assessment model was built. The model that they developed is identified in the literature as the Discrepancy Analysis Model because, as will be further explained below, the model is based on the definition of a need as a "gap," or "discrepancy" that exists between conditions that should be and conditions that actually exist. The authors describe their model as an "outcome oriented model," and base it on the following assumptions:

1. Reality can be known, understood, and represented in symbolic form.
2. Reality is not static: assessment must be a continuing process.
3. Perceptual fields can and should be changed relative to the ends of education.
4. On some scale of measurement, everything in education can be measured.
5. The aims or outcomes of education can be made specific.
6. The recipients and supporters of the schools should be involved in determining their goals and effectiveness.

7. There is a relationship between organizational specificity and productivity.

8. Productivity and humanization are compatible as dual outcomes of improved schools. (English and Kaufman, 1975, pp. 6-10)

The authors offer several definitions for needs assessment, among which are the following:

... a process of defining the desired end (or outcome, product, or result) of a given sequence of curriculum development.

... a process of making specific, in some intelligible manner, what schooling should be about and how it can be assessed.

... an empirical process for defining the outcomes of education, and as such it is then a set of criteria by which curricula may be developed and compared.

... a process for determining the validity of behavioral objectives and if standardized test and/or criterion-referenced tests are appropriate and under what conditions.
... a logical problem solving tool by which a variety of means may be selected and related to each other in the development of curriculum.

... a tool which formally harvests the gaps between current results (or outcomes, products) and required or desired results, places these gaps in priority order, and selects those gaps (needs) of the highest priority for action, usually through the implementation of a new or existing curriculum or management process. (English and Kaufman, 1975, p. 3)

Of these definitions the one most accepted in the literature related to needs assessment is the last definition, that which defines need as a "gap" between what is and what should be (Borg, 1983; Melton, 1977; Sweigert, 1977, Witkin, 1977).

Given these definitions of needs assessment and the notion of an educational need as a gap between what is and what should be, the authors describe 14 generic steps for a needs assessment:

1. Planning to plan: charting means and ends;
2. Goal derivation;
3. Goal validation;
4. Goal prioritization;
5. Goal translation
   5.1 The development of performance indicators;
   5.2 The development of detailed performance objectives;
6. Validation of performance objectives;
7. Goal re-prioritization;
8. Futuristic input to goal ranking;
9. Rerank goals;
10. Select testing instruments or evaluative strategies for assessing the current state;
11. Collate data gathered;
12. Develop initial gap or need statements;
13. Prioritize gap statements according to step 4;
14. Publish list of gap statements.

As proposed, the Discrepancy Analysis Model represents an ideal which may or may not be achievable given the limited resources of time, research personnel and finances available to an individual school or school system. Nonetheless, the model offers a framework for applying needs assessment to curriculum development through a series of individual steps.

Step 1: Planning to Plan

English and Kaufman (1975) warn that a great deal of planning should precede the needs assessment. Among the questions which should be answered during the planning stage are, who should be involved in the needs assessment?. The authors recommend that three groups be involved in any educational needs assessment processes: learners, educators, and parents. They refer to these three
groups as the "educational partners." They suggest that in the actual development of the performance indicators, performance objectives or the like, the professional educator carries the major responsibility for goal translation, as well as for implementation. They offer no procedures for weighting the inputs from the educational partners, but they do insist that it is important to:

...state ahead of time the intended uses of the data (derived from the needs assessment) and what kinds of administrative and instructional decisions will be made with the data; also how much influence various groups will have in the input process, the problem identification, the solution derivation, and the implementation and evaluation of the entire process (English and Kaufman, 1975, p. 18).

**Step 2: Goal Derivation**

The authors suggest that goal derivation is the conscious process of stepping away from the current program, its current curriculum and methods of implementation, and its biases and assumptions. They make this recommendation because they feel that any process that bases goal derivation on current program offerings or current curriculum assumptions will fail to identify gaps between what is and what should be. That is, focus on current program offerings and assumptions may help identify and prioritize the goals of the current programs and may even identify areas where current programs fail to meet these goals. However, focus on current program offerings will
fail to identify what program offerings should be in the future, and thus fail to provide adequate direction for curriculum development. One method that the authors suggest for future goal derivation, though they admit that there are some logistical problems with this method, is to:

... gather a group together (it can also be done by mail) and have the group list the desired results. Upon agreement, an assessment of what is currently the state then follows. A simple discrepancy list can then be constructed. This is called a compilation of "felt needs," since such lists begin with the concerns (or internal judgements or "feelings") of the group as to what ought to be present (or absent) in a given situation. (English and Kaufman, 1975, p. 19).

In research situations, goals are frequently derived through interviews with key individuals, expert panels, focus groups, or questionnaire techniques.

**Step 3: Goal Validation**

For the purposes of needs assessment, validity is established, in part, by consensus among the educational partners identified who are involved in determining whether or not those goals listed shall be used by the system itself. The authors admit that this type of validity can be considered no more than "face validity," but they indicate that the goals so derived can be used for the purposes of constructing an instrument to rank order the goals of the system. If possible, these
goals are compared to an "external referent" or an external set of criteria about that which is actually necessary in the world of work, the world of human relations, and the world of values and productivity. Thus, the constituent goal list is developed by agreement among the constituents; the final goal list is derived by comparing the constituent goal list to goal lists which have been developed and validated elsewhere (the external referent), if such an external referent exists. In the elementary and secondary education system, this comparison step could be made by comparing constituent goal lists to established district, state, and national goals. For other educational systems, such as colleges and post-secondary vocational institutes, external referents might include professional associations, accreditation agencies, advisory groups, or professional consultants.

Step 4: Goal Prioritization

Goal prioritization is necessary to apportion the limited physical and financial resources of the school system appropriately. Prioritization is performed in a ranking exercise. The authors indicate that the two most commonly used techniques are the survey or questionnaire utilizing a Likert-type scale, or the Q-sort technique. Of the two techniques, the survey with Likert-type ranking is the most frequently used, probably because it is the faster and least expensive of the two methods.
Step 5: Goal Translation

At some point the goals derived during the needs assessment must be translated into performance objectives. The authors recognize that goals are so broad as to take many objectives to capture their full scope and intent, and recommend that goals first be translated into "performance indicators" which provide an indication or mark of the goal. These performance indicators are developed by professional educators, based on feedback about system goals derived from all of the educational partners. They are more global than performance objectives, but less global than general goals, and are used in the drafting of performance objectives.

Step 6: Validation of Performance Objectives

English and Kaufman (1975) point out that "the process of establishing a performance or behavioral objective is not a process to establish its validity, except to say that it is either a performance objective or it is not" (p. 32). Once they are written, the performance objectives must be validated to determine whether in fact the objectives represent an accurate translation from the goal, and whether or not they are all of the objectives that are required to meet the goal. Validation of performance objectives, then requires an additional sampling of the educational partners.

The authors recommend three procedures for validation of performance objectives: a telephone survey technique, a door-to-door sampling of the community with a trained group of parent or student
volunteers, or a paper questionnaire or survey. Through the validation process, each respondent group [educators, students, and parents] should have a chance to approve at a previously determined level of acceptance that the objectives represent the intent and scope of any given educational goal.

**Step 7: Goal Re-prioritization**

English and Kaufman indicate that in their experience, simply stating educational goals in terms of performance objectives, then undertaking a validation of the performance objectives often causes the respondent groups to rethink the priority ranking that they first assigned to the goals. This rethinking, in turn, leads to goal re-prioritization, with the possibility that new goals will be introduced, and goals originally ranked as priority will be dropped or modified. If goals are re-prioritized, the needs assessment should be restarted at Step 4 (Goal Prioritization) taking into account the new or modified goal priorities. This process could go on indefinitely, but at least one goal re-prioritization cycle is recommended.

**Step 8: Futuristic Input to Goal Ranking**

The authors warn that "there may be some danger that the school system would become shaped by a studied moment at our place in time" (English and Kaufman, 1975, p. 34). To avoid this failing, they suggest using a Delphi Technique as a method for generating educational goals for the future. With this technique, it is possible to
develop sets of educational goals based upon probable conditions which may be exist at some agreed upon point in the future. While the authors recognize that there are some drawbacks to the use of a procedure like the Delphi they feel that it does provide a systematic method for attempting to balance the development of educational goals between present and future, and can serve as one more input to establishing the educational priorities of various goals.

Step 9: Rerank Goals

The goals derived from the Delphi-type study are incorporated into the goals already established by Steps 1 through 7, and all goals are again submitted to the respondents for reranking. In the context of the authors' model, needs assessment is the process of formulating gaps or discrepancies between two sets of criteria, a list of future desired conditions and results, and a list of current, existing (not necessarily desired) conditions and results. The reranking of present and future goals provides the concluding step in formulating a future, validated, and desired set of conditions [and results] for learners. Future desired conditions and results are stated as management or behavioral objectives: the behavioral objectives apply to student performance outcomes; management objectives apply to the managerial organization and operation of the school. The current levels of performance in relation to these objectives are determined in Step 10.
Step 10: Selecting Testing Instruments or Evaluative Strategies for Assessing the Current State

English and Kaufman offer several techniques for determining the current levels of student performance. They suggest that the technique most readily available to the researcher is the standardized test. However, they caution against using standardized tests as the only method for determining the current level of student performance. One problem with such tests is the possible usurpation of professional educators, citizens and students -- the educational partners -- in determining what should be of most importance in the school curriculum.

To discover the gap between desired future objectives for learners and the learners' current mastery of these objectives through standardized tests, researchers must locate tests which measure current student mastery of the desired future objectives. As standardized tests are designed primarily to measure mastery of desired current objectives, they may be of limited value in measuring mastery of future objectives.

Recall that the desired future objectives are derived from the thoughts of the educational partners (Steps 1-9). Unless the the needs assessment is national in scope, the educational partners' thoughts are likely to reflect local conditions applicable to a single school, a school district, or a state education system. Such local conditions as population, economic health, land use, and the geographic location of the educational partners who participated in
the needs assessment may profoundly effect their thoughts about future objectives. A standardized test which has been nationally validated to measure mastery of nationally accepted objectives is not likely to reflect these local conditions. A standardized test which has been validated on the state level may be equally inappropriate when applied to the district or individual school level. Thus, in most instances, needs assessment researchers who wish to use standardized tests to measure current mastery of the desired future objectives, must develop and validate an applicable standardized test, based on these future objectives. If this step is not taken, and an inappropriate standardized test is used, the "test data may be totally inaccurate and may lead a school system to overstate the unimportant in the name of that which can be measured" (English and Kaufman, 1975, p. 37).

Given the probable dearth of applicable standardized tests, the authors offer the researcher several alternatives for measuring current student mastery of future objectives. Among these are graduate follow-up studies, simulated activities, and gathering data which may be representative of an attitude or skill.

Step 11: Collate Data Gathered

Data collation includes the process of sorting, arranging, computing, and presenting the data. English and Kaufman insist that the educational partners should be given an accounting of current levels of performance with as much additional information as may help
to establish the reliability and validity of the instruments used. They suggest that data be presented in appropriate tables, graphs, charts and other summative and descriptive materials.

The suggestion of "summative and descriptive materials" is an important one which has had a profound influence on statistical presentations used by needs assessment researchers. By Kaufman's definition, "goals are measured by nominal or ordinal scales of measurement; objectives are measured by interval or ratio scales of measurement" (Kaufman, 1979, p. 182). Thus needs assessment researchers typically utilize nonparametric rather than parametric statistics to prioritize goal statements; parametric statistics are occasionally used to evaluate the degree of attainment of objectives in relation to a specific goal, however this can only be done when the objectives are stated in measurable terms and there is enough known about a the objective to measure it on an interval or ratio scale.

As will be seen during the following discussion of other needs assessment models and of actual needs assessment research, this use of nonparametric (nominal or ordinal scale) statistics is consistent for goal determination and ranking. In this context, it must be remembered that the first purpose of a needs assessment is to identify (name) desired future goals and prioritize (order) them. Such data can be presented on a nominal or ordinal scale for which nonparametric statistics are appropriate. It is on the basis of goal priority that attention is given to individual objectives during curriculum development. That is, knowing that the magnitude of the
gap in meeting a priority one goal is greater than, less than, or equal to the magnitude of the gap in meeting a priority two goal is less important to the needs assessment researcher than knowing that a gap exists in meeting both goals, and that goal one is of a higher priority than goal two. English and Kaufman (1975) offer an example which illustrates this point:

Across clusters [of objectives] the actual gap itself is not a good indicator of the severity of the need. Since the goals have already been ranked (and reranked) the curriculum developer knows which gaps are most critical to close by the place in which they were ranked. For example there may be a 65 percent gap in students recognizing Beethoven's Fifth Symphony, and a 23 percent gap in students being unable to read the editorial page of the New York Times. If the goal relating to basic skills was ranked higher than a goal calling for recognition and appreciation of great music, then the 23 percent gap must be addressed by the system and its resources first (p. 42).

Put another way, knowledge about the magnitude of the gap in students' ability to recognize Beethoven's Fifth Symphony, compared to the magnitude of the gap in students' ability to read the editorial page of the New York Times is not as important to the needs assessment researcher as the knowledge that a gap exists for both objectives, and that the goal relating to basic skills such as reading is
of a higher priority than the goal relating to recognition and appreciation of great music. It is on the basis of the goal priority, not the gap magnitude of the individual objectives, that curriculum decisions must be made.

Step 12: Develop Initial Gap or Need Statements

A "gap" or "needs statement" is a statement about the gaps in learner performance, between what is desired and the actual performance in measurable terms. For the needs assessment researcher, these needs statements, after prioritization (Step 13) provide the basis for curriculum development and modifications intended to eliminate the gaps.

Step 13: Prioritize Gap Statements

In Steps 1 through 10 the researcher identified the desired future objectives of the target population; in Steps 11 and 12, the "gaps" were identified and formulated as needs statements. The needs must be prioritized so that educational planners can best apply limited resources where they are most needed. This is done by arranging the needs statements into clusters relating to the educational goals derived in Step 1 and 2 (goal derivation and goal validation) and assigning each objective a priority based on the information gained from Step 3 (goal prioritization).
Step 14: Publish List of Gap Statements

The final step of the needs assessment process in the Discrepancy Analysis Model is the publication of the gap or needs statements. The authors recommend that these be published without any hypotheses as to the causes of the gaps, but that the gaps should be explained and the process by which they were identified reiterated.

Discussion of the Discrepancy Analysis Model

English and Kaufman indicate that the Discrepancy Analysis Model is useful for:

1. determining the needs through input from the educational partners and resolving differences between the agreed upon needs and the non-agreed upon needs;

2. placing the needs in priority order and selecting the target needs for curriculum development, based on this prioritization; and

3. developing management and learning objectives, based on the needs selected.

Thus the model can be used to accomplish the first two functions of Kaufman's (1972) system approach: identification of the problem based upon needs (Function 1), and determination of solution requirements and identification of solution alternatives (Function 2).

The authors suggest four post-needs assessment steps needed to effectively integrate information gathered during needs assessment into curriculum development:

1. curriculum planning.
2. curriculum development,
3. curriculum implementation, and
4. curriculum evaluation.

These four post-needs assessment steps relate closely to Kaufman's (1972) Functions 3 through 6 in his system approach: selection of solution strategies from among alternatives (Function 3), implementation (Function 4), determination of performance effectiveness (Function 5), and revision as required (Function 6). As will become clear during the discussion of the Kaufman (1977) taxonomy, needs assessment can be applied to these functions as well as the preceding two functions. Indeed, the total process of curriculum development with the system approach, is one of needs assessment. The type of needs assessment required, and the specific techniques most appropriate to each type of needs assessment, is determined, in part, by the function to be accomplished as a result of the needs assessment. A needs assessment for determining goals (Function 1) will require different techniques than a needs assessment for determining performance effectiveness (Function 5).

Strict adherence to all of these needs assessment and post-needs assessment procedures is described by English and Kaufman (1975) as:

A process which starts with the assessment of the needs of the partners, relates the needs to survival and contribution in the world of work and world of relationships, puts the needs in priority order and selects the needs of the
highest priority for closure, develops and defines the most effective and efficient way of meeting the needs (curriculum) which implements and manages this curriculum, evaluates it during its use and at the end of learning, and uses the evaluation information to revise and renew the system (p. 52).

As can be seen, the Discrepancy Analysis Model is complex. However, the model is inclusive of all of the functions of curriculum development identified in the system approach. The model also provides a mechanism for developing both present and future curriculum goals, based on input from those most concerned with the curriculum outcome: the educators, the learners, and the society. In addition, the model offers numerous feedback loops, with which the efficacy and accuracy of goals and objectives can be constantly verified, and through which learner performance in relation to these goals and objectives can be constantly evaluated as a basis for curriculum revision.

The Discrepancy Analysis Model is not without its drawbacks. Strict adherence to the Discrepancy Analysis Model might require more time of educators than is typically available, and more participation from the remaining educational partners than could be expected. As will be seen from reviews of actual needs assessment research presented in this review of literature, most needs assessment studies are limited both temporally and financially: most
must be conducted within a limited time frame, and most have only limited financial resources with which to gather and analyze data. In addition to these practical limitations imposed on the researchers, there is a limitation imposed by the remaining educational partners. Without a high degree of commitment on the part of parents and students, the needs assessment researcher is likely to achieve only low returns from even a single needs assessment survey. Where the survey must be repeated to prioritize goals or needs statements, the return rate is likely to be affected by a high dropout rate. The Discrepancy Analysis Model requires no less than four separate inputs (surveys or interviews) of parents and students. Such a needs assessment is likely to suffer even lower returns and higher dropouts than a single-survey technique.

Even with these drawbacks, the Discrepancy Analysis Model does provide a theoretical framework for conducting a needs assessment and a model, elements of which have been applied by many needs assessment researchers, albeit in a modified form.

A Taxonomy of Needs Assessment

Since English and Kaufman presented their formalized model for needs assessment as a focus for curriculum development, much work has appeared in the literature concerning the practice of needs assessment, the problems encountered with needs assessment, and the practical applications for needs assessment techniques. Within this context, according to Sweigert (1977), needs assessment models
address two general questions about student learning: "(1) Are students learning what they are being taught?, and (2) Are students being taught the right things?" (p. 29). Which of these two questions is addressed by a particular needs assessment model depends, to a great extent, upon the definition of "needs" which the model embraces. Sweigert (1977) states that models aimed at answering the first question define needs as "discrepancies between what learning goals and objectives are offered in instruction and those that should be offered" (p. 30); models which address the second question define needs as "discrepancies between actual and desired levels of student achievement in respect to the learning goals and objectives that are judged to be important and are offered in instruction" (p. 30). Models which embrace the first definition are useful for establishing curriculum goals; those which embrace the second are useful for program evaluation.

It will be helpful to remember this distinction when considering the taxonomy of needs assessments provided by Kaufman (1977). This taxonomy differentiates the various types of needs assessment, based on their applicability and on the assumptions which must be made in their selection. The taxonomy provides guidance for selecting among the various needs assessment techniques based on their relationship to the to general questions posed by Sweigert (1977), and the applications for each technique. In the taxonomy, needs assessments are divided into six basic types, each of which is given a Greek letter
designation, corresponding to the six system approach functions of curriculum development.

**Alpha Needs Assessment**

The Alpha needs assessment is the most global type of needs assessment. Kaufman (1977) states that this type of needs assessment "would have relatively few givens and be required to assume no 'sacred cows' in terms of organizations, personnel or history" (p. 61). An example of an Alpha-type needs assessment would be a needs assessment undertaken by a school district willing to find out whether its current policies, procedures, mores, folkways, myths, curriculum and procedures were in fact related to the operational requirements of learners at the time they completed school. The critical assumption of this type of needs assessment is that almost anything may be changed and questioned. Thus an Alpha-type of needs assessment is concerned with policy formation and is related to Function 1 of the system approach: identification of problem based on need.

**Beta Needs Assessment**

While the Alpha-type needs assessment is concerned with policy formation, the remaining five types of needs assessment are concerned with policy execution. As such, each of them starts with more "givens" than does the Alpha-type. The Beta-type needs assessment, according to Kaufman (1977):
might be implemented when a school district felt it was sure that the goals, objectives and policies of the system were correct and immutable, and that it became appropriate to determine the gaps in current learner performance . . . as compared to desired performance (p. 62).

The basic assumptions of the Beta-type needs assessment are that work is to be conducted within a context, usually organizational and that the rules and policies of the organization as they now exist, are the ground rules for planned change. Thus a Beta-type needs assessment could be conducted by a school system which already has established goals and objectives, and is seeking the curriculum changes to be made to meet these goals and objectives within the established organizational framework. This type of needs assessment corresponds to Function 2 of the system approach: determination of solution requirements and identification of solution alternatives.

**Gamma Needs Assessment**

The Gamma-type needs assessment focuses on the sorting of existing goals with the purpose of obtaining a ranking of goals. Based upon the resulting list of prioritized goals, alternative programs or materials are emphasized in the school system. In the Gamma type needs assessment, costs govern curriculum decisions, rather than behavior-change criteria being used to determine programs and results. Thus the Gamma-type needs assessment starts with the
assumption that the existing goals and objectives are useful and appropriate" and seeks to find the most efficient and effective manner to meet the objectives. In this context, the Gamma-type needs assessment is more management oriented than either the Alpha- or Beta-type needs assessment models, as it is primarily used for selecting among various strategies for the accomplishment of established goals. Thus it corresponds to Function 3 of the system approach: selection of solution strategies from among alternatives.

**Delta Needs Assessment**

Once strategies have been selected, decisions must be made about how to apportion the resources needed to carry out the strategies. This is the purpose of a Delta-type needs assessment. Kaufman (1977) describes a Delta-type needs assessment as an implementation needs assessment which starts with the assumption that, "it is known what is to be done and how to do it, the important function here is to successfully administer the jobs to be done and the resources to help get the jobs accomplished" (p. 63). In this context, a Delta-type needs assessment is concerned with such topics as systematic budgeting and scheduling in relation to established, validated, and prioritized goals and objectives. Thus the focus of the Delta-type of needs assessment is on implementation, Function 4 in the system approach.
Epsilon Needs Assessment

The next two types of needs assessments identified in the Kaufman taxonomy are the Epsilon- and Zeta-type needs assessments, which are evaluative in nature. The first of these, the Epsilon-type needs assessment, is best described as a summative evaluation process. This type of needs assessment can be utilized when it is appropriate to determine the extent to which required results have been accomplished. Thus the Epsilon-type needs assessment is only undertaken after the goals have been determined, the strategies selected, the resources apportioned, and the curriculum delivered. With this type of needs assessment the gaps between the goals and objectives and the accomplishments can be discovered, and curriculum interventions can be planned, based on these gaps. In terms of the system approach, an Epsilon-type needs assessment corresponds to Function 5: determination of performance effectiveness.

Zeta Needs Assessment

In the taxonomy, a Zeta-type needs assessment most closely resembles the formative evaluation process (Function 6 in the system approach). This type of needs assessment is applied as an on-going assessment to identify discrepancies between goals and objectives and the fulfillment of these goals and objectives. On the basis of a Zeta-type needs assessment, corrective action is instituted during
curriculum delivery, or a decision not to change is accepted and implemented.

Discussion of the Taxonomy

According to Kaufman, his taxonomy can be used to select an appropriate needs assessment technique, based on the entry level assumptions which the educator is willing to embrace. In addition, entry at any level assumes that the needs assessments of a higher entry level have already been done, and that every needs assessment at a lower level remains to be accomplished and will be undertaken during a continual curriculum development process. That is; if researchers start with a Gamma-type needs assessment, they will be making the assumption that the Alpha- and Beta-type assessments have already been accomplished and, to systematically develop, implement and evaluate the curriculum, will perform not only the Gamma-type assessment but the Delta, Epsilon, and Zeta assessments as well. This notion is in keeping with Kaufman's system approach to curriculum planning in which each of six curriculum functions are carried out continuously.

Kaufman (1977) states that the purpose of his taxonomy is to "provide a referent for both what is as well as what is not a needs assessment" and that "many data collection efforts, status reports and observations frequently are dubbed needs assessments, but in actuality are not if [his] taxonomy is not observed" (p. 62). However, it should be pointed out that the Kaufman taxonomy has not been as strictly
adhered to as Kaufman would imply. Applied (as opposed to theoretical) needs assessments tend to embrace a variety of assumptions, purposes, and techniques, often representative of more than one needs assessment type identified in the taxonomy. In practice, researchers tend to determine their purpose, consider their assumptions, then pick from among the numerous needs assessment techniques available, often paying more attention to their specific application and available resources, than to Kaufman's taxonomy. Thus most needs assessments used in actual research situations cannot be neatly classified into any of the six types identified by Kaufman. Perhaps this is because, as Melton (1977) states:

   Public school educators are 'turned off' by the theoretical exposés which are thrust upon them by 'outsiders,' who may not be aware of or have experienced the day-to-day frustrations and pressures of public school administration. Seldom is a public school administrator fortunate enough to be able to conduct a needs assessment process, or any other project for that matter in a pure sense. The trade-off is utility versus purity; in other words, the public school administrator must ask: Is a needs assessment worth doing if it isn't possible or practical to implement a pure model, i.e. one that the textbooks might talk about? (pp. 39-40)
For Melton, the answer to this question must be yes. In this context, Witkin (1977) states emphatically that "there is no one 'right' way to do a needs assessment" and that the "tools and strategies necessary may depend on the level of entry into the planning process, as well as the kinds of decisions to be made and the use to which the data will be put" (p. 13). She goes on to state that her observation:

. . . from examining needs assessment models in action and from interviewing or consulting with nearly a hundred people of varying background and experience with needs assessment is that the typical overworked administrator, faced with an assessment, wants 'an instrument' -- and wants it to be quick, cheap, but comprehensive and generating exactly the right information for decision-making (p. 13).

Based on this observation, Witkin (1977) identifies one of "the most widely used procedure for general or first-time assessment" as "the one-shot discrepancy survey questionnaire" (p. 13). This type of questionnaire generally lists pre-established goals or objectives and asks participants to rate how important they are and/or how well they are currently being met.

This is not to say that Kaufman's taxonomy is inappropriate or that it is poorly conceived. Kaufman himself agrees that there are no "right" or "wrong" models and proposes his taxonomy as a means for educators to pick from among the possible choices available to those who wish to design successful needs assessments.
The literature concerning needs assessment offers a plethora of models from which a researcher may select. After reviewing many models, this researcher has concluded that needs assessment models can be divided into two categories, based on the manner in which they are developed and come to be recognized as models. One type of needs assessment model results from the application of a specific theory. In models of this type, a theory, generally proposed by an individual researcher or research team, provides the theoretical framework for a needs assessment. Through repeated applications and modifications of needs assessments based on this theory, a process evolves. The process is subsequently referred to as a "model" in the literature. Often the model so named is attributed to the original theoretician. Such models tend to be more specific in application than the general model proposed by English and Kaufman. This is the case with the Need Appraisal System, based on the work of Alan Knox (1970, 1980), who developed a general theory for the use of needs assessment for program development in adult education. Knox's theory served as a basis for a number of needs assessments, and was subsequently presented as a model by Betz (1984).

A second type of model develops and becomes recognized as a model as the result of a specific needs assessment study for a specific research application. In the development of such models, researchers draw from a variety of needs assessment theories (and models); select among techniques, based on their particular application; execute the needs assessment; and subsequently describe their process as a
“model.” These models are generally developed in relation to highly specialized applications and specific target populations. Such is the case with the Practice Audit Model, proposed by Smutz, Kalman, Lindsay, Pietrusko, and Seaman (1981), in the area of continuing professional education for pharmacists.
Two Additional Models

The Discrepancy Analysis Model developed by Kaufman and English has been described by this researcher as inclusive of all needs assessment applications for curriculum development, and of most techniques which can be employed during needs assessment. As Kaufman (1977) pointed out, many research efforts have been "dubbed" needs assessment "models" (p. 62). Upon close examination of these models, in the light of Kaufman's work, three general statements can be made:

1. Needs assessment models tend to correspond to one or more of the six curriculum functions identified by Kaufman. Models tend to be related to Function 1, identification of the problem based on needs and goal development; Function 2, identification of solution requirements and solution alternatives; or Function 3, selection of solution strategies. Most models treat the remaining functions, those having to do with curriculum development, implementation, evaluation and revision, as post-needs assessment operations, undertaken in the light of information gathered during needs assessment.

2. Needs assessment models tend to involve one or more, but not all, of the steps in the Discrepancy Analysis Model. However, the steps are rarely executed in the sequence presented by English and Kaufman.

3. Needs assessment models tend to fit into one or more of the needs assessment types proposed in Kaufman's taxonomy.
However, the tolerance for this fit is not as close as the taxonomy implies.

The following review of the Need Appraisal System and the Practice Audit Model will illustrate these statements.

**The Need Appraisal System**

Alan Knox in (1977, 1980) developed the theoretical basis for the Need Appraisal System. Betz (1984) proposed Knox's theory as a needs assessment model for program development in adult education. While the Need Appraisal System is, according to Betz (1984) like the Discrepancy Analysis Model, "directed at identifying gaps in knowledge, competence, and commitment, and making curricular decisions to meet these needs" (p. 39), its primary focus is on identifying formal procedures instrumental in generating, locating, selecting, or refining program ideas. In the context of Kaufman's taxonomy of needs assessment models, therefore, the Need Appraisal System is a Beta-type needs assessment, as its function is to determine solution requirements and identify solution alternatives in an organizational framework which is already established.

The Need Appraisal System contains four steps:

1. identification of the target population,
2. collection of data,
3. analysis of data, and
4. utilization of data for program development.
Each of these steps and their relationship to Kaufman's work will be described below to demonstrate that the Need Appraisal System corresponds to the first three Functions in the system approach and includes some, but not all, of the steps in the Discrepancy Analysis Model.

Step 1: Identification of the Target Population

Central to the Need Appraisal System is the development of curriculum to meet the needs of a particular audience. Thus the identification of the target population to be served by the curriculum is a necessary first step in the needs assessment process. During this step, according to Betz (1984), the provider must "be realistic about matching the resources it has available [the established organizational framework] and the population it wishes to serve" (p. 39). The physical classroom and meeting spaces, library, curriculum materials, and instructional equipment represent one type of resources. An equally important resource is the philosophy embraced by the provider as an educational institution. Betz warns that when identifying the target population, the provider must guard against designing a program that requires the utilization of outside resources which can result in increased expenses. In addition, the provider must guard against designing a program which does not adequately or accurately reflect the philosophy of the provider. That is, it is of little value for an educational institution to design a program which they either do not have the resources to provide, or a program which runs
so counter to their educational philosophy that program implementation or continuation comes into question. In this context, Knox (1980) states that:

The tangible past -- such as the founding documents of the agency, its history, and its plans for the future -- are inescapable influences on the search for program ideas. Intangible legacies -- such as the invisible borders of the acceptable, the unspoken rules of procedure, and the prevailing ethos -- also serve as guides for the practitioner seeking program ideas. Programs generated with these constraints in mind tend to have agency-wide support (p. 18).

Thus the target population identified must be one which has needs that it is within the provider's ability and interest to provide. A teaching hospital, for example, would look for a target population with educational needs in health care, nursing, hospital administration, or a related field. One possible means the hospital could use for determining a potential target population is through a review of educational efforts in other hospitals. Identification of the target population corresponds to Function 1 of Kaufman's system approach: identification of problem based on needs. It involves elements of Steps 1 through 3 (planning through goal validation) of Discrepancy Analysis Model.
Step 2: Collection of Data

Once the target population is identified, data collection begins. Two types of data must be collected: data relevant to the target population, the participants whom the provider wants to reach, and data relevant to the content area. What is suggested by the Need Appraisal System, therefore, is a two-phase data collection process.

During the first phase of data collection, the researcher is primarily concerned with determining the areas of interest regarding specialized fields of practice. Thus, the researcher seeks to determine what topics the target population is interested in learning about, how many individuals would be likely to take courses in these topics, and what would be the most appropriate delivery mode (scheduling, location, and presentation technique) for these courses. Questionnaire surveys or interviews can be used to collect this data. Data from the target population is used to develop a list of appropriate topics (goals) around which curriculum development proceeds.

During the second phase of data collection, the researcher seeks to determine the actual course content for the identified topics. These data can be obtained from experts and specialists in the relevant content area. Questionnaires or interviews can be used to gather expert opinion about course content, information that can be used to develop and prioritize a list of objectives on which to base curriculum development. Betz (1984) stated that if these two types of data are not collected:
program developers often will formulate programs based on what they feel to be identifiable needs of the learner. When this approach is utilized, a program is developed that meets the needs of the educator or institution rather than those of the learner” (p. 40).

Collection of data in the Need Appraisal System corresponds to Function 2 of the system approach: determination of solution requirements and identification of solution alternatives. It involves elements of Steps 2 through 3 (goal derivation and validation) and 11 (data collation) of the Discrepancy Analysis Model.

Step 3: Analysis of Data

The Need Appraisal System makes a distinction between the needs elicited from potential program participants (the "actual needs"), and the needs elicited from specialists in the field (the "perceived needs"). During data analysis, a comparison is made between the actual needs (topics learners want to learn about) and the perceived needs (topics and content that specialists recognize as important). By comparing these two sets of data it is possible to formulate a program that best serves the learning needs of the target population.

Data analysis corresponds to Function 3 of the system approach: selection of solution strategies. It involves elements of Steps 2 and 3 (goal derivation and validation); 10 (assessing the current state), and
12 (development of need statements) of the Discrepancy Analysis Model.

Step 4: Utilization of Data for Program Development

The final step in the Need Appraisal System is to eliminate the identified needs by developing programs based on the data collected. Unlike the Discrepancy Analysis Model, in the Need Appraisal System, prioritization of needs for program development is primarily the concern of the educator and occurs after the needs assessment process. Thus final goal prioritization is a post-needs assessment process. As Betz (1984) points out, "It is the educator's responsibility to prioritize and select those identifiable needs which are considered the most pertinent" (p. 40) and develop programs based on this prioritization. As in the Discrepancy Analysis Model, individual objectives are clustered and prioritized under specific goals. Prioritization of the objectives provides direction concerning curriculum interventions for meeting a specific goal. However, the priority of the goal itself is most important. The priority of specific objectives is considered only in relation to the priority of the goal under which they are clustered.

Prioritization of goals and objectives for program development corresponds to Function 3 of the system approach: selection of solution strategies. Functions 4 through 6 (implementation through revision) follow as a result of strategy selection. Utilization of data for program development involves elements of Steps 5 through 9 (goal
translation to goal reranking), and 12 through 14 (develop, prioritize, and publish needs statements) of the Discrepancy Analysis Model.

Discussion of the Need Appraisal System

The Need Appraisal System appears to serve some of the curriculum development functions identified in the system approach, and involves some of the steps from the Discrepancy Analysis Model. However, because it is based on curriculum development for a specific population (adult learners) within an established framework, the Need Appraisal System collapses the 14 steps in the Discrepancy Analysis Model, into four steps. In so doing, it offers one major advantage over the Discrepancy Analysis Model: It can be accomplished in a relatively short period of time with limited financial resources. Whether questionnaires, interviews, or panels of experts are used to appraise needs, the population surveyed is limited to only a sample of those practicing professionals for whom the program would be appropriate. In most instances, this means that there is a well-defined population.

The programs identified by Betz which followed the Need Appraisal System all used a combination of techniques to determine goals, as well as actual and perceived needs. All programs relied on evaluation forms from programs that they currently offered, and reviews of literature from similar programs to identify the target population and ascertain areas of interest (goals) among learner groups. Researchers in three programs used questionnaires, and
those in two programs used interview techniques to determine working practitioners "actual needs." All program developers relied extensively on reviews of literature and expert consultation (interviews) to determine the "perceived needs" from expert panels consisting of specialists in the field. In all cases, the program directors themselves made the comparison between perceived and actual needs, prioritized the needs so determined, and developed programs to meet these needs.

No recommendation is made in the Need Appraisal System concerning the weight to be given to actual or perceived needs, or to the type of statistical analysis which should be used for comparing these needs. However, as the needs are identified by a naming process, nonparametric statistics would be most appropriate.

Betz surveyed the needs assessment methods used by five nursing programs in the Los Angeles area. Two of the programs were based in educational institutions; one at a community college, and the other at a large metropolitan university. The remaining three programs were associated with acute-care hospital facilities. Each of the five programs used nonparametric statistics to rank perceived and actual needs on a percentile basis.

Betz does point out one possible pitfall in the utilization of the Need Appraisal System. The focus in the model is on identifying procedures for generating, locating, selecting, or refining program ideas. As Betz mentions, one of the most accepted methods for generating, locating, selecting or refining program ideas is through
the study of brochures distributed by other providers. It is from this review of established programs, coupled with evaluation sheets from current programs, that program developers often determine actual needs (needs expressed by the learner). However, this method will not work successfully if program directors can find no other program on which to model their program. This would be the case during the start up of a completely new, unique program, a situation that is addressed by the Practice Audit Model.

**The Practice Audit Model**

The research which led to the development of the Practice Audit needs assessment Model (Smutz, Kalman, Lindsay, Pietrusko, Seaman, 1981) started in 1976 and evolved from an effort to develop quality continuing professional education programs for pharmacists. The process that evolved was formally proposed as a model in 1981. Early in their effort, after an extensive review of the literature covering continuing education offerings nationwide, the researchers discovered that no programs specifically addressing the continuing education needs of practicing pharmacists existed. In addition, the authors concluded that while "continuing professional education can improve the quality of practice and help professionals continually maintain a fresh and current outlook on their work... no relationship between continuing education and improved practice has been convincingly demonstrated" (Smutz et al., 1981, p. 4) This lack of relationship between continuing education offerings and improvement
in practice, the authors theorized, existed because educators who develop programs possess little understanding of the problems professionals face in their day-to-day practice. Thus the authors based their needs assessment model on the notion that competence in practice is the idea on which the development of continuing professional education must rest and that the primary contributor to competent services is the individual professional.

The Practice Audit Model was designed by the authors to assess the needs that professional pharmacists actually had in their practices, thus "avoid the trap of equating skills with competence" and concentrate on "factors that contribute to adequate performance" (Smutz et al., 1981, p. 7). Competence of professionals in practice was to become the focus of program development because, as the authors point out, "while knowledge and skills are prerequisites for appropriate action, they are not substitutes for it" (Smutz et al., 1981, p. 7). The model which evolved contains seven phases:

1. assessment team organization;
2. development of practice standards;
3. construction of assessment materials;
4. administration of assessment materials to practicing professionals;
5. comparison of performance to standards;
6. program planning; and
7. program implementation and evaluation.
Each of these phases is discussed in some detail by the authors, and will be reviewed briefly to demonstrate that the Practice Audit Model, as different as it may be from the Discrepancy Analysis Model, still involves most of the steps from that model, and corresponds to some of the functions in the system approach to curriculum development.

Phase 1: Assessment Team Organization

Development of the Practice Audit Model was a collaborative effort between three groups which made up the research team: representatives from four schools of pharmacy in Pennsylvania, officers of the Pennsylvania Pharmacy Association, and continuing education faculty at Pennsylvania State University. These three groups were identified by project directors because:

... continuing education professionals are experienced in the delivery of programs, university faculty members work on the frontiers of knowledge and are experienced in program development, and professional associations are in the closest touch with the practicing professionals' concerns (Smutz, et al., 1981, p. 11).

The research team was charged with devising a technique for conducting the needs assessment, presenting the results and conclusions from the study, and developing a program based on those conclusions. Phase 1 in the Practice Audit Model is a planning step, similar to Step 1 of the Discrepancy Analysis Model (planning to plan).
and is a precursor to the tasks performed in Function 1 of the system approach (identification of problem based on needs).

**Phase 2: Development of Practice Standards**

The concern of the program developers was to assist professionals in remaining competent. Their approach was to seek a definition for a competent pharmacist, which could be used as a standard, then assess pharmacists' competence against this standard. Where pharmacists failed to meet the standard, there would be a need.

Program developers reviewed several methods for determining standards of competence, including task analysis, job competence assessment, interviews with practitioners, direct observation, expert panels, job diaries, open-ended questionnaires, behavior event analysis, and survey checklists of responsibilities. They concluded that various schools of thought had emerged around these different methods and techniques, each arguing that theirs was best. As is so often true in needs assessment, the technique that was eventually used in the Practice Audit Model proved to be a combination of several methods and techniques.

To determine standards of practice competence for pharmacists, the researchers contracted the Educational Testing Service (ETS) to develop a "competence inventory." The methodology used by ETS involved the following stages:

1. review of the pertinent literature on the practice of pharmacy;
2. field interviews with a small sample of pharmacists;
3. construction of a preliminary inventory of pharmacists' responsibilities;
4. review of the inventory by two separate technical advisory committees;
5. review of the inventory by a small sample of pharmacists;
6. development of final inventory;
7. pilot test of the inventory;
8. distribution of the inventory to a nationwide stratified sample of practitioners.

During stage eight, 5,000 pharmacists were asked to rate each responsibility on the inventory with regard to time spent, importance in actual practice, and level of judgement required. Analysis of this data provided an inventory of 71 responsibilities, identified and ranked by practicing pharmacists. This inventory represented a list of standards which a competent professional pharmacist should have, and could be used to guide the development of tests and procedures with which to evaluate the practicing pharmacists' professional needs.

This phase in the Practice Audit Model is closely related to the first function of the system approach (identification of problem based on needs) and to Step 2 and 3 (goal derivation and validation) of the Discrepancy Analysis Model.
Phase 3: Construction of Assessment Materials

During this phase of the project, the researchers determined the content for assessment, who was to be assessed, and the techniques to be used in the assessment process. The researchers, in consultation with practicing professionals, continuing education faculty, and the Pennsylvania Pharmacy Association, used the list developed in Phase 2 to identify five content areas for assessment.

In deciding who would be assessed, the researchers' primary concern was that a representative sample of pharmacists be selected so that the identified deficiencies could be generalized to pharmacists throughout the State. In response to this concern, the researchers turned to the Pennsylvania Pharmacy Association which, they felt, could offer the most up-to-date and complete information on pharmacists in the State. The Association provided a representative sample of practicing pharmacists for assessment.

The assessment technique selected was a workshop approach, involving practicing pharmacists. During the workshops, five needs assessment tools were administered to each pharmacist:

1. a pharmacy management interview concerning legal, personnel, inventory and fiscal matters
2. a surgical and health accessories exercise in which pharmacists demonstrated how they would fit or show patients how to use devices such as walkers or syringes;
3. a communication interview to determine the pharmacist's ability in pharmacist/patient communications;
4. an exercise on prescription processing in which participants identified errors in prepared, hypothetical prescriptions; and
5. a professional practice interview where pharmacists were asked to respond to hypothetical practice situations.

This phase of the Practice Audit Model is related to Function 2 of the system approach: determination of solution requirements and identification of solution alternatives. In terms of the Discrepancy Analysis Model, it relates to Steps 4 through 9, in which final goals are decided, prioritized, and translated into objectives, and Step 10, selection of testing instruments for assessing the current state.

Phase 4: Administration of Assessment Materials to Practicing Professionals

During this phase of the project, workshops were conducted to assess 38 practicing pharmacists with the three interviews and two exercises describe above. Due to the time required to complete the exercises and interviews, two workshops were held, each lasted 24 hours and involved 19 pharmacists. The pharmacists were informed of the projects' purpose, that they would be away from their work for only one day, and that Smith Kline & French Laboratories would pay for travel, lodging and expenses. When the workshops were complete, "two small groups of practicing pharmacists had been assessed on content areas directly related to their daily professional practice" (Smutz et al., 1981, pp. 32-33).
Administration of assessment materials corresponds to Function 1 of the system approach: identification of the problem based on needs. It involves Steps 10 (testing) and 11 (collation of data) in the Discrepancy Analysis Model.

**Phase 5: Comparison of Performance to Standards**

Determination of needs, based on the information gathered during the workshops, occurs during Phase 5. In the Practice Audit Model, this comparison was made by project staff. In the process, the researchers determined how "well" participants performed in the interviews and exercises as compared to the to the standards derived in Phase 2. Performance in the exercises was determined by a grading process: where exercises were written, correct and incorrect responses to individual questions were totalled; where exercises were manipulative, interviewer observations were recorded. Notes taken during the assessment interviews were analyzed. The project directors reviewed all of this information to identify weaknesses and strengths. Ultimately, they identified the areas where pharmacists performed "well" and the areas where they preformed "least well." This information was used to identify need areas to be addressed by continuing education pharmacy programs.

Phase 5 of the Need Appraisal System corresponds to Function 2 of the system approach: selection of solution strategies from among alternatives. It involves Steps 12 and 13 (development and prioritization of gap statements) in the Discrepancy Analysis Model.
Phase 6 and 7: Program Planning, Implementation and Evaluation

In the Practice Audit Model, Phases 6 and 7 (program planning, implementation and evaluation), are essentially post-needs assessment processes. Phases 1 through 5 led to the identification of needs. During program planning, project staff address the issues of program content, format, instructors, appropriate instructional techniques, delivery mechanisms, and program promotional materials.

Four years after the project began, the Pennsylvania Pharmacists' Professional Development Program was implemented. Participants evaluated the program on the basis of its contribution to the improvement of their practice behavior. These evaluations revealed a positive assessment of the total effort.

Discussion of the Practice Audit Model

Smutz, et al. (1981) describe the Practice Audit Model as unique because it involves a consortium effort which brings together the resources of professional school administrators, academic content experts, practitioners, and professional association leaders. The researchers claim that the model "provides a systematic method of addressing the needs assessment/program development process" (Smutz, et al., 1981, p. 48).

The model seems a good one for situations in which little or nothing is known about the goals of a program. Just such a situation led to the model's development. Pharmacy schools are accredited
institutions, thus before the project began, the researchers had an established accreditation structure containing at least some curriculum goals. However they felt that these curriculum goals had to be supplemented with continuing education leading to the elimination of practice needs. They did not know what these practice needs were. Their needs assessment provided goals and direction for the continuing education curriculum.

The presentation of the Practice Audit Model only describes Phases 1 through 4 in detail (assessment team organization through administration of assessment materials). These phases correspond to Functions 1 through 3 of the system approach and involve a number of the steps described in the Discrepancy Analysis Model.

The researchers' description of Phases 5 and 7, (comparison of performance standards, program implementation and evaluation) is sketchy, probably because execution of these phases will vary greatly from program to program. Also, during the development of the Practice Audit Model, these phases were not undertaken until after the project had ended.

Smutz et al. (1981) indicate that all of the phases in the model should be repeated on a "three- to four-year cycle" (p. 48) to refine program implementation and keep program offerings consistent with established and developing practice-based, educational needs in pharmacy. These repeat cycles correspond Functions 5 and 6 of the system approach: determination of performance effectiveness and program revision.
While the Practice Audit Model does appear to provide a thorough method for goal determination, without external support, such as that provided by Smith Kline & French Laboratories, application of the model may be beyond the resources available to most needs assessment researchers. Even with this limitation, the model has value. Outside of the time and effort spent by the project staff, continuing education, university faculty, and professional associations representatives, the workshops were the major expense incurred. As will be seen during the review of actual needs assessment studies, this expense is often avoided by interviewing and/or testing participants on a one-to-one basis at their work cite, rather than bringing participants together in a workshop situation.
Applied Needs Assessments

Most needs assessment researchers would probably agree with Grupe and Stewart (1979) that with the variety of needs assessment methods, techniques and applications available, the only approach to needs assessment which can be said to work best is "one which takes into account the facts of the situation at hand and responds directly to them" (p. 18). Researchers seem to agree with Witkin (1977) that:

... the tools or strategies necessary depend on the level of entry into the planning process, as well as the kinds of decisions to be made and the use to which the data will be put. ... the best guideline for the planner is to ask, "Why do I want to do a needs assessment?" and "What will I do with all that data when I get it?" The answers to these questions may help in selecting the most effective approach (pp. 13-14).

Applied needs assessments can be categorized into three general types, based on the curriculum planning functions, identified by Kaufman, that they address. Applied needs assessments tend to address Function 1 and sometimes Function 2 (goal determination and determination of solution requirements), Function 5 (summative evaluation), or Function 6 (formative evaluation).

**Type 1: Goal determination.** Goal determination needs assessments are used to identify and/or prioritize goals. Such needs assessments are frequently used as a basis for new program
development, often for unique target populations. Needs assessments of this type seek to answer the question "What should we be teaching?" The "gap" determined is often between what should be taught, and what is not taught at all; therefore, no attempt can be made to measure the difference between what "is" and what "should be." The programs developed from goal determination needs assessments are frequently not implemented until after the needs assessments are complete. Thus there is no "current" with which to compare the "future." During a goal determination needs assessment, the attempt is only to determine goals and, if possible, prioritize them so that program planning can begin.

**Type 2: Summative evaluation.** Needs assessments for summative evaluation are applied to an existing program to determine how effective the program has been. These needs assessments seek answers to the questions, "How well have we met our current goals?" and "What steps are needed to better meet these goals?"

**Type 3: Formative evaluation.** Formative evaluation needs assessments occur during the implementation stages of a program and throughout the program's duration. Such studies seek to answer the question, "What changes should be made to an on-going program, either to better accomplish current goals, or to identify and respond to new goals?"
Focus of Applied Research Review

In relation to the above, the needs assessment to be undertaken in this research, is similar to Type 1. The problem in this research is to prioritize program content areas and topics for a community college level printing program. This prioritization will be based on the needs of a specific community: the community served by the Halifax County Community College in Halifax, Nova Scotia. Thus, the data collected will be used to derive and prioritize program broad content areas and topics appropriate to the needs of the printing industry in this community. The needs assessment to be executed in this study is similar to the Beta-type needs assessment identified in Kaufman’s taxonomy. Consequently, this review of needs assessment research will include only needs assessment studies corresponding to curriculum planning Function 1 and 2, as identified Kaufman.

After the preceding discussion about needs assessment models, it would be difficult to avoid the conclusion that a needs assessment of this type, one which seeks to identify appropriate curriculum content areas and topics must ask someone what they think these content areas and topics should be. Kaufman referred to the educational partners -- parents, students, educators -- as the ones who should be asked. He also introduced the idea of using an external referent to validate the curriculum goals against the "real world of work" (English and Kaufman, 1975, p. 24). The number and variety of educational
partners and external referents used in needs assessment research varies considerably. Rarely does a single needs assessment reflect the breadth of "inputs" described in the Discrepancy Analysis Model. However, depending on the application, all needs assessments do gather information from one or more "outside" sources (i.e. sources other than the researchers themselves). It is these outside sources who are asked to derive and/or prioritize the goals.

A variety of techniques are available for this "asking" process. Most needs assessments use interviews or questionnaires; both techniques are referred to as "surveys" in the literature. In this review of literature, an interview technique is considered one in which discussion occurs between an interviewer and one or more interviewees, either singly or in groups, in-person or by telephone. A questionnaire technique involves only paper-and-pencil written responses to written questions.

A special case exists in considering the Delphi technique. This technique is a questionnaire, in the sense that participants write responses to written questions. However in another sense, the Delphi technique is a paper-and-pencil interview with which the researcher "interviews" a number of participants simultaneously, asking them open-ended questions and, subsequently, boiling down their responses into relatively definitive statements. For this reason, the Delphi technique will be considered an interview technique in this review of literature.
The frequent use of interview or questionnaire techniques in needs assessment research may be due to the low cost and relative ease of information gathering with these techniques, as compared to techniques such as observation for task analysis or review of anecdotal evidence (log books or work reports). Some needs assessment researchers use only interviews, some only questionnaires, and some use a combination of both techniques.

**Interview Only Needs Assessments**

In many needs assessments, interviews provide either the major, or the only input about program goals. Three types of interviews are used in such studies: individual interviews, group interviews; and Delphi studies.
Individual Interviews

Individual, face-to-face interviews with members of the target population are a useful technique for gathering information about needs and establishing goals (Anderson, 1984). Often, face-to-face interviews are the only possible technique available. To categorize and prioritize Haitian immigrants' self-identified needs, Klopner (1985) interviewed 18 Haitian immigrants living in the New York-New Jersey metropolitan area. Barody (1983) used a series of interviews to determine the math learning needs of a single learning disabled child. In these studies, subjects in the population either would not, or could not respond to a questionnaire.

When individual interviews are used, researchers attempt to interview those most likely to know what program goals should be. The number of interviews conducted and the variety of subjects interviewed depends, to a great extent, on the purpose of the study and the resources available to the researcher. Randall (1986) interviewed faculty, attended faculty meetings, observed faculty interactions with media services, and analyzed media services utilization data during a needs assessment to identify the media support services needs in a school of nursing. The purpose of the study was to identify specific needs in a particular school; only those perceived to have the needs in that school were interviewed. Grahn (1980) interviewed three groups, members of the local business community, local college faculty, and students during an analysis of
educational needs in the area of sales education. No information was collected in this study from people outside of the local area because the program to be designed was intended to meet local needs, and local interviews were within the resources available to the researcher.

More often than not, interview only needs assessments involve more than one group of interviewees. A needs assessment which served as the basis for curriculum development for migrant children, conducted by Badaracca (1972), involved interviews with 10 groups, consisting of school personnel, recruiters from state and national offices of migrant education, education and learning theory consultants, parents of migrant children, migrant children advisory groups, and migrant children themselves. This study is similar in nature to Klopner's (1985) needs assessment of Haitian immigrants' needs. In the Badaracca (1972) study, however, input from more than one interview group was considered appropriate, and Pilot V sponsorship by the New Jersey Office of Migrant Education made a large-scale interview strategy possible.

Individual interviews can use open-ended, structured or semi-structured question formats. Typically the researcher visits the interviewee to conduct the interview. Some researchers use telephone interviews instead of in-person interviews; some researchers use both. Leinbach (1981) concluded that, in a curriculum planning environment, telephone interviews can provide a viable substitute for face-to-face interviews. With either technique, the
response rates obtained and the needs determined were essentially the same.

Open ended format. The information gathered through open-ended questions is used by some researchers as the only data for establishing goals and program development. Other researchers use information gathered from open-ended questions to develop more specific questions for use in structured, follow-up interviews, or on a pencil-and-paper questionnaires.

Lynch (1983) conducted telephone interviews and in-person interviews during a needs assessment undertaken to develop a national plan for marketing education at the pre-baccalaureate level. The interview question format was completely open-ended. Following a review of literature "pertaining to the past, present, and future of business, marketing, education, marketing education, and vocational education" (p. 2), Lynch interviewed over 600 individuals by telephone or in-person, representing three groups: educators, business persons, and executive directors or presidents of professional associations. Similar questions were presented to each group. Two examples of the questions asked will illustrate Lynch's open-ended question format:

What should marketing and distributive education educators be thinking about as we prepare people for jobs in marketing in the next twenty years? (asked of educators).

What should educational systems be thinking about as they prepare people for jobs in marketing occupations for the

Ideas from all interviewees were compared by the researcher to derive program goals.

Wiederanders (1978) conducted a "loosely structured, open-ended interview schedule" (p. 6) of ten California Youth Authority parolees. By reviewing tape recordings of these interviews, Wiederanders developed a structured interview format. Structured interviews were subsequently conducted on 145 parolees to assess their educational needs relevant to job survival skills. During these interviews, Wiederanders gathered "descriptions of actual job successes and failures," as revealed by parolees. These descriptions were used to develop a "theoretical set of job-survival skill areas" (p. 5). Curriculum was then developed to meet parolees' needs in these skill areas. The population interviewed consisted of subjects "selected according to certain demographic characteristics which would ensure that the sample was representative of California Youth Authority releases [parolees]" (p. 6). Appropriate subjects for the study were identified by the California Youth Authority.

Two features common to needs assessment studies which use open-ended questions are displayed in Wiederanders' (1978) study: (1) these needs assessments tend to have an easily-definable target population, and (2) the researchers rely on an external referent, such as the Youth Association in Wiederander's study or a professional association, to identify appropriate and representative interviewees.
Semi-structured format. Semi-structured interviews are generally used when the researcher knows or is willing to assume something about the program goals. In this case the researcher presents the interviewee with structured questions concerning these goals and with open-ended questions to gather additional information.

Maykut (1983) used semi-structured in-person interviews to develop a guide for outreach programs for families of handicapped children. Maykut completed a review of literature to derive 14 topics related to family care for handicapped children. Semi-structured interviews were conducted with selected parents of handicapped children to determine parents' needs in relation to these 14 topics, and to gather information on additional needs, not identified in the review of literature.

The San Lorenzo Valley Unified School District (1985) conducted a telephone survey consisting of structured and unstructured questions to assess community attitudes toward the schools and determine the extent to which parents perceived the schools as meeting their needs. Structured questions were used to gather parents' perceptions about how well current needs were being met. Open-ended questions were used to identify new unmet needs.

Structured format. Structured interviews are used in needs assessment when the researcher has very specific information about what program goals actually are, and seeks to determine whether these goals are appropriate. In one such study researchers at the Santa Fe Community College (1983) compiled task listings for 16
program areas in industrial education, then conducted structured interviews with local employers and advisory committee members to prioritize these tasks, based on perceived importance for employment in the local area. Program development was guided by the prioritized task list.

Another illustration of the structured interview format is given by Casper and Roecks (1982). These researchers sought to evaluate one school districts' teachers' needs in relation to inservice education. The researchers' approach was to list current inservice offerings in the district, then interview a sample of teachers, each of whom were asked specific questions regarding the usefulness of existing inservice offerings. Through structured questions, interviewee responses were coded by the researchers into one of six levels, ranging from "Non-use (Level 0), where the person has little knowledge of the program to Renewal (Level VI), where the person seeks major modifications or alternatives to the program" (Casper and Roecks, 1982, p. 5). The level of use of individual programs was expressed as the percentage of participants indicating each use level for each inservice offering. This data was analyzed to identify programs which offered information that was used, those which offered information which was not used, and to develop new programs based on the most used information.

**Group Interviews**

Group interviews are used where an individual interview strategy is not possible, or is not considered appropriate for the needs
assessment. Group interviews are conducted in the form of workshops (Regan and Clark. 1984), focus groups (Mueller and Krueger, 1985) or community forums (Koppel and Isenhour, 1986). The Practice Audit Model (Smutz, et al., 1981), described previously, provides one example of the workshop approach.

Heggen (1981) conducted a needs assessment in which he held "brainstorming" workshops consisting of two groups of teachers and supervisors. Information gathered during the workshops was used to develop, revise, and validate curriculum materials for disabled industrial arts students at the middle school level. Information from advisory groups, such as the two used by Heggen, is often gathered in a workshop or focus group environment.

Muller and Krueger (1985) reviewed two needs assessment studies which utilized focus groups. In both studies the interviewer or moderator used a question outline and unstructured questions to pursue the topic of interest. The authors differentiate the focus group technique from "traditional Extension group procedures" and from the "Delphi approach." With the focus group technique, "participants do not plan, vote, or reach a consensus on issues. Emphasis is not on agreement, cooperation or support, but on identifying the range of observations, attitudes, and opinions" (Muller and Krueger, 1985, p. 5).

Based on information gathered during focus groups, researchers can evaluate program ideas and develop program goals. According to Muller and Krueger, the focus group method appears to have been an
excellent evaluation procedure given the time and financial resources available to the projects they reviewed.

In both Heggen's (1981) study and the research reviewed by Muller and Krueger (1985), outside of a literature review, information from workshop participants was the only "input" gathered during the needs assessment. Often focus groups are used as one of several "inputs" in the needs assessment process. This is the case in the "multiphase need assessment" approach adapted by Koppel and Isenhour to determine community needs for preschool programs in an urban school system. This needs assessment provided a list of currently perceived needs based on parent and community member input; program ideas generated by knowledgeable professionals in response to these statements of need; and information concerning community response to program ideas. To derive a list of perceived needs and gather demographic information about potential enrollment if appropriate programs were offered, the researchers held a series of open community forums. During the forums, participants were interviewed with structured questions to gather demographic information, such as number of children, children's ages, sex, current program utilization, and the amount participants would be willing to pay for responsive programs. Participants were also asked to write out an answer to an open-ended, "substantive question":

What needs do you have for the care and education of your children, ages three to five, that are not being met by
existing programs, public or private, in the community? (Koppel and Isenhour, 1986, p. 10).

To move the identified needs to relevant program alternatives the researchers employed the process of key informant utilization. That is, the identified needs were reviewed and prioritized by an advisory group consisting of key informants who were especially familiar with the needs in question.

Key informants, interviewed individually or in advisory group setting, have been used by numerous needs assessment researchers (Lawrence and Cruze, 1981; Laakso, 1982; Brown, 1982; Moreby, 1985; Olian and Schneier, 1985). The merits of key informants have been described by Koppel and Isenhour (1986):

The use of key informants yields specific data that are highly involving for participants. Those serving as key professionals may develop a strong sense of commitment to the study and its results because of their participation. Further, while key informant utilization is not particularly representative, it is primarily safe for the sponsor organization. Surprises are unlikely as key informants will usually know the organization and its constraints. Additional benefits of key informant methods include the ability to collect data and analyze them within a short period of time and the possible strengthening of lines of communication between various professionals in the
community and decision makers in the agency sponsoring the assessment (p. 12).

During the workshops, key informants in the Koppel and Isenhour study reviewed all program ideas and rank ordered each in terms of priority. They also rated each idea as to the feasibility of implementation. After the workshops were complete, the researchers averaged prioritizations from all key informants to obtain mean ratings for all program ideas and used arithmetic means to select the top fifteen program ideas. These fifteen ideas were then ranked, in terms of acceptability, during structured interviews conducted on different segments of the school system's community. Program ideas selected during this final ranking provided a focus for the development of specific programs.

**Delphi Techniques**

Some needs assessment researchers use a Delphi technique instead of, or along with, individual or group interviews. With the Delphi technique, a selected group of "experts" is asked to list future program goals on an open-ended questionnaire. The researcher then compiles the goals listed by each expert into a master list. The same participants are then asked to rank the goals listed, and indicate new goals for inclusion in the list. This process is repeated two or more times until a final, prioritized goal list is established.
Palm and Boyer (1979) used a Delphi technique in conjunction with a door-to-door interview technique in a needs assessment to determine the future child care needs of parents and children in South Minneapolis. The Delphi study was used to develop questions for the structured questionnaire, which was later used in the door-to-door interview.

The Delphi technique has been used by other researchers to gather information on future goals (Hentges and Hosokawa, 1980; New Jersey Vocational-Technical Curriculum Laboratory, 1981). However, the Delphi study is not a common needs assessment technique. The technique has several problems, including the length of time necessary to execute the study; the extent of participant involvement required, which often leads to high participant dropout; and the lack of verification of the results (Sackman, 1974).

**Questionnaire Only Needs Assessments**

Paper-and pencil questionnaires for goal determination typically require participants to either rank or select appropriate items (goals, tasks, needs) from a list provided by the researcher. Selection or ranking is made on the basis of some predetermined criteria, such as interest. Inherent in the technique is the limitation that questionnaires cannot be used to gather individualized information (Marshal, 1982). That is, through a questionnaire, a researcher can only gather information on specific questions, those questions
included on the questionnaire. Most questionnaires have no mechanism for collecting additional information which the participant may want to add, information which could be important during curriculum development.

Witkin (1977) identified several commercially available needs assessment kits, many of which contain prepared, statistically validated questionnaires for assessing educational needs. Witkin discussed these kits in terms of their applicability, advantages and disadvantages. Prepared and validated questionnaires such as those described by Witkin are rarely available to a needs assessment researcher who is working outside of the elementary or secondary public school environment. Typically the target population in a needs assessment is either too small to demand questionnaire publication, or the needs assessment is executed as a "one shot" study, which will not necessarily be repeated. Thus most questionnaires used in needs assessment studies are produced by the researchers, themselves: specific questions are often based on a review of literature or consultation with an expert panel.

Needs assessments for goal determination which use only questionnaires tend to fit into three categories, based on the type of information sought in each: topic identification studies, needs comparison studies, and task identification studies.
Topic Identification Studies

A number of needs assessment studies seek to answer the questions, "What programs do people want (or perceive that they need)?" and "If our institution offered such programs, how many people would attend?" Information gained from this type of needs assessment is often more applicable to marketing than to curriculum development. In most such studies, curriculum development occurs after needs assessment has identified topics for which there is a demand; actual curriculum content for any topic so identified is not developed through the needs assessment, but determined in a post-needs assessment process.

In 1977, Howard and Lucas, at William Rainey Harper College, performed a needs assessment to determine appropriate topics for continuing professional education programs pertaining to significant issues in local government. During the needs assessment, the researchers distributed a questionnaire to 422 individuals, each of whom had taken an issues in local government continuing education course at the College between 1974 and 1976. The questionnaire presented a list of previously offered topics in local government. The 207 participants who returned the questionnaire rated these topics in terms of preference. Demographic information, such as the location (urban or rural) and the job position (administration or staff) of each respondent was also gathered through the questionnaire. Finally, the instrument contained questions to determine the best method of attracting participants to take continuing education classes:
specifically, whether participants had taken classes as a result of a mailed brochure or a supervisor recommendation. Based on percentage ranking, Howard and Lucas identified topics that were "most preferred" by past program participants. These topics were selected for future curriculum development. In addition, the research team developed a profile of the types of people who had taken local government issues courses, and of the mechanism most successful in attracting people into these courses.

Howard and Lucas' needs assessment only identified appropriate topics (those that past participants preferred). Specific information for determining program goals, objectives, and curriculum development came from sources other than the needs assessment. In addition to the preferred topic list, the researchers gathered marketing information concerning how many people would want to take specific programs and how people in the target population could be attracted to take programs.

Howard and Lucas examined past performance (preference for topics offered in the past) to determine future needs (topics which should be offered in the future). A slightly different approach, though still very much a marketing strategy, was taken by the Johnson County Community College in 1978. Researchers at the College conducted a needs assessment to determine potential future career education offerings, such as medical records technology, advertising, journalism, and dental laboratory technology. Their strategy was to determine the need for such programs in relation to the employment outlook in each
area. To execute this strategy, the researchers submitted a questionnaire to local employers. The questionnaire elicited responses concerning local manpower needs, salary potentials, and the relevance of an associate degree for attaining entry-level positions in the careers under study. Additional questions addressed program cost, staff selection, and mechanisms for student recruitment.

The researchers were trying to determine what programs should be offered in the future to meet future employment needs in a local area. Again, the development of curriculum to meet these needs was a post-needs assessment process. The needs assessment only established that there was a perceived need for individuals with particular types of training in the future, in the local community. Information from the needs assessment was not used to develop specific goals, objectives or curriculum for career programs in the topics identified.

One other approach to defining "marketable" topics is that used by Vogelsang and and Boudreau (1979). These researchers attempted to define the continuing education needs of adults in Vermont by developing a profile of adults who were interested in adult education. Their questionnaire elicited information concerning topics which adults considered interesting. Additional information was gathered about the best time of day to offer courses, the amount adults would be willing to pay, the course length (hours per week, weeks per term) that adults considered best, and the best location(s) for course offerings (on the college campus, at work, in local high schools, at
home). From this information Vogelsang and Boudreau developed a profile of potential adult education participants in Vermont and made specific recommendations regarding appropriate topics, course costs, course locations, and course lengths. Actual curriculum development was left to adult education faculty; information from the needs assessment was not used to develop specific program goals or objectives.

Needs Comparison Studies

A number of needs assessments use questionnaires to gather data and compare needs, as perceived by one sample, to needs as perceived by another sample, in an effort to identify the actual needs relevant to both samples. Zemp (1981) took this approach in a needs assessment to determine the continuing education needs of industrial scientists and engineers in North Carolina. Through a review of literature, Zemp identified a list of needs for the target population. The individual needs on the list were then ranked in importance by two separate groups: employees in the selected fields and managers in the selected fields. Descriptive statistics were used to identify the frequency with which individual needs were selected by each group. Through studying these findings and, in some instances, interviewing employees and employers, Zemp made recommendations regarding the type of topics which should be offered, based on the needs ranking. He also made recommendations about class scheduling and location, based on demographic information.
In the context of the above study, it should be pointed out that the researcher's intent was **not** to determine whether employers perceived different needs as being important than did employees, but to determine which needs both groups perceived as important, estimate the magnitude of importance of these needs, and use this information to develop programs that, as closely as possible, meet the perceived needs. In this process, the researcher, either acting alone or in concert with an external referent such as an advisory committee, summarizes information, proposes the finalized needs statements, and makes recommendations for curriculum development based on these needs. This methodology is typical of needs assessments in general, and of needs comparison studies in particular. Rarely is a needs assessment conducted in an experimental research mode, in which an hypothesis is stated, then "accepted" or "rejected" at some level of confidence. Even in studies such as the one conducted by Zemp, where hypothesis testing would have been possible, it is typically not done. This is probably because little information would be gained by determining that there is a difference in perception between two samples about what goals should be. The purpose of a needs assessment is not to **identify** differences in perception, but to **reconcile** such differences and build a curriculum that meets identified needs. Information about needs gathered from various participant groups, such as the parents, students, and educators identified by Kaufman or the employers and employees identified by Zemp, is **expected** to be different. Statistically demonstrating that
needs are perceived differently, by rejecting or accepting a null hypothesis, would add little to the process of reconciling these needs perceptions and developing appropriate curriculum. Latshaw (1975) offers a comment which directly addresses this point:

Eventually, one must come to the conclusion that there are a variety of learning needs, a variety of practitioners with individual differences, a variety of employment contexts, and a variety of ways of meeting learning needs (p. 24).

Final selection of appropriate needs and ways of meeting these needs is accomplished in consideration of all identified needs, regardless of the different need perceptions held by the various participant groups.

Latshaw conducted a needs assessment, similar to the one conducted by Zemp. The problem identified by Latshaw was that, while many continuing education offerings were available for professional nurses, few programs were available for vocational occupations in nursing: specifically, nurses aids and operating room technicians. Latshaw’s approach was to determine the educational needs for these specific occupations by surveying four samples: nurses aids, operating room technicians, nursing supervisors, and nursing educators.

According to Latshaw rough drafts of the questionnaires were developed on the basis of the working knowledge of the investigator and the exploration of related literature. To insure that the questions being asked would be understood by the respondents, and that they would recruit information appropriate to the needs assessment, the
Director of the School of Health Occupations and selected faculty members were asked to review the questionnaire to assess "the appropriateness of the level of communications and the adequacy of the items to elicit the desired data" (Latshaw, 1985, p. 55). On the basis of this examination, Latshaw developed the final questionnaire.

This method of questionnaire development, in which the researcher develops a rough draft, based on a review of literature, then has that draft examined by a panel of experts, is common in needs assessment research, probably because most needs assessment research is local in nature, and members of the local target population are often considered best able to judge the appropriateness and usefulness of specific questions. Using this method, Latshaw concluded that enough initial information had been gathered for the School of Health Occupations to plan in continuing education in nursing at the vocational level. This planning was based on descriptive information. According to Latshaw (1985):

The instruments were not designed for advanced statistical computations. The development of a model for a continuing education center [in health sciences] was primarily concerned with the types of learning needs identified and the numbers of potential participants. Simple frequencies and percentages were adequate to provide the information sought (p. 75).
Low response rate is a common problem in questionnaire-based needs assessment research. Questionnaires may not be returned because they are perceived by the recipients as threatening or too personal; because they are overlooked and forgotten; or simply because recipients do not have any of the needs listed on the questionnaire and, therefore, choose not to rank them. At what point, then, does the researcher assume that the responses received are generalizable to the total population, rather than generalizable only to those who choose to respond? Needs assessment researchers consider generalizability in relation to the a problem addressed in the study. In relation to response rates in her study, Latshaw (1985) makes the following observation:

The purpose of the study was to identify types of learning needs and the numbers interested. The low level of response was not detrimental to the objectives of the study as long as the data were analyzed with no attempt made to generalize to the total populations (p. 63).

Most needs assessment researchers expect a low response rate, but low response rate is not viewed as a problem. The attempt is to identify needs; non-respondents are viewed as either not having the needs in question, or not having enough knowledge (or interest) to respond to the needs in question. Information from such non-respondents is considered of negligible value, which may be why follow-up questionnaires are rare in needs assessment research.
Task Identification Studies

A number of researchers use questionnaires only in a "task-identification" approach to needs assessment. With this method, researchers attempt to describe educational needs by identifying actual skills and abilities used by practitioners. Curriculum is then developed which will prepare students with these skills and abilities. The Practice Audit Model (Smutz, et al., 1981), discussed previously, is an example of a task identification study.

Few task identification needs assessments are as thorough as the Practice Audit Model. Typically, a list of tasks is identified by the researcher(s) through a literature review or in consultation with an expert panel. This list is then presented in a questionnaire, in which participants are asked to rank each task in terms of its importance in a work situation. Importance is judged on the bases of participant perceptions, or frequency of use reported by participants.

Steimel (1979) conducted a study to assess curriculum needs in the vocational areas of graphic arts, nurse's aid and small engine repair. Her approach was to identify job competencies as reported by workers in each of these areas, then develop a curriculum which would teach these competencies. The project staff developed a questionnaire, listing suggested competencies, and subsequently distributed it to selected employees in the occupations under question. Employees ranked each competency in terms of perceived
level of importance on-the-job. Curriculum design was based on analysis of employee rankings for each competency.

**Interview and Questionnaire Needs Assessments**

Whether interviews, questionnaires, or both should be used during needs assessment has been a nagging problem to needs assessment researchers. As Marshall (1982) points out:

. . . little research has actually been done to establish the validity and consistency of the various methodologies [used in needs assessment]. To date, except for some of the measurement research, there has been little scientific information available to planners; thus, decisions on needs assessment have been left to common sense. . . There are two general approaches to the problem. For informal assessment [interviews], the need categories emerge post hoc from information obtained from the staff during the study process; while for formal assessment [questionnaires], the categories are usually identified apriori through previously completed research, theoretical constructs, and group consensus (p. 10).

In his research, Marshall attempted to determine whether interview or questionnaire techniques, which he referred to respectively as "informal" and "formal" needs assessment methods, provided the same information for program planning, and whether
these methods were equally valid as information gathering devices for staff development planning. To do so, Marshall identified four groups of teachers and conducted needs assessments to determine these teachers' needs in relation to inservice teacher education programs. A formal assessment only was conducted on Group 1 (n=21) and an informal assessment on a Group 2 (n=43). Both formal and informal assessments were conducted on Groups 3 and 4. Group 3 (n=12) underwent the formal assessment first, then the informal assessment. For Group 4 (n=12), the order was reversed.

After analysis of the data, Marshall concluded that informal and formal needs assessment procedures are equally valid for obtaining information to plan and implement staff development inservice programs. Both techniques gather valid, but essentially different types of information. Which method is selected, depends largely on the type of information that the researcher is attempting to gather. In Marshall's words:

The decision as to which method should be used in a given program would be better made by considering the primary purpose for the assessment, time and cost efficiency, secondary uses for the information, and other similar concerns. . . .each method had its strengths and weaknesses (Marshall, 1982, p. 33).

Several strengths can be noted for the interview technique. Its primary strength is that the information gathered is "robust." The
technique recruits new information and a wide range of individual thoughts, perceptions, and feelings which cannot be recruited on a questionnaire. In addition, the interview technique offers two by-products, identified by Wilburn and Summers (1983) as "personal regard enhancement" and a "positive effect upon participation . . . in the program developed" (p. 20). That is, interviews increase the interviewees' knowledge of and "regard" for the program being developed and, simply because they were involved in the interview process, interviewees are likely to take the program and recommend it to others. However, with the interview technique, sample size is small and the generalizability of results comes into question.

Questionnaire techniques typically involve a larger sample size and can be used to recruit specific information, information such as task listings or perceptions about specific needs. Thus conclusions based on questionnaire data tend to be considered more generalizable than those made on interview data alone. Data gathered through questionnaires are also somewhat easier to process statistically than data gathered through interviews. However, the technique cannot gather a wide range of individual thoughts, perceptions, or feelings of the type that can be gathered during a interview.

Information gathered through interview techniques is often referred to as "soft data" in needs assessment literature; that gathered through questionnaires is called "hard data." Many needs assessment researchers recognize the need for both types of information during curriculum planning. Needs assessments which gather both interview
and questionnaire data can be classified as complementary or contingency studies.

**Complementary Studies**

In complementary studies, interview and questionnaire data are gathered simultaneously. The two types of data are considered "complementary" in the sense that information gathered with one technique expands or amplifies information gathered with the other. Researchers who conduct needs assessments of this type generally interview experts (teachers, association members, professional managers) to gather soft data about what program goals and directions should be, while, at the same time, distributing a questionnaire to gather hard data. Often the same or similar questions are asked in the interview and on the questionnaire (Dunbar and Salazar, 1985; Florence, 1983; Dimun, 1983). The hard data from the questionnaire is used to "validate" the soft data gathered through the interviews and/or gain more information about the individual questionnaire items. After data collection, the researcher statistically analyzes the hard data, then draws conclusions in light of complementary, soft data information.

As Kaufman points out, this type of validity is no more than face validity. However, in the absence of any scientific test to determine validity, face validity is often the only validity that can be determined in a needs assessment. In any event, external validity is considered a limitation, rather than a procedural problem in most needs
assessments. Because research is executed in relation to a specific target population only, conclusions are expected to be generalizable only to that specific population. Internal validity is established by comparing hard and soft data to identify similarities or trends of thought and resolve areas of conflict.

Some researchers who gather hard and soft data simultaneously pose essentially different questions in the interview and on the questionnaire. Often demographic information about enrollment potential is gathered on the questionnaire; information about perceived needs (or wants) is gathered during the interviews. Eggers (1986) conducted a needs assessment of this type to identify the needs of well-elderly women with respect to fitness and to identify the fitness activities well-elderly women would most prefer. Her approach was to interview selected directors of physical fitness programs and well-elderly women (n=10) concerning their perceived fitness needs and attitudes towards fitness. At the same time, Eggers surveyed, by questionnaire, a sample of well-elderly women (n=56) to gather demographic information, attitudes toward structured physical fitness programs, and activity preferences. Eggers used both the hard and the soft data to select appropriate fitness topics. Interview data was used to develop a topic list. Appropriate fitness offerings were selected in relation to the demographic data, attitudes, and activity preference information gathered through the questionnaire. These hard data were used to complement the soft data. Similar procedures
were followed by Kajonpia (1985), Hollingsworth, (1984) and Helms, (1982).

Contingency Studies

A very common approach in needs assessments for goal determination is to conduct a series of interviews and then construct a questionnaire, based on information gathered during the interviews. In this type of needs assessment, the hard data gathered with the questionnaire is contingent upon the soft gathered through interviews. This approach is often taken by researchers who either know little about the needs in question, or are unwilling to make many assumptions about those needs. With this approach, the researcher constructs a goal, task, or need list based on interview information. This list is subsequently prioritized through analysis of questionnaire responses about the perceived importance of each item.

In 1983, Maduka conducted a needs assessment to establish guidelines for inservice educational programs in the school district of Logos State, Nigeria. Maduka's premise was that the specific inservice needs of the teachers in question must be defined, and that those needs might be different from inservice needs which has been defined for other school districts. To develop an appropriate need list for subsequent prioritization through questionnaire data, Maduka used the group interview technique to gather information about needs from 10 teachers and administrators in the target school districts. This data was then used to develop a 20 item questionnaire which was
disseminated to a random sample of teachers in the target school districts. Descriptive statistical analysis of the questions provided a prioritization of the 20 needs identified on the questionnaire: needs selected as highest priority by the largest percentage of respondents became the focus of program development. A similar technique was used by Shodavaram (1983) to determine the cocurricular needs of international graduate students at North Texas State University.

Siman (1984) conducted a needs assessment to determine need areas related to mother and worker roles among Mexican females. Siman used data gathered during semi-structured interviews with 11 selected Mexican women to develop a 67 item needs questionnaire which was subsequently disseminated to 101 adult Mexican women residing in the San Ysidro border area. Participant ranking of the perceived need for each of the items on the questionnaire established a level of importance for each of the 67 needs. The most important needs were selected for curriculum development.

During a needs assessment to determine management educational needs in the area of communication management, Smith (1986) interviewed 6 individuals responsible for training and management development in multi-national organizations. During the interviews, Smith gathered information concerning content in existing training programs, potential goals for future programs, and interviewees opinions regarding the most effective instructional methods for teaching communication management subjects. On the basis of this data, Smith developed a questionnaire on which
participants could rank a list of abilities (such as the ability to listen and the ability to analyze problems) in terms of perceived importance. The questionnaire was disseminated to 145 participants attending an annual conference of training and development professionals. Data from the questionnaire were analyzed to establish a level of importance ranking for each ability listed. This ranking provided direction for curriculum development.

One additional needs assessment which utilized interview information for questionnaire development, executed by Thomas and Heick (1973), will be reviewed here as illustrative of this methodology. The problem addressed by these researchers was to determine the priority (ranking) given to selected continuing education topics by nurses employed in Iowa hospitals and by University of Iowa College of Nursing faculty members. The researchers conducted interviews with faculty members to determine faculty opinions regarding needed continuing education content.

From these responses, thirty-two topics were isolated. When faculty responses were translated into these topics, some of the suggestions were generalized, others were combined, and in general, categories appropriate in scope and terminology for continuing education programs were sought (Thomas and Heick, 1973, p. 27).

The instrument so developed listed the 32 topics identified, adjacent to six priority selections: highest priority, high priority,
moderate priority, lesser priority, lowest priority, and no priority. As a check for internal validity, the instrument was pretested using a small sample (n=5) of graduate students in nursing. No inconsistencies were found. Following this check the instrument was disseminated to a sample of University of Iowa nursing faculty and to a sample of registered nurses employed in Iowa hospitals. After data analysis, priority ratings by practicing registered nurses and by nurse educators were reported as mean scores for each of the topics. Mean scores were then compared to find the highest and lowest priority items assigned by both groups. The researchers offered explanations for differences in ranking of selected items when such differences were found; however, they made no attempt to derive a mathematical formula for weighting responses from the different samples. Instead, consideration was given to both rankings for drawing conclusions and making curriculum recommendations. This type of analysis was considered most appropriate for the purpose of the study. In the researchers' words:

... it is recognized that needs of [a] broader population may differ in contend and in priority levels from those related in this study. Thus, the extent to which the results can be generalized to all practicing registered nurses in Iowa, regardless of health care setting, is left to the reader (Thomas and Heick, 1973, p. 27).
Summary of Literature Review

The first part of this review of literature explored the theoretical basis for needs assessment in curriculum development. Kaufman's system approach to curriculum development was discussed in detail. His theory proposed six functions in curriculum development, and identified needs assessment as an appropriate methodology for the achievement of each function. The system approach was then related to the Discrepancy Analysis needs assessment model described by English and Kaufman and to the taxonomy of needs assessment proposed by Kaufman.

Kaufman's system approach and the Discrepancy Analysis Model were described by this researcher as inclusive of all needs assessment applications for curriculum development, and of most techniques which can be employed in needs assessment. Two other models were reviewed to illustrate this point. Based on Kaufman's work and the additional models reviewed, it can be concluded that needs assessment techniques can and have been used for establishing and prioritizing program goals.

In addition to a review of needs assessment theory, a review of applied needs assessments was presented. A number of needs assessment techniques were identified; research applications using interview and/or questionnaire techniques were reviewed extensively.

Based on this review of needs assessment theory, models, and applied needs assessment research, four general conclusions about needs assessment techniques are stated below:
1. Information from interviews and questionnaires is valuable and "valid" in needs assessment research.

2. Interview and questionnaire techniques can be combined in a contingency approach to increase validity, and to gather additional information.

3. Interviews can be used for establishing goal, task, or need lists where goals are unknown or no assumption about goals is made.

4. Questionnaires can be used to prioritize goal, task, or need items identified through interviews.
CHAPTER 3
METHODOLOGY

Introduction

The purpose of this research was to determine and prioritize appropriate content and topic areas for a community college level printing program. The target population consisted of those printing firms located in Halifax County in the Province of Nova Scotia.

Selection of Participants

Initial research, based on data collected from the Halifax Board of Trade, Canada Manpower and Immigration, and the local branch of the Canadian Printing Industries Association revealed that 59 firms in Halifax County are included in the classification "printing, publishing and related industries." Of these 59 firms, 9 firms were eliminated from the study group because they specialized in publishing, design or advertising rather than printing; 2 because they offered only photocopy services; and 3 because they offered engraving, embossing or plate services, rather than printing. Thus there were 45 firms remaining in the study group (59-14=45).

Development of the Questionnaire

Using the information gathered from key informants during preliminary research, a questionnaire was developed consisting of three potentially appropriate printing content areas: pre-press
operations, press operations, and post-press operations. Film processes were treated as a sub-topic of special consideration within pre-press processes.

The use of key informants for questionnaire development in needs assessment is consistent with the procedures followed by Thomas and Heick, 1973; Lawrence and Cruze, 1981; Brown, 1982; Laakso, 1982; Moreby, 1985; and Olian and Schneier, 1985.

Each of the identified content areas was further sub-divided into topic areas as follows:

1) pre-press operations
   image design
   typesetting and layout
   camera through platemaking operations
   1a) film processes
      line photography
      halftone photography
      color separation

2) press operation
   duplicator (11 x 17 or less)
   sheet-fed offset (larger than 11 x 17)
   letterpress operations

3) post-press operations
   folding
   cutting and trimming
   binding
Interview Technique

The methodology used in this needs assessment was an interview technique. All interviews were conducted by telephone, based on a list of questions prepared by the researcher. As discussed previously, Leinbach (1981), concluded telephone interviews can provide a viable substitute for face-to-face interviews during curriculum planning.

Telephone interviews have been used successfully by a number of needs assessment researchers including Lynch (1983) who used telephone interviews to assess needs in marketing education and the San Lorenzo Valley Unified School District (1985) where telephone interviews were applied in a needs assessment to determine the extent to which parents perceived the schools as meeting their needs.

The questions used in this study were developed in consultation with key informants in the local branch of the Canadian Printing Industries Association, and refined, based on the results of five test interviews.

At the start of each interview, interviewees were told that the aim of the research was to determine appropriate content and topics for a printing curriculum at the community college level for Halifax County. If necessary, questions about the proposed community college were answered by the researcher. After the interviewee agreed to participate in the research, the basic framework of the questionnaire
was explained. This framework involved a series of questions designed to gather demographic information about the type of equipment and number of employees in the interviewee's firm.

The demographic questions were followed by a forced-choice ranking of three major content areas: pre-press operations, press operations, and post-press operations. Each interviewee was asked, "If you were designing a community college printing program for Halifax County and you only had five dollars to spend, how much of your five dollars would you spend in teaching each of these major content areas?"

Forced-choice rankings are common in needs assessment research. Casper and Roecks (1982) used forced-choice rankings based on a level-of-use scale developed by the researchers. Koppel and Isenhour (1986) and numerous other researchers have used a Likert-type scale during the interview process. Palm and Boyer (1979) found forced-choice ranking a useful process for prioritizing items identified through a Delphi technique. The use of a forced-choice ranking based on the division of five dollars is similar to the use of a five point Likert scale. It provides a clear mid-point and has the advantage of being easily understood by participants and efficiently communicated in a telephone interview.

After the interviewees ranked the three major content areas, they were asked a series of questions to prioritize individual topics within the broad content areas. These questions were also a forced-choice ranking, based on dividing up five dollars between the
proposed topics. With this methodology, it was possible to prioritize broad content areas and topic areas within these broad content areas. The complete script for the questionnaire is shown in Appendix A.

Analysis of Data

The data were analyzed to 1) develop a profile of the employment levels and types of equipment used by the firms in the sample; 2) prioritize the major content areas of pre-press, press, and post press; 3) prioritize the topic areas within each of the three major content areas; and 4) determine if there was a correlation between the size of the printing firm and the emphasis placed on each content area and topic area.

Prioritization of Major Content Areas

Descriptive statistics were used to prioritize the three major content areas (pre-press, press, and post-press). Use of descriptive statistics for prioritization is recommended by English and Kaufman, 1975 and has been applied successfully by Zemp (1981), Latshaw (1985), Shodavaram (1983) and many other needs assessment researchers.

Priority ranking was achieved for the importance of each content area by tallying the number of dollars committed to each area by all participants. This number, called the "total dollar commitment" was then divided by the number of participants to derive an "average dollar commitment." This average dollar commitment was expressed
as a percentage of the allotted five dollars to derive a "percentage of emphasis" figure for each content and topic area. The percent of emphasis given each content and topic area by the small firms, the large firms, and the combined sample, was then compared. The content area receiving the highest percentage of emphasis by the combined sample was considered the most important content area. The remaining content areas were ranked in order of importance, based on the percentage of emphasis given to each.

In addition to the three major content areas of pre-press, press, and post-press operations, the priority of topics within the film processes area was also established. While film processes can be classified under the pre-press major content area, during initial research leading to questionnaire development, the area of film processes was identified as a sub-content area deserving particular attention. Many printers in the Halifax area utilize the camera area only for photostats and/or line shots, sub-contracting halftone and color work either to larger printers or to specialized graphic arts service companies. It was felt that prioritizing topics under film processes would give a clearer indication of the local needs and appropriate emphasis in the film processes area.

**Prioritization of Topic Areas**

Individual topics within content areas were prioritized in a manner similar to that used for the prioritization of the three major content areas. That is, the topic which received the highest
percentage of emphasis within a content area was ranked highest, the
remaining topics were ranked according to the percentage of
emphasis allotted to each.

**Correlation of Content Area and Topic Emphasis With Size of Firm**

While initial calculation of the percentage of emphasis given to
each topic provided some information for curriculum development,
Phi correlation tests were used to determine if there was a correlation
between the size of the firm and the emphasis placed on different
content and topic areas. Many correlation tests are available. The Phi
coefficient, according to Hinkle, Wiersman, and Jurs (1979) is a
"special case of the Pearson r when both variables are discrete
dichotomies" (p. 99). The primary advantage of the Phi correlation
test in this research is that it allows statistical analysis of a relatively
small sample size.

For the execution of these tests, large firms were defined as
firms with a standard score of employment one-half standard deviation
or greater (+.50) above the mean level of employment for the sample;
small firms were defined as firms with a standard score of
employment one-half standard deviation or greater (-.50) below the
mean level of employment for the sample. Conversion of raw scores to
standard scores, as demonstrated by Tuckman (1978) "allows a
researcher to adjust scores from absolute to relative to reflect the
relationship between all scores in a group." Equally important,
"standard scores are interval scores, since the standard deviation unit
is a constant interval throughout the scale" (p. 169). The definition of large and small firms as those firms one-half standard deviation in employment above or below the mean level of employment was derived after conversion to standard scores. This definition provided sufficient cell size to employ the Phi correlation tests.

A correlation between emphasis given and firm size was considered important because, while there were more small firms than large firms in the study group, when combined and analyzed as two separate groups, the group of large firms employed many more people than did the group of small firms. It was felt, therefore, that in addition to establishing the priorities given by the total study group to the major content and topic areas, it was necessary to determine if there was a correlation between between the size of the firm and the emphasis given to each content and topic area. Where a correlation was demonstrated, curriculum developers would have decide whether the prioritization given by the larger firms, who would be hiring most of the graduates from the program, should be given more weight during curriculum development than that given by smaller firms who, because of their small size, would be hiring fewer employees.

Research Questions

The following research questions were addressed with the Phi correlation test. Is there a significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on:

1. pre-press operations?
2. press operations?
3. post-press operations?
4. image design?
5. typesetting and layout?
6. stripping through platemaking?
7. line photography?
8. halftone photography?
9. color separation?
10. duplicator press operation?
11. sheet-fed offset press operation?
12. letterpress operation?
13. folding?
14. cutting and trimming?
15. binding?

Each of these research questions was restated in the form of the null hypothesis: There is no significant correlation at the $p = .05$ level between the independent variable (firm size) and the dependent variable (emphasis placed on content area or topic).
CHAPTER 4
RESULTS AND DISCUSSION

Returns

Of the 45 firms in the study group, 8 could not be contacted by phone and were assumed to be out of business. Thus a total of 37 individuals representing 37 different printing firms in Halifax County were contacted during the weeks of March 1, 1988 to March 18, 1988. Of these 37 individuals, 7 (19% of those contacted) refused to participate in the interview. All of the remaining 30 individuals (81% of those contacted) participated fully, responding to all of the questions asked during the interview.

Results of Analysis

Results of the data analysis are reported in two sections. The first section presents demographic information, including the number of employees and types of equipment reported by individuals from the firms in the sample. The second section presents an item analysis of each of the curriculum questions asked during the interviews.

Demographic Data

Employment and Size of Firms

Interviewees in each firm in the sample were asked to give the total number of persons employed in their firm who were involved in
printing production. As shown in Table 1, the total number of persons employed in printing production reported by the 30 firms in the study group was 369; the mean (arithmetic average) of employment was 12.30 employees, with a standard deviation of number of employees of 12.82, and a range of employment of 53. Firms employing 3 employees were the most frequent in the sample and represented the sample mode.

There are no set guidelines for determining the size of a printing firm. However, the number of employees involved in printing production does provide one measure of size. In the third column of Table 1, the deviation from the mean number of employees for the sample has been calculated for each employment level. The 21 firms (70% of the sample) with negative deviations employ below the mean number of employees for the sample; the 9 firms (30% of the sample) with positive deviations employ above the sample mean number of employees. For the purposes of discussing demographic information, the division of firms employing above and below the mean number of employees for the sample will be used to define large and small firms respectively. Using this definition, as seen in Table 1, a firm employing 12 persons or less will be considered a small firm; a firm employing 13 persons or more will be considered a large firm.
Table 1

Employment by Firms in the Study Group

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Employees</th>
<th>Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>3</td>
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<tr>
<td>1</td>
<td>4</td>
<td>-8.30</td>
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<td>4</td>
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<td>-7.30</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
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<tr>
<td>4</td>
<td>7</td>
<td>-5.30</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>-4.30</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>-0.30</td>
</tr>
<tr>
<td>1</td>
<td>13</td>
<td>0.70</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
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<td>40</td>
<td>27.70</td>
</tr>
<tr>
<td>1</td>
<td>55</td>
<td>42.70</td>
</tr>
</tbody>
</table>

Notes.
Number of firms  30
Total employed, all firms  369
Mean number employed, all firms  12.30
Standard deviation of number of employees  12.82
Types of Firms

Interviewees in each firm in the sample were asked, "Would you describe your firm as a full service commercial printer, a job shop, or a quick printer." Definitions for these terms were given as follows:

**Full Service Commercial:** a printer who offers all services from image design through binding, specializes in long runs (over 5,000 copies), and regularly prints process color.

**Job Shop:** a printer who offers limited services in pre-press and bindery, specializes in limited press runs (5,000 copies or less), and does not regularly print process color.

**Quick Printer:** a printer who offers few services in pre-press and bindery, specializes short run printing (1,000 copies or less) with rapid turn-around, and does not regularly print process color.

Table 2 shows that, based on these definitions, 16 firms (53% of the firms in the sample) were identified as full service commercial printers, 11 firms (37% of the sample) as job shops, and 3 firms (10% of the sample) as quick printers.
Table 2

<table>
<thead>
<tr>
<th>Description</th>
<th>No. of Firms</th>
<th>Percent of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full service commercial</td>
<td>16</td>
<td>53</td>
</tr>
<tr>
<td>Job shop</td>
<td>11</td>
<td>37</td>
</tr>
<tr>
<td>Quick printer</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100</td>
</tr>
</tbody>
</table>
Equipment

The number of different types of equipment used in the printing industry is almost limitless. Therefore no attempt was made during this research to identify all of the various makes and models of equipment used by the 30 firms in the sample. Instead, equipment was divided into 3 broad categories, based on the function the equipment performed in the printing process. The three categories used were (1) imaging equipment, (2) other equipment excluding presses, and (3) presses. Definitions for these terms were given as follows:

Imaging Equipment: any electronic equipment used to design and/or produce a print-reproducible image, including computer design and page make-up equipment and computer typesetting equipment.

Other Equipment Excluding Presses: all equipment not used for design/imaging, including camera, stripping, platemaking, folding, cutting, and binding equipment.

Presses: all press equipment used in image transfer excluding xerographic transfer equipment (photocopiers).

Interviewees in each firm in the sample were asked to describe the types of equipment, within these three categories, used by their firm. Table 3 shows the types of equipment reported.
<table>
<thead>
<tr>
<th>Description</th>
<th>No. of Firms (n=30)</th>
<th>Percent of Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Imaging Equipment</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer design and page make-up</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>Computer typesetting</td>
<td>18</td>
<td>60</td>
</tr>
<tr>
<td><strong>Other Equipment Excluding Presses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Camera</td>
<td>25</td>
<td>83</td>
</tr>
<tr>
<td>Stripping area</td>
<td>27</td>
<td>90</td>
</tr>
<tr>
<td>Platemaker</td>
<td>28</td>
<td>93</td>
</tr>
<tr>
<td>Folding equipment</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>Paper cutter</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>Binding</td>
<td>29</td>
<td>97</td>
</tr>
<tr>
<td><strong>Presses</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duplicator</td>
<td>26</td>
<td>87</td>
</tr>
<tr>
<td>Sheet-fed offset</td>
<td>20</td>
<td>67</td>
</tr>
<tr>
<td>Letterpress equipment</td>
<td>11</td>
<td>37</td>
</tr>
</tbody>
</table>
Turning first to the imaging equipment, 18 firms (60%) had some form of typesetting equipment; only 4 firms (13%) had computer imaging and page make-up equipment. Computer imaging and page make-up equipment ranges from microcomputer "desktop publishing" equipment to minicomputer and mainframe computer color graphic work stations. All interviewees indicated that the computer imaging equipment in their firms was microcomputer-based. This type of equipment was used by both large and small firms: 2 of the firms using this type of equipment had 5 and 7 employees respectively, the remaining 2 firms had 26 and 30 employees respectively.

All of the firms using microcomputer imaging equipment also had traditional typesetting equipment. Of the 30 firms in the sample, 12 (40%) had no typesetting or imaging equipment. All of these firms either sub-contracted typesetting and imaging services, or accepted only camera-ready copy from their customers.

Regarding other equipment exclusive of presses, all of the firms in the sample reported having some type of folding equipment and paper cutting equipment. Only one firm, a quick printer, had no binding equipment. Five firms reported that they did not have a camera. All of these 5 firms had between 3 and 7 employees. Three firms reported that they did not have a stripping area and 2 that they did not have a platemaker. Each of these firms had less than 7 employees. Each indicated that they sub-contracted all camera, stripping and platemaking services.
All of the firms contacted indicated that they had some type of printing press. No attempt was made to itemize the type or number of presses in use in each firm. Instead, press equipment was divided into duplicator presses (maximum press sheet size 11" x 17"), sheet-fed offset presses (maximum sheet size greater than 11" x 17"), and letterpress equipment.

The division of lithographic presses into duplicator and offset sizes is common in the industry. This division provides an indication of the type of work that the printer does: duplicator presses are not typically used for high quality process color printing, as are larger offset presses. Of the 30 firms contacted, 16 (53%) indicated that they had both duplicator and offset presses; 10 firms (33%) that they had only duplicator presses, and 4 firms (13%) that they had only offset presses.

Letterpress equipment was quite evident in the sample, with 11 firms (36%) indicating that they had some type of letterpress equipment. All of these firms had letterpress equipment along with either duplicator or offset presses, and the presence of letterpress equipment was not limited to small firms. Of the 11 firms with letterpress equipment, only 6 had 12 employees or less.

Individuals from all of the firms with letterpress equipment reported that this equipment was used for ancillary printing operations such as scoring, embossing, die cutting, or numbering. Only 5 of the 11 firms with letterpress equipment indicated that they
used this equipment for printing with metal type. Each of these 5 firms was classified as a job shop.

**Curriculum Questions**

Representatives from each firm in the sample were asked a series of questions to elicit information about the emphasis they would place on various aspects of a printing curriculum. Each participant was asked "If you had only five dollars to spend on the following content areas (or topics), how would you divide your five dollars between them?" During data analysis, the dollar amounts devoted to each content area or topic were totalled into a "total dollar commitment." This figure was then divided by the total number of participants (n=30) to derive an "average dollar commitment" for each content area and topic. The average dollar commitment was then converted to a percentage of five dollars. This percentage figure represents the emphasis that the whole sample placed on any single content area or topic, as shown in Table 4.
Table 4

Emphasis in Curriculum

<table>
<thead>
<tr>
<th>Description</th>
<th>Commitment Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printing content areas</td>
<td></td>
</tr>
<tr>
<td>Pre-press</td>
<td>0.33</td>
</tr>
<tr>
<td>Press</td>
<td>0.45</td>
</tr>
<tr>
<td>Post-press</td>
<td>0.22</td>
</tr>
<tr>
<td>Pre-press operations</td>
<td></td>
</tr>
<tr>
<td>Image design</td>
<td>0.29</td>
</tr>
<tr>
<td>Typesetting and layout</td>
<td>0.37</td>
</tr>
<tr>
<td>Stripping through platemaking</td>
<td>0.34</td>
</tr>
<tr>
<td>Press operation</td>
<td></td>
</tr>
<tr>
<td>Duplicator</td>
<td>0.38</td>
</tr>
<tr>
<td>Sheet fed offset</td>
<td>0.54</td>
</tr>
<tr>
<td>Letterpress</td>
<td>0.08</td>
</tr>
<tr>
<td>Post-press operations</td>
<td></td>
</tr>
<tr>
<td>Folding</td>
<td>0.35</td>
</tr>
<tr>
<td>Cut and trim</td>
<td>0.34</td>
</tr>
<tr>
<td>Binding</td>
<td>0.32</td>
</tr>
</tbody>
</table>
While the average dollar and percent commitment to each of the content areas and topics listed above does provide some guidelines for curriculum development, such guidelines have one potential drawback. In giving equal weight to the emphasis given to content areas and topics by both large and small firms, the average dollar and percent commitment may not accurately reflect the needs of the largest employers and, thus, may fail to identify the appropriate skills required by the greatest number of graduates. In the sample studied, for example, the 22 "smaller" firms (identified in Table 1 as having 13 employees or less) employed a total of 132 people in printing production. The 8 "larger" firms (identified in Table 1 as having 15 employees or more) employed a total of 237 people in printing production, more than twice the number employed by the smaller firms. It seems logical that a curriculum should prepare graduates for the largest employment market, represented in the sample as the largest printing firms.

No mathematical formula was used for weighting the emphasis given to a content areas or topics based on the size of the firm. However, it is important for the curriculum developer to recognize the different emphasis given by large and small employers to the content areas and topics offered in the curriculum. If, for example, the largest employers express a different emphasis for content areas and topics than the smallest employers, curriculum must reflect this bias, and prepare graduates for the greatest potential employment market.
To determine whether large firms placed different content and topic emphasis than small firms, correlation tests were executed on each content and topic area. These tests helped determine if there was a correlation between firm size and the emphasis placed on each content or topic area. To execute these tests, the definition of "large" and "small" printing firms in the sample was refined.

Recall that in foregoing discussion of demographic information, large firms were defined as those firms employing above the mean number of employees for the sample; small firms were defined as those firms employing below the mean number of employees for the sample. While this definition of large and small is acceptable, its weakness is that large and small firms are only differentiated by the presence or absence of one or two additional employees. In the case of the sample data, based on employment above or below the mean employment level for the sample, a firm with 13 or less employees was considered small, one with 15 or more employees was considered large.

A definition which more accurately differentiates between large and small firms can be based on the number of standard deviations above and below the mean standard score of employment. In the following correlation tests, therefore, a large printing firm will be defined as one with a standard score of employment one-half standard deviation or greater (+.50) above the mean; a small firm will be defined as one with a standard score of employment one-half standard deviation or greater (-.50) below the mean. This definition has the
advantage of locating only the tails of the distribution, thus providing a clearer differentiation between large and small firms.

Using this definition for large and small firms, as shown in Table 5, those firms employing 22 or more persons (n=6), fell one-half standard deviation or more above the mean standard score of employment for the sample; those firms employing 5 or less persons (n=12), fell one-half standard deviation or more below the mean standard score of employment for the sample.
<table>
<thead>
<tr>
<th>Frequency</th>
<th>Number of Employees</th>
<th>Standard Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>3</td>
<td>-0.73</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>-0.65</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>-0.57</td>
</tr>
<tr>
<td>1</td>
<td>6</td>
<td>-0.49</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>-0.41</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
<td>-0.34</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>-0.02</td>
</tr>
<tr>
<td>1</td>
<td>13</td>
<td>0.05</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>0.21</td>
</tr>
<tr>
<td>1</td>
<td>22</td>
<td>0.76</td>
</tr>
<tr>
<td>1</td>
<td>25</td>
<td>0.99</td>
</tr>
<tr>
<td>1</td>
<td>30</td>
<td>1.38</td>
</tr>
<tr>
<td>1</td>
<td>35</td>
<td>1.77</td>
</tr>
<tr>
<td>1</td>
<td>40</td>
<td>2.16</td>
</tr>
<tr>
<td>1</td>
<td>55</td>
<td>3.33</td>
</tr>
</tbody>
</table>
In what follows, the emphasis placed on each content and topic area by the total sample is reported. The Phi correlation test was applied to determine if there was a correlation between firm size, based on employment, and degree of emphasis placed on content and topic areas. In each Phi test below, the large firms were defined as those firms which employ one-half standard deviation or more above the mean standard score of employment for the sample. Small firms were defined as those firms employing one-half standard deviation or more below the mean standard score of employment for the sample. Using this definition for large and small firms, there were 12 small firms and 6 large firms in the sample.

Above average emphasis was defined as those firms which indicated above the average dollar commitment given by the combined firms in the sample to a content area or topic. Below average emphasis was defined as those firms which indicated below the average dollar commitment given by the combined firms in the sample to a content area or topic. The formula given by Hinkle, et. al. (1979) was used for the Phi correlation test. The critical value of the Phi correlation test statistic for significance with a two-tailed Phi test at the $p = .05$ level with $n-1$ degrees of freedom is 0.468, where $n=18$.

**Printing Content Areas**

Each participant was asked to indicate the emphasis that they would place on each of the three major content areas of pre-press,
press, and post-press. Definitions for these terms were given as follows:

**Pre-press:** all operations required to provide a press-ready image, including image design, image generation, image layout, camera work, stripping and image assembly, and platemaking.

**Press:** all operations required to transfer the image from the image carrier (plate) to the substrate.

**Post-press:** all operations occurring after image transfer, including, but not limited to, trimming, folding, scoring, embossing, numbering and labelling.

Results from this question are shown in Table 6.
<table>
<thead>
<tr>
<th>Description</th>
<th>Amount (%)</th>
<th>Amount (%)</th>
<th>Amount (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-press</td>
<td>1.66 (33)</td>
<td>1.44 (29)</td>
<td>1.65 (33)</td>
</tr>
<tr>
<td>Press</td>
<td>2.47 (49)</td>
<td>2.11 (42)</td>
<td>2.27 (45)</td>
</tr>
<tr>
<td>Post-press</td>
<td>0.87 (17)</td>
<td>1.44 (29)</td>
<td>1.08 (22)</td>
</tr>
</tbody>
</table>
As shown in Table 6, all firms combined placed 33% emphasis on teaching pre-press operations, 45% on press operations, and 22% on post-press operations. The small firms placed more emphasis on teaching pre-press and press operations than did the large firms, and less emphasis on teaching post-press operations than did the large firms. In terms of the data from all firms combined, the curriculum should emphasize press more than pre-press operations, with the least emphasis placed on post-press operations.

The Phi correlation for each of these three areas is reported below. Three hypotheses were explored, as follows:

1. There is no significant correlation at the \( p = .05 \) level between the size of the firm and the emphasis placed on pre-press operations.

2. There is no significant correlation at the \( p = .05 \) level between the size of the firm and the emphasis placed on press operations.

3. There is no significant correlation at the \( p = .05 \) level between the size of the firm and the emphasis placed on post-press operations.

Contingency tables and Phi test results for each of these areas follow.
Table 7
Contingency Table: Pre-Press Operations

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Value of Phi = 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical value of the test statistic = 0.468</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Findings: The null hypothesis was not rejected. There was no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on pre-press operations.
Table 8
Contingency Table: Press Operations

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>7</td>
<td>4</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Value of Phi</td>
<td>0.0806</td>
<td></td>
</tr>
<tr>
<td>Critical value of the test statistic</td>
<td>0.468</td>
<td></td>
</tr>
</tbody>
</table>

Findings: The null hypothesis was not rejected. There was no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on press operations.
Table 9
Contingency Table: Post-Press Operations

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>10</td>
<td>2</td>
</tr>
</tbody>
</table>

Value of Phi = 0.866

Critical value of the test statistic = 0.468

Findings: The null hypothesis was rejected. There was a significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on post-press operations.
Pre-Press Operations

Each participant was asked to indicate the emphasis that they would place on each of the three major topic areas of image design, typesetting and layout, and stripping through platemaking within the pre-press operations content area. Definitions for these terms were given as follows:

**Image Design**: all creative aspects of image design, including the production of thumbnail and rough sketches and comprehensives, whether created as hard copy or through the use of an electronic workstation.

**Typesetting and Layout**: all manual aspects of typesetting and laying out the image so that it is in a print-reproducible condition.

**Stripping Through Platemaking**: all aspects of film-based image assembly and transfer of the image from a film flat to a printing plate.

Results from this question are shown in Table 10.
Table 10

<table>
<thead>
<tr>
<th>Description</th>
<th>Average Commitment</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small Firms (n=12)</td>
<td>Large Firms (n=6)</td>
<td>All Firms (n=30)</td>
</tr>
<tr>
<td>Image design</td>
<td>1.26 (25)</td>
<td>1.36 (27)</td>
<td>1.47 (29)</td>
</tr>
<tr>
<td>Typesetting and layout</td>
<td>2.10 (42)</td>
<td>1.22 (24)</td>
<td>1.85 (37)</td>
</tr>
<tr>
<td>Stripping through platemaking</td>
<td>1.64 (33)</td>
<td>2.42 (48)</td>
<td>1.68 (34)</td>
</tr>
</tbody>
</table>
As shown in Table 10, all firms combined placed 29% emphasis on teaching image design, 37% on typesetting and layout, and 22% on stripping through platemaking. The small firms placed slightly less emphasis on teaching image design than did the large firms, more emphasis on teaching typesetting and layout than did the large firms, and less emphasis on teaching stripping through platemaking than did the large firms. In terms of the data from all firms combined, the curriculum should emphasize typesetting and layout equally with stripping through platemaking, with the least emphasis placed on image design.

The Phi correlation for each of these three topics is reported below. Three hypotheses were explored, as follows:

1. There is no significant correlation at the $\phi = .05$ level between the size of the firm and the emphasis placed on image design.

2. There is no significant correlation at the $\phi = .05$ level between the size of the firm and the emphasis placed on typesetting and layout.

3. There is no significant correlation at the $\phi = .05$ level between the size of the firm and the emphasis placed on stripping through platemaking.

Contingency tables and Phi test results for each of these topics follow.
Table 11

Emphasis on Image Design Topic Areas

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Value of Phi = 0.0791</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical value of the test statistic = 0.468</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Findings:** The null hypothesis was not rejected. There was no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on image design.
Table 12
Emphasis on Typesetting and Layout Topic Areas

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>

Value of Phi = -0.471

Critical value of the test statistic = 0.468

Findings: The null hypothesis was rejected. There was a significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on typesetting and layout.
<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
<td>Value of Phi = 0.1612</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical value of the test statistic = 0.468</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Findings:** The null hypothesis was not rejected. There was no significant correlation at the \( p = .05 \) level between the size of the firm and the emphasis placed on stripping through platemaking.
**Film Processes**

Each participant was asked to indicate the emphasis that they would place on each of the three major topic areas of line photography, halftone photography, and color separation within the film processes content area. Definitions for these terms were given as follows:

**Line Photography:** conversion of an image, color or black and white; monotone, multiple tone, or continuous tone; into a high contrast, monotone film image for printing in a single tone.

**Halftone Photography:** conversion of a continuous tone, color or black and white image into a high contrast, halftone film image for printing as a halftone.

**Color Separation:** conversion of a continuous tone color image into four high contrast halftone film images, each of which is used to print one color needed in four color process printing.

Results from this question are shown in Table 14.
Table 14
Emphasis on Film Processes Topic Areas

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount (%)</th>
<th>Amount (%)</th>
<th>Amount (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line</td>
<td>2.84 (57)</td>
<td>2.10 (42)</td>
<td>2.31 (46)</td>
</tr>
<tr>
<td>Halftone</td>
<td>1.34 (27)</td>
<td>1.81 (36)</td>
<td>1.72 (34)</td>
</tr>
<tr>
<td>Color separation</td>
<td>0.82 (16)</td>
<td>1.08 (22)</td>
<td>0.97 (19)</td>
</tr>
</tbody>
</table>
As shown in Table 14, all firms combined placed 46% emphasis on teaching line photography, 34% on halftone photography, and 19% on color separation. The small firms placed more emphasis on teaching line photography than did the large firms, but less emphasis on teaching halftone photography and color separation than did the large firms. In terms of the data from all firms combined, the curriculum should emphasize line photography more than halftone photography, with the least emphasis on color separation.

The Phi correlation for each of these three topics is reported below. Three hypotheses were explored, as follows:

1. There is no significant correlation at the $\rho = .05$ level between the size of the firm and the emphasis placed on line photography.
2. There is no significant correlation at the $\rho = .05$ level between the size of the firm and the emphasis placed on halftone photography.
3. There is no significant correlation at the $\rho = .05$ level between the size of the firm and the emphasis placed on color separation.

Contingency tables and Phi test results for each of these areas follow.
Table 15
Contingency Table: Line Photography

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Value of Phi = -0.395</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical value of the test statistic = 0.468</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Findings: The null hypothesis was not rejected. There was no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on line photography.
<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Value of Phi = 0.50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical value of the test statistic = 0.468</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Findings:** The null hypothesis was rejected. There was a significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on halftone photography.
Table 17
Contingency Table: Color Separation

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Value of Phi = -0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical value of the test statistic = 0.468</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Findings: The null hypothesis was not rejected. There was no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on color separation.
Press Operation

Each participant was asked to indicate the emphasis that they would place on each of the three major topic areas of duplicator press operation, sheet-fed offset press operation, and letterpress press operation within the press operation content area. Definitions for these terms were given as follows:

**Duplicator Press Operation**: operation of an offset press for which the maximum sheet size is 11" x 17" or smaller.

**Sheet-fed Offset Press Operation**: operation of an offset press for which the maximum sheet size is larger than 11" x 17".

**Letterpress Operation**: operation of a relief press designed for image transfer through the use of a metal relief image.

Results from this question are shown in Table 18.
Table 18
Emphasis on Press Operation Topic Areas

<table>
<thead>
<tr>
<th>Description</th>
<th>Small Firms (n=12)</th>
<th>Large Firms (n=6)</th>
<th>All Firms (n=30)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplicator</td>
<td>2.00 (40)</td>
<td>1.42 (28)</td>
<td>1.89 (38)</td>
</tr>
<tr>
<td>Offset Press</td>
<td>2.42 (48)</td>
<td>3.38 (68)</td>
<td>2.69 (54)</td>
</tr>
<tr>
<td>Letterpress</td>
<td>0.58 (12)</td>
<td>0.21 (4)</td>
<td>0.42 (8)</td>
</tr>
</tbody>
</table>
As shown in Table 18, all firms combined placed 38% emphasis on teaching duplicator press operation, 54% on sheet-fed offset press operation, and 8% on letterpress operation. The small firms placed more emphasis on teaching duplicator press and letterpress operation than did the large firms, but less emphasis on teaching sheet-fed offset press than did the large firms. In terms of the data from all firms combined, the curriculum should emphasize sheet-fed offset press operation more than duplicator press operation, with little emphasis on letterpress operation.

The Phi correlation for each of these three topics is reported below. Three hypotheses were explored, as follows:

1. There is no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on duplicator press operation.

2. There is no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on sheet-fed offset press operation.

3. There is no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on letterpress operation.

Contingency tables and Phi test results for each of these areas follow.
Table 19
Contingency Table: Duplicator Press Operations

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Value of Phi = -0.158</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical value of the test statistic = 0.468</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Findings: The null hypothesis was not rejected. There was no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on duplicator press operation.
Table 20

Contingency Table: Sheet-Fed Offset Press Operations

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>6</td>
<td>4</td>
</tr>
</tbody>
</table>

Value of Phi = -0.158

Critical value of the test statistic = 0.468

Findings: The null hypothesis was not rejected. There was no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on sheet-fed offset press operation.
### Table 21
**Contingency Table: Letterpress Operation**

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

Value of Phi = -0.081

Critical value of the test statistic = 0.468

**Findings:** The null hypothesis was not rejected. There was no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on letterpress operation.
Post-Press Operations

Each participant was asked to indicate the emphasis that they would place on each of the three major topic areas of folding, cutting and trimming, and binding within the post-press operations content area. Definitions for these terms were given as follows:

**Folding:** operations of equipment which folds the substrate on which an image is printed.

**Cutting and Trimming:** operation of equipment which cuts or trims paper to size, generally through the use of an electric shear.

**Binding:** operation of equipment which binds individual sheets of paper together through staples, tape, adhesives, wire, or thread.

Results from this question are shown in Table 22.
Table 22
Emphasis on Post-Press Operation Topic Areas

<table>
<thead>
<tr>
<th>Description</th>
<th>Average Commitment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Small Firms (n=12)</td>
</tr>
<tr>
<td>Folding</td>
<td>1.57 (31)</td>
</tr>
<tr>
<td>Cutting and trimming</td>
<td>1.90 (38)</td>
</tr>
<tr>
<td>Binding</td>
<td>1.53 (31)</td>
</tr>
</tbody>
</table>
As shown in Table 22, all firms combined placed 35% emphasis on teaching folding, 34% on cutting and trimming, and 32% on binding. The small firms placed more emphasis on teaching cutting and trimming than did the large firms, but less emphasis on teaching folding and binding than did the large firms. In terms of the data from all firms combined, the curriculum should provide equal emphasis on all three post-press areas.

The Phi correlation for each of these three topics is reported below. Three hypotheses were explored, as follows:

1. There is no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on folding.
2. There is no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on cutting and trimming.
3. There is no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on binding.

Contingency tables and Phi test results for each of these areas follow.
Table 23
Contingency Table: Folding

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>9</td>
<td>3</td>
</tr>
</tbody>
</table>

Value of Phi = 0.25

Critical value of the test statistic = 0.468

Findings: The null hypothesis was not rejected. There was no significant correlation at the $p = .05$ level between the size of the firm and the emphasis placed on folding.
Table 24
Contingency Table: Cutting and Trimming

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>8</td>
<td>3</td>
</tr>
</tbody>
</table>

Value of Phi = 0.1612
Critical value of the test statistic = 0.468

Findings: The null hypothesis was not rejected. There was no significant correlation at the $\alpha = .05$ level between the size of the firm and the emphasis placed on cutting and trimming.
Table 25
Contingency Table: Binding

<table>
<thead>
<tr>
<th></th>
<th>Small Firms</th>
<th>Large Firms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above Average Emphasis</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Below Average Emphasis</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Value of Phi = 0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critical value of the test statistic = 0.468</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Findings:** The null hypothesis was not rejected. There was no significant correlation at the \( p = .05 \) level between the size of the firm and the emphasis placed on binding.
CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS

Needs Assessment as a Technique for Curriculum Development

One of the areas of interest in this research was determining whether needs assessment offers a viable technique for curriculum development. After considerable time and effort reviewing needs assessment techniques, then selecting an appropriate technique for this study, this researcher has concluded that needs assessment does provide a viable technique for curriculum development. The technique allows the researcher to directly ascertain the needs of some or all of the educational partners. In addition to this benefit, a needs assessment which utilizes the interview technique and relies on information from key informants, as does this study, offers the advantages mentioned by Koppel and Isenhour (1986): it helps develop a sense of commitment to the study results by the key informants because of their participation in the study, it offers the ability to collect and analyze data within a relatively short period of time, and it strengthens the lines of communication among professionals in the area. Indeed, one of the tangible and immediate results of this study has been a renewed commitment on the part of the Nova Scotia Printers Association to sponsor and evaluate printing education at all levels in the province. All of the professionals expressing this commitment served as interviewees in this study.
The methodology for this study was a telephone interview technique utilizing a questionnaire developed on the basis of in-person interviews with key individuals in the printing profession. The review of literature indicated that this methodology was both effective and efficient. After conducting this research, this researcher would agree that the telephone interview technique is both effective and efficient. As suggested in the literature review, this methodology does provide a fairly high return rate. In this research, the return rate was 81%, considerably higher than the return rates achieved by needs assessment researchers utilizing a written questionnaire technique (Witkin, 1977). In addition, the telephone interview allowed interview participants to add additional information which is typically not possible with a written questionnaire. In this research, for example, the researcher derived much information related to existing printing programs across Canada, the specific needs of Nova Scotia printers which professionals felt were different from the needs of printers elsewhere in the nation, and even information leading to possible donations of equipment for teaching printing and a list of professionals anxious to participate in program development and recruit program graduates.

Curriculum Guidelines

As a result of this study, several guidelines are proposed below for development of a community college level printing curriculum for the Halifax County Community College.
Broad Content Areas

It is clear from both the demographic data collected and the commitment indicated to the three major content areas of pre-press, press, and post-press, that the highest priority in the curriculum should be placed on press operation. Within these three broad areas, there was no correlation between the size of the firm and the emphasis placed on pre-press or press operation, but there was a correlation between the size of the firm and the emphasis placed on post-press operations. One possible reason for these correlations is that all printers offer some type of press operations and most large and small printers offer some type of pre-press operations. Smaller printers, however, tend to offer little in the post-press area, thus they may not place as high a priority on this area as would large printers. This researcher recommends, however, that despite the lower priority given to post-press operations by small as compared to large printers, during curriculum development, post-press operations be given an emphasis consistent with the prioritization indicted by the large printers in the sample. This emphasis will help prepare graduates to work for the largest printers who will require the greatest number of employees. Thus in terms of the areas of pre-press, press, and post-press, almost half of the curriculum content should be devoted to press operations, with the remaining content divided evenly between pre-press and post-press operations.
**Topic Areas**

**Pre-Press Operations**

The three topic areas of image design, typesetting and layout, and stripping through platemaking were given almost equal priority by the sample as a whole. In image design and stripping through platemaking topic areas no correlation was found between the size of the firm and the emphasis placed on the topic. Correlation was found between size of firm and emphasis placed on image design. Thus the curriculum should follow the prioritization given by the sample as a whole, with approximately equal emphasis placed on the three topics of image design and stripping through platemaking. However, as mentioned previously, consideration must be given to the curricular emphasis to be placed on typesetting and layout with regard to the number of graduates required by the larger, as opposed to the smaller firms.

Special mention should be given to the teaching of microcomputer "desktop publishing" operations. While only 4 firms in the sample indicated that they had this type of equipment, during the interview process many printers indicated that they were looking into this type of equipment either as a replacement for traditional typesetting equipment, or as a means of providing design services that they currently could not provide. These individuals indicated fairly strong support for an image design curriculum component based entirely on electronic design with desktop publishing equipment.
Film Processes

Of the topic areas in film processes, line photography was given the highest priority by both large and small printing firms, halftone photography was given less priority, and color separation was given least priority. On these topics, there was no correlation between firm size and the priority given to line photography or color separation, but there was a significant correlation between firm size and the priority placed on halftone photography. Again, the larger firms tended to give halftone photography a higher priority than did the smaller firms. While it is true that many smaller firms do not offer halftone photography as a service to their customers, this researcher concludes that the curriculum should reflect the prioritization given the film processes topics by the larger firms. Again, the reason for this recommendation is that the larger firms would be likely to hire graduates skilled in halftone photography, even if the smaller firms did not need graduates with this skill. Thus, in coursework related to film processes, almost half of the curriculum should be devoted to line photography, about one-third to halftone photography, and the remainder to color separation.

During the interview process, all interviewees mentioned that there is no color separation done in the province, and that the population of the province, and thus the demand for color separation, probably mitigated against the acquisition of color separation equipment or the development of a color separation facility in the province. However, many printers indicated that a knowledge of color
separation was important in the pre-press processes, in press operation, and in customer service and estimating. This would indicate that the coursework on color separation should reflect conceptual understandings of what color separation is and how it is done, including some information on evaluating color separations when diagnosing stripping, platemaking, and press problems.

Press Operation

All firms combined placed the highest priority on teaching offset press operation, with less emphasis on teaching duplicator press operation and very little emphasis on teaching letterpress operation. The smaller printers tended to place more emphasis on duplicator press operation than did the larger printers, but there was no significant correlation between firm size and the priority of either duplicator press operation, offset press operation, or letterpress operation. During the interview process, most printers agreed that duplicator press operation should be taught before offset press operation, and would serve as a solid basis for teaching the larger offset presses. Following the data gathered from the whole sample, duplicator press operation should represent approximately one-third of the press curriculum, offset press operation approximately one-half of the curriculum, with only a small amount of coursework devoted to letterpress operation.

In regard to letterpress operation, based on information received during the interviews, the focus of letterpress coursework
should be on ancillary operations such as scoring, embossing, and numbering, rather than the primary process of printing with metal-based type. While letterpress printing with metal-based type is still done in small job shops in the province, the primary use for letterpress indicated by all printers was in these ancillary processes.

**Post-press Operations**

Three topic areas were considered in the post-press content area: folding, cutting and trimming, and binding. Each of these topics was given almost equal emphasis by the large printers, the small printers, and the combined sample. There was no correlation between firm size and the priority given to any of these topics in the post-press content area. Thus this researcher recommends that the curriculum priority given to the three post-press topics reflect the equal priority of each given by the combined sample.

**Recommendations for Further Study**

Curriculum development is an evolutionary process. This needs assessment can serve as the basis for initial curriculum development for a community college level program for Halifax County. However, to remain valid the curriculum so developed must be subjected to continual study leading to improvement. Thus this researcher offers the following recommendations:
1. A curriculum be developed with emphasis on content areas and topics based on the guidelines derived from the data collected in this study.

2. Once developed, the curriculum should be submitted to a panel of experts, consisting of printing professionals and professionals in the field of printing education.

3. That the curriculum be implemented on a three year trial basis in the Halifax County Community College.

4. That after the three year trial, the curriculum be evaluated by an expert panel consisting of professionals in the field who have hired graduates from the curriculum, professionals involved in curriculum delivery, and graduates of the curriculum.

5. That, based on this three year evaluation, the curriculum be modified to better meet the needs which for which it was initially developed and to incorporate new needs which have become apparent since initial curriculum development.

6. That a ten year longitudinal study be conducted of program graduates to determine the impact of the curriculum on long-term success in their printing careers.

This cycle of curriculum development, implementation, evaluation, and modification is consistent with curriculum development theories.
expressed by leading needs assessment researchers and can provide an effective method for continual curriculum updating and vitalization.
LITERATURE CITED


Leinbach, R. M. Alternatives to the fact-to-face interview for collecting gerontological needs assessment data. *Gerontologist. 22*(1), 78-82.


Belmont, California: Fearon Publishers.


APPENDIX A
QUESTIONNAIRE

Introduction

"Hello, my name is Lloyd Rieber. As you may have heard, Nova Scotia is starting a community college system and the first community college is to be located in Halifax County. My interest in the community college system is in developing a possible curriculum for printing education to be taught at the proposed Halifax County Community College. If possible, I'd like to ask you some questions about what content and topics you think are important for printing education in Halifax County. Can you spare me a few minutes of your time?"

If no, thank participant and hang up.

If yes.

"Thank you. As I said, I am trying to determine what Halifax County printers would consider the important printing content and topic areas for a community college printing program. To get your opinion, I am going to ask you a few questions."

Demographic Questions

"First I want to get an idea of the type printing that you do and the type of equipment that you use in your business:"
Question 1: "Would you describe your firm as a full service commercial printer, a job shop, or a quick printer. To clarify, here's what I mean by full service commercial, job shop, and quick printer."

Definitions:
Full Service Commercial: a printer who offers all services from image design through binding, specializes in long runs (over 5,000 copies), and regularly prints quality process color.
Job Shop: a printer who offers limited services in pre-press and bindery, specializes in limited press runs (5,000 copies or less), and does not regularly print process color.
Quick Printer: a printer who offers few services in pre-press and bindery, specializes short run printing (1,000 copies or less) with rapid turn-around, and does not regularly print process color.

Question 2: "Do you have equipment for:
   a. computerized design and page layout
   b. computer typesetting"

Question 3: "Do you have:
   a. a process camera
   b. a stripping area
   c. a platemaker
   d. any folding equipment
Question 4: "Do you have:

a. a duplicator press (11 x 17 or smaller)
b. a sheet fed offset press (larger than 11 x 17)
c. any letterpress equipment"

Question 5: "How many employees in your firm are involved in printing production."

Curriculum Questions

"Good, that information will give me an idea of who you are and what you do. Now I am going to ask you to think along with me about a possible printing program. One of the things that we have to do when developing a program is decide how much emphasis should be given to various topics in the program. That's what I want you to help me with."

Question 6: "For example, most printing programs can be divided into three major content areas: pre-press operations, press operations, and post-press operations. If you were designing a community college printing curriculum for the Halifax area, how much emphasis would you give to each of these topics? What I've been doing with most of the
printers that I have talked to is asking them, 'if you were designing a curriculum and you only had five dollars to spend between the areas of:

- a. pre-press,
- b. press, and
- c. post-press operations

how would you divide your five dollars up between these three areas?'

**Question 7:** "Looking for a moment at just the pre-press operations, most printing programs divide the pre-press area into:

- a. the creative aspects of image design and typography
- b. the operations of typesetting, layout and paste-up, and
- c. camera through platemaking operations

If you were given only five dollars to spend on these three areas, how would you divide the five dollars up between them?"

**Question 8:** "Let's focus for a moment on film processes. Most printing programs divide work with film processes into the three areas of:

- a. line photography
- b. halftone photography, and
- c. color separation techniques and processes.

If you were given only five dollars to spend on these three areas, how would you divide the five dollars up between them?"


Question 9: "All printing programs teach some sort of press operation. Most divide this area up into teaching:
   a. duplicator press operation
   b. sheet-fed press operation, and
   c. letterpress press operation.
If you were given only five dollars to spend on these three areas, how would you divide the five dollars up between them?"

Question 10: "Finally, I want to look at the last area, that of post-press operations. This area includes everything that can be done to the job after it leaves the press and, in most printing programs, is divided up into the three areas of:
   a. folding
   b. cutting and trimming, and
   c. binding
If you were given only five dollars to spend on these three areas, how would you divide the five dollars up between them?"

"Thank you very much, that's all of the questions that I have for you right now. If this study starts the development of a community college program for Halifax, I may be calling you again for more information, if you don't mind"
A Note About The Questionnaire

While the questionnaire, as it appears above, is quite structured, actual presentation of the questionnaire was less formal than indicated in the written script. Each of the questions were asked, essentially as it is written above. However, some participants had difficulty identifying emphasis by dividing up a theoretical five dollars. These individuals were allowed to express emphasis on a percentage, rather than a dollar basis. The percentage allotment in each category was then be converted to a dollar commitment by multiplying five dollars by the percentage commitment indicted in each category.
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4/81 — 9/81 Research Associate: Standards Project Grant
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Member of the following academic honor societies:  
Eta Kappa Omega (6/70, Economics)  
Phi Beta Kappa (1/71, National)  
Epsilon Pi Tau (5/73, Industrial Arts)  
Phi Delta Kappa (5/77, Education)

WRITING:  
Textbooks  
Adams, Faux, & Rieber, Printing Technology, 3rd ed. © 1988,  
Delmar Publishers, Albany, NY  
Funk and Rieber, Handbook of Welding, © 1985,  
Breton Publishers, Boston, MA