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THE DEVELOPMENT AND TESTING OF AN INNOVATIVE TOTAL PROGRAM EVALUATION SCHEMA FOR INDUSTRIAL ARTS EDUCATION

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

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1970

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CHAPTER I

INTRODUCTION

Curriculum evaluation in industrial arts education has been a rather nebulous task. This possibly could be due to the diverse and fragmented nature in which industrial arts is found in our educational institutions. Various self-appointed experts, study groups, and popular educational curriculum philosophers have added confusion to the conglomerate content and methods by stating their ways are the answer to all industrial arts curricular problems (Sommers and Face, 1966, pp. 22-27). When one tries to determine logical and valid support for the propositions set forth he usually finds unsystematic, non-rational, and intuitive curriculum evaluation. Therefore, it is apparent that there is a need for total program evaluation based on a rational, systematic, and logical foundation if informed decisions are to be made.

Traditionally, industrial arts has tried to keep pace with the dynamics of an advancing technological society through the addition of new tools, new materials, new courses, or new facilities. Obviously, this approach has
only led to still greater confusion, for the relationship between what curriculum is being taught in industrial arts shops and what modern industry is doing lacks congruence. A hypothesis could be drawn from this incongruence that the evaluators are not questioning enough of the variables (such as the industrialist in the community) to gain adequate information for making changes in the program.

Recently revolutionary curriculum reforms have been inaugurated to solve this incongruence by developing programs that reflect the concepts of modern industry. Nevertheless, even these new curricula are not satisfactory to some who are clamoring for a supposedly more relevant curriculum that teaches the understanding and insights of industry through the study of industrial occupations (Stadt, 1969, pp. 21-22). In addition, many teachers still believe in the traditional trade-oriented curriculum.

In each of these different curriculum types total program evaluation has been basically lacking. As a result the right questions are not being asked to determine where the exact operational strengths and weaknesses of each curriculum lies. The crux of the impediment is in the inadequacy of evaluative procedures, instruments, and applicable models which are needed to provide useful information on alternatives for aiding the educational consumer in making logical and rational decisions (Guba and Stufflebeam, 1968, p. 8).
Dr. Howard Merriman (1969), Director of the Department of Evaluation and Research, Columbus (Ohio) Public Schools makes this comment:

The educational community faces unprecedented challenges and change as it answers the what, why, and how questions of public education. During and emerging from these efforts, educational leadership will take the form of facilitating rather than directing the critical tasks of teaching and learning. Evaluation is one of the expanding provinces of knowledge which can help both the educational community in answering its questions and the educational leadership in facilitating teaching and learning tasks (p. 85).

Industrial arts education needs answers to questions about the strengths and weaknesses of various types of curricula operating under different learning situations. With such answers, makers can make an informed choice among alternative programs.

Statement of the Problem

The study of industrial arts has been included as a vital part of the secondary school program. Nevertheless, certain members of the industrial arts profession, parents, and administrators have challenged the growing gap between what industrial arts ought to be teaching and what it is teaching on grounds of obsolescence, irrelevance, and accountability (Feirer, 1970, p. 29). Householder and Suess (1969) state that criticism has come from both within the profession and from without because the discrepancy exists between stated objectives and the content of industrial arts programs (pp. 41-42).
Possibly even a greater criticism is the difficulty the industrial arts profession has in adequately conceptualizing its uniqueness as a worthwhile body of knowledge in a changing technological society.

A description of evaluative activities in industrial arts shows many inadequacies. Evaluation of students in the public schools only involves cognitive or psychomotor performance on projects and paper and pencil tests and not their attitude, or interest found in the affective domain. Adequacy of facilities, tools, and equipment in relation to course content and teaching methodology is judged by non-systematic and irrational procedures. Various sets of curriculum objectives are followed in industrial arts but are rarely, if ever, evaluated quantitatively or qualitatively. Presently a national standardized achievement test has been made available so that a teacher can make a comparison between his program and a standard one; however, the test items are based on traditional content. When new facilities are planned, the state director and other consultants from universities, equipment suppliers, and private consulting firms rarely apply a total program evaluation schema to determine just where the weaknesses and excesses lie.

Various evaluation documents in industrial arts education and allied fields have been published. One such publication has emphasized improved instruction starts
through the development of better achievement tests (Householder and Suess, 1969, p. 41). However, today the educator is required to look at all domains of a student's behavior of which the achievement test is only one phase of the total behavior. Other data from publications consist of providing a means of updating programs by using the knowledge of consultants and industrial arts teachers.

Evaluation involved in recent curriculum reform projects gives greatest emphasis to the revision of instructional materials based on feedback from field testing. But currently, information about the worth of these innovative programs in various instructional situations is only cursory.

What is lacking is the conceptualization and development of a sophisticated evaluation model to gain a schema of total program evaluation in industrial arts education. There is evidence to show from Stufflebeam and Guba (1968), Stake (1967), Hammond (1968), and others that excellent general theoretical evaluation models for education are available. Unfortunately few have been applied to industrial arts education as a means of generating information for the decision makers. This possibly could be due to a narrow interpretation of program evaluation held by the industrial arts educator.

As a consequence, the educational consumer (see definitions) of industrial arts programs finds himself desper-
ately seeking useful information on innovative programs to maintain, revise, or completely terminate his current program. Accordingly, if industrial arts is to remain a vital part of the total school program the consumer of its products must have useful information to make the above decisions.

The Problem Statement

Therefore, the problem of major concern is how to gain useful information about the effectiveness of industrial arts curricula and other instructional items so that the educational consumer can make informed decisions.

The solution to this problem of inadequate information as expressed by Stake (1967), Scriven (1967), Hasting (1969), Stufflebeam and Cuba (1968), Alkin (1970), and others is through a schema of total program evaluation. This schema is concerned with evaluating educational instruction and its interlocking factors prior to, during, and after program development is completed.

Due to the problem stated above the main thesis of this study is that a logically sound total program evaluation schema can be developed. This can provide evaluative roles, purposes, and mechanisms for supplying creditable information to the decision maker for judging alternative solutions.

Objectives of the Study

1. To generate program evaluation statements from a review
of selected evaluation literature.

2. To produce logically sound program evaluation premises from the program evaluation statements.

3. To develop (adapt or adopt) a theoretical program evaluation model which is based on the developed set of logically sound program evaluation premises.

4. To develop a schema for generating pertinent questions to gain useful information about alternative industrial arts programs.

5. To develop a program evaluation operational model from the theoretical model that provides a schema for delineating, obtaining, and providing useful information to decision makers for judging alternatives.

6. To test the total program evaluation schema by simulation and its acceptance by the known experts in evaluation, systems, and industrial arts research.

Significance of the Study

Unfortunately, says Stake (1967), "the best trained evaluators have been looking at education through a microscope rather than using a panoramic view finder." There is no clear picture of what any school or instructional program is accomplishing today because the methodology of processing judgment is inadequate (p. 536).

The conceptualization of evaluation as a means of providing information for judging alternative decisions appears to be lacking in the industrial arts instructional program.
The term program has been extensively used in evaluation of industrial arts, but its interpretation usually is limited to the introspective factors within the school.

In most instances, program evaluation in industrial arts is narrowly conceived and often based on unsystematic measurement and non-rational judgment of individual students. Stake (1967) and Tyler (1967) say this is fine for guidance of individual students but totally inappropriate to evaluate educational programs. Typically, the educator who follows this unsystematic illogical approach to evaluating programs has followed rather than inspired changes in instructional programs.

Heath (1969) states that the lack of enthusiasm for rigorous evaluation is due to the insensitivity of evaluation purposes, roles, and mechanisms needed to effectively assess instructional programs. The industrial arts educators and parents are aware of socio-economical, motivational, attitudinal, and emotional differences among students, but these variables generally have been ignored in program evaluation.

Meanwhile, the educational consumer of industrial arts products is trying desperately to gather useful information to make informed decisions on what direction he should take to meet the demands of an advanced technological society. In relationship to this, Mehrens (1969), a consultant for National Assessment Research, found in his
work with National Assessment that decisions which are based on other than adequate information spell future disaster (p. 217).

It is apparent that there is a critical need for a total program evaluation schema which employs a set of generalizable strategies applicable to different types of evaluation. These strategies will require a model or a theoretical framework which will enable the evaluator to systematically gain and disperse useful information to decision makers.

In essence, the guidance and direction of industrial arts education in the future is dependent upon a sound program of total evaluation and not a narrow introspective approach. Therefore, program evaluation should follow an objective assessment of the total environment, both educational and otherwise. It goes without saying that those interlocking factors can certainly influence the effectiveness of an instructional program.

The specific benefits of program evaluation are possibly known but rarely used by curriculum innovators. Evidence of this was brought to light by Morgenson (1968) in a nationwide survey of industrial arts instructional programs where he found only a small per cent of industrial arts educators evaluating their programs.

One logical reason for the lack of program evaluation may be the resistance to assessment. This possibly has
come from criticism-sensitive curriculum innovators and others who are heavily involved personally and professionally in their products. Nevertheless, a major reason for lack of program evaluation centers upon the inadequacies of instruments, procedures, and trained personnel. However, the most critical reason is the lack of adequate conceptualized purpose to direct the total program evaluation schema (Stake, 1967). Mehrens (1969) indicated that to counteract educators' lack of enthusiasm for evaluation one should employ an overarching approach which does not compare or assess individual teachers, students, or programs.

The purpose, roles, and mechanisms to be developed in this study will attempt to circumvent the fear of comparison. Further, it is hoped that an enthusiasm for program evaluation can be developed which elicits help from all sectors of society so that the evaluator can better determine the effectiveness of instructional programs without fear. In addition, says Stake (1967), evaluation should be data gathering that leads to decision making not to trouble making. This follows the same basic plan that National Assessment is presently using to counteract the initial fear that the nation's educators formerly felt.

Information about total program evaluation in industrial arts is slight. However, known researchers in industrial arts are aware of the need for greater information. Evidence of this can be gained by reviewing the Suess (1969)
report covering the National Conference on Research in Industrial Arts. Suess states:

The most important task facing industrial arts is continued research related to content selection at all levels.

Increased attention must be given to the evaluation of instruction...the need for articulated study in content selection and research into efficient and effective instructional modes both require meaningful evaluation of the quantity and quality of learning that results from curriculum and instructional innovation. There is a critical need to evaluate both the innovative and the existing programs. Positive change can occur most effectively when individuals are aware of the deficiencies in existing programs...This task will not be easy in the profession long accustomed to evaluating an end product in isolation of the relevance of that product to the "real world" (pp. 15-16).

Note: the underlining has been added.

It is apparent that the need for evaluation of instructional programs has become one of industrial arts most pressing problems. Presently there is no effective and efficient procedure through which a consumer of an industrial arts instructional program can gain information about the exact weaknesses and strengths of alternative programs.

If the problems of industrial arts evaluation are to be effectively corrected an evaluation schema which is logically and rationally accurate is necessary. The procedure that will be used to accomplish this task is outlined here.

Steps in Solving of the Problem

The study will be conducted and its progress will be monitored through the application of a Critical Path Method
network (CPM) (See Figure 1), a later development of Program Evaluation Review Technique (PERT). The only difference between PERT and CPM is in the time calculations; otherwise, the same techniques apply to both procedures.

The purpose of constructing a CPM network is to provide a work breakdown and to impose this breakdown into the network during the planning stages of research. This allows the researcher to be cognizant of the flow of activities and to identify the elements which might otherwise be overlooked. The network will be constantly modified and updated to provide a communication tool for determining goals as the research progresses toward completion.

The successful completion of the major activities should lead to satisfactory completion of the objectives listed on pages 6 and 7. These are given below:

1. Write proposal.
2. Write overview of industrial arts instructional program development.
3. Review the state of evaluation—its problems and its solutions.
4. Generate the program evaluation statements.
5. Develop the design for the study.
6. Analyze data on developing premises.
7. Generate the overarching questions.
8. Develop the theoretical total program evaluation model.
9. Develop an operational total program evaluation model.
FIGURE 1
THE CRITICAL PATH METHOD NETWORK FOR DEVELOPING AND TESTING THE TOTAL PROGRAM EVALUATION SCHEMA
10. Test total program evaluation schema through simulation and its acceptance by known evaluation, systems, and industrial arts research experts.

11. Present summary, conclusions, and implications.

12. End development of the total program evaluation schema.

CPM Activities

1. Start Chapter I, the proposal.
2. Complete Chapter I, the proposal.
3. Start Chapter II, the Review of Literature.
4. Write past curriculum development.
5. Write present curriculum development.
6. Write future need in curriculum development.
7. Write evaluation problems.
8. Write solutions to evaluation problems.
9. Write program evaluation statements (preliminary).
10. Complete Chapter II.
12. Write management process of study.
13. Develop instrument for generating premises.
14. Determine and write sample process.
15. Write methods and means of handling analysis of data.
16. Write overarching questioning process.
17. Write methods and means of developing evaluation schema.
18. Write methods and means of testing evaluation schema through simulation.
19. Complete Chapter III.
20. Start Chapter IV, Analysis of Data.
21. Write methods and means of analyzing and interpreting data.
22. Complete Chapter IV.
24. Write overarching questions from questioning matrix.
25. Secure questions from Project Talent and from other means.
26. Write theoretical evaluation model.
27. Write operational evaluation model.
28. Complete Chapter V.
30. Write preliminaries to the simulation.
31. Write the simulation.
32. Complete Chapter VI.
33. Start Chapter VII, Summary, Conclusions, and Implications.
34. Complete Chapter VII.
35. Provide rough draft to graduate office.
36. Start assembling research documents.
37. Complete Table of Contents.
38. Complete Appendices and Bibliography.
39. Review and revise final draft.
40. Write abstract.
41. Complete development.

Assumptions

1. Total program evaluation is necessary if industrial arts curriculum is to adequately improve and if information on alternatives to answer the questions deemed important by the decision makers is provided.

2. Adequate information can be gleaned from the literature that will enable the development of logically sound and rationally accurate theoretical and operational evaluation models.

3. Industrial arts is a worthy discipline to study in the formal school setting; therefore, it requires adequate evaluation if it is to keep pace with the advancing society.

4. The total program evaluation schema can be theoretically tested adequately by simulation and the council of experts in evaluation, systems concepts, and industrial arts research.

5. Educational consumer of industrial arts products are in vital need of total information about alternative programs which will aid them in making better decisions.

Delimitations of the Study

The study will be limited to developing premises, overarching questions, theoretical and operational evaluation models, and testing models through simulation and a council of experts. The development of evaluation statements from selected literature and their ranking by national leaders through a developed instrument will serve as the only basis
for producing premises. No other instruments to gather evaluative information will be developed in this study.

Limitations

1. The review of literature will serve as the major basis for preliminary development of models.

2. Simulation and experts in the fields of evaluation, systems, and industrial arts research will be used as the only means of testing the applicability of the evaluation schema.

3. The ranking of program evaluation statements will be limited to generalists in evaluation and industrial arts researchers in higher education.

4. The generation of overarching questions will be limited to a questioning matrix, Project Talent, and other selected questions from decision makers and other sources.

5. The development of the total program evaluation schema will be limited to management concepts, evaluation rationale, and the logic of systems theory.

Research Methodology

Since the study is mainly concerned with developing a total program evaluation schema and testing its effectiveness, a method to gain this end begins with the development of premises. The review of literature will enable the generation of pertinent program evaluation statements. Hopefully, through a ranking process of the evaluation statements by national leaders in the general field of educational evaluation and in industrial arts education, premises will emerge. This process may be referred to as a modified Delphi technique where a consensus of experts who provided the information for writing the program evaluation statements will be asked to rate their information and that of
other experts. This data will be used to build a rationale. These premises are to be used as guidelines to develop a theoretical evaluation model from those evaluation models that are readily available from selected literature. From the theoretical model together with an overarching questioning process, an operational program evaluation model for industrial arts education is to be developed. This operational model is to provide useful information to the educational consumer so that he can make an informed choice among alternatives.

If information is needed about alternative industrial arts programs so that educational consumers can make decisions, then a systematic and logical questioning technique must be developed. The questioning technique should be an overarching approach for determining the worth of individual curriculum projects, rather than trying to make comparative analyses of curricula based on one or the other stated objectives.

One of the three ways to accomplish this task is through a three-order overarching questioning matrix which was adapted from the Epic model (Hammond, 1968). This will provide a systematic and logical schema for identifying relevant questioning factors. (See Figure 2.)

Gibson and McClain (1967) provide further classification of the questioning matrix when they developed a coding schema for the three axes, namely, X axis for population,
FIGURE 2
THE OVERARCHING QUESTIONING MATRIX
(AN ADAPTATION FROM THE EPIC CUBE)
Y axis for program dimension, and Z axis for the behavioral dimension. Hammond (1969) developed a chart for identifying relevant factors to be evaluated within a given instructional program. In essence, questions are to be generated which ask what instructional program dimensions are in focus, who is involved, and how the behavior is changed. Through the use of this Epic cube and the identification relevancy chart, questions will be generated which, when answered, will provide one means of generating program information for the curriculum developer as well as for educational consumers. The other two means of generating questions are questions from Project Talent and questions from the decision makers and other sources.

The operational evaluation model will need a management information decision system of planning, organizing, controlling, and communicating. This decision making process will be used as a method of linking the parts of total program evaluation schema. In essence, this management decision process will be a device to provide an organizational structure in which evaluation can adequately be related to decision making.

The systems approach of input, process, and output will be used to structure logically the major events and their subsystems in the evaluation schema. Both the management decision process and the systems approach will function within the framework of a developed theoretical evaluation
model. When these three elements are brought together in a logical form the total program evaluation schema for industrial arts education will be developed.

The testing of the evaluation schema will be accomplished through simulation and critical review by known experts. Simulation is a means of applying a model to a realistic hypothetical situation to determine if the model actually meets its mission objective. It also can determine whether the schema can be readily understood. Further, the evaluation schema will be tested by expert reviewers from evaluation, systems theory, and industrial arts research.

Definition of Terms

Decision Making: A process whereby a choice among alternatives is provided.

Educational Consumer: A group which includes all school personnel, students, parents, community, educationalists, and other interested public.


Model: Not a theory but ways of thinking or patterns for research that, when carried out, can lead to the development of a theory--they derive their usefulness from their generality. They apply to all specific instances of a whole class of events or processes (Gage, 1963, p. 95).

Premise: A previous statement or assertion that serves as the basis for an argument.

Operational Evaluation Model: The actual implementation of the theoretical model to answer the questions generated from the overarching questioning schema. It is graphically structured and designed to provide information so that an informed choice is available to the decision maker.
Program: Educational instruction and its interlocking factors within the total curriculum.

Operational Definition of Evaluation: Educational evaluation is the process of delineating, obtaining, and providing useful information for judging decision alternatives (Phi Delta Kappa National Study Committee on Evaluation, 1970).

Theoretical Evaluation Model: a conceptualized framework which is graphically illustrated to guide and direct the total program evaluation schema.

Summary

The evaluation of industrial arts instructional programs has not been adequately conceptualized for a rapidly changing technological society. Possibly the reason is due to (1) the diverse and fragmented curricula, (2) the inability to specifically state instructional objectives, or (3) the lack of evaluation instruments, procedures, and theory.

Recently, industrial arts education has developed innovative curricula programs for the consumers of its products. The primary intention has been to make industrial arts instruction relevant to modern industry. However, most of these curriculum innovators fail to properly state their objectives in terms that they can be specifically measured. Nevertheless, these innovative programs are applying good evaluation techniques for revising materials.

Today the consumers of industrial arts products are wanting more information about the particular strengths and weaknesses of each program as it relates to different types of students and learning situations. Therefore, only re-
cently have researchers in industrial arts education become concerned about evaluating the total instructional program for generating useful information for decision making.

What is needed to accomplish this task of total program evaluation is a schema for identifying relevant factors to gain complete information about all curricula. That is, information is gained through an overarching theory of curriculum evaluation, instead of looking at individual objectives or making comparative studies of objectives. It is expected that if enough relevant factors can be identified and adequately answered then possibly the educational consumer can use the data effectively in making decisions.

The steps in the solution of the research problem are to:

1. Develop program evaluation statements into logically sound premises through a modified Delphi technique.

2. Use the developed premises in developing a theoretical evaluation model.

3. Generate procedures for gaining overarching evaluation questions.

4. Develop an operational program evaluation model from the theoretical model to answer the pertinent overarching questions.

This process hopefully will be accomplished through the application of management decision concepts and the logic of the systems approach. A CPM network will be used to augment the possibility of completing the development on time.

The total program evaluation model will be tested by
using simulation and the council of experts. Simulation is a hypothetical situation designed to determine whether the model meets its specific objective. Simulation also adds understanding of the model. The resource experts will represent educational evaluation, systems theory, and industrial arts research.
CHAPTER II

REVIEW OF LITERATURE

Developing a total program evaluation schema for industrial arts education includes reviewing pertinent literature to determine what was, what is, and what ought to be the theoretical foundation from which to operate. It is in light of this that Travers (1958) gave the following suggestions:

The review of the literature should provide an overview of the current framework of theory in the area in which it is proposed to undertake an investigation. The student may be expected to abstract from this review of the literature a theory in terms of which he plans to work. A minimum requirement should be that he draw up a statement covering the essential features of the theory, but preferably he should be more ambitious and draft the theory as a set of postulates. He should then show how these hypotheses (objectives) represent a series of deductions from these postulates. This he will find to be a worthwhile exercise in clear thinking (pp. 75-76). (The term objective is added to the original.)

In essence, the review of literature will serve as the substantiating evidence needed for the study as well as provide the rationale for conducting further research and development.

If the search is to be beneficial, one must seek the help of the generalists in evaluation as well as those in the field of industrial arts education. Possibly as a result of the above research, one can generate new ideas and
new patterns of information which will go beyond the mere reporting of what has and is being done in evaluation. However, a sound foundation of the facts that have preceded is necessary; enables one to gain guidance and direction toward the quest for possible new frontiers of knowledge. This may augment the effectiveness of a systematic approach to educational change which is essential for improvement of the industrial arts instructional program.

Chapter II is vital for it attempts to identify the need and desire to generate the purposes, roles, and mechanisms for developing a total program evaluation schema for industrial arts education. The means to this end starts with the development of a theoretical program evaluation model based on a set of logically sound premises from which an operational model can be developed.

Before developing a theoretical program evaluation model, one must provide a mechanism to accomplish this task. Therefore, the objective of this chapter is to examine the following questions in an attempt to provide data on generating program evaluation statements which serve as a starting point for developing a total program evaluation schema:

1. What are the past and present curriculum developments and the expressed desires for future industrial arts programs which substantiate the need for a total program evaluation schema?

2. How has the current program of industrial arts evaluation functioned and what is the general
inadequacy of this process as expressed by selected current program evaluators?

3. What solutions are necessary to correct the inadequacies in program evaluation as indicated by selected evaluators?

4. What recent program evaluation statements are representative of the purposes, roles, and mechanisms as found in the review of selected literature?

Program Development in Industrial Arts

Antecedents of Curriculum Development

The dawning of a new nation brought with it a multitude of people whose mixture of ideas, cultures, and habits formed a mold called America. America seemed different from other nations in that it promoted in people a desire to achieve more than was possible in the old countries from where they came. America had a dream in regard to human rights and the dignity of man to strive to reach the good life. Soon followed the industrial revolution which fostered and developed the need for increased skilled manpower plus the necessity for man's understanding of his industrial society. As a result specific educators began seeking better means to educate students for an industrial labor force as well as provide them with a general knowledge about the world of work.

The significant starting point occurred in 1876 when President John Runkle of MIT visited the Philadelphia Exposition (Bennett, p. 320). There he discovered the Russian tool analysis process for teaching skilled trades to a large
number of students rather than the wholly inadequate apprenticeship technique. Instruction was based on analysis of construction activities which represented selected trade skills. The analysis process generated basic exercises that depicted the actual activities performed by the tradesmen. These exercises were arranged in a logical order from simple to complex levels of difficulty as the students progressed through a program of graded model building.

Shortly afterward, in 1880, Calvin Woodward, another observer of the Russian System, opened the St. Louis Manual Training School. Woodward viewed manual training as a science and convinced the school of its liberalizing aspects under the guise of faculty psychology. This concept gained acceptance with the trained hand and the cultured mind in which the concept of the "whole boy" was stressed (Bennett, 1937, p. 367). The significance of manual training was a break from traditional academia.

Runkle and Woodward represented the development of two main ideologies of industrial education in this country. That is, Runkle represented vocational job training and Woodward industrial arts general education.

In the 1890's Swedish sloyd was transplanted to American schools by two immigrants, Gustag Larsson and Lars Erickson. American sloyd provided the needed break from the rigid Russian tool analysis process to a curriculum that emphasized the utilitarian value of a useful project.
American sloyd also generated the desirability of project design to satisfy a need and promoted the concept of worthy use of leisure time.

The progression of manual training to industrial arts was nurtured by the influence of three men, Bennett, Dewey, and Richard. The arts and crafts movement promoted by Charles A. Bennett brought aesthetic forces to bear on the manual training curriculum. The name of manual training was changed in 1893 to manual arts. The underlying philosophy generated the idea that tool skills become a means to gain an end rather than an end in itself. Bennett (1919) grouped skills under graphic arts, mechanic arts, plastic arts, textile arts, and bookmaking arts (pp. 15-16). At the turn of the twentieth century John Dewey launched his psychology of occupations and later the progressive education movement (Scobey, 1966, pp. 29-30). Education was then based on societal needs of every child which regenerated Woodward's concept of the "whole child." Richards, in 1904, suggested that the name of manual training was not representative of what was taught in the school shops and that the name of industrial arts was better able to accomplish this function.

Possibly one of the greatest ideology splits in curriculum between the general or liberal education approach as opposed to industrial or vocational orientation of manual training happened in 1917. This event occurred with the
passage of the Smith Hughes Bill which provided federal monies for those vocational oriented concepts of education which emphasized job training.

In 1923 Bonser gave his classic definition to industrial arts which states that: "Industrial arts is a study of the change made by man in the forms of materials to increase their value and the problems of life related to those changes" (Bonser and Mossman, 1925, p. 5). Therefore, one finds the original concepts of manual training, manual arts, and industrial arts becoming interchangeable with diffused and obscured purposes.

Dr. William Warner, (1934) through his laboratory of Industries and his (1947) Curriculum to Reflect Technology, gave added knowledge for bridging the gap from selected trade and job analysis content to unified concepts such as manufacturing, construction, transportation, etc. Warner's ideas generated the forces that can be seen in most of the present curriculum development projects.

However, it still appears that none of these curriculum forces has created an unified conceptual base for industrial arts. To summarize the curriculum forces that resulted from the antecedents of industrial arts, Hauenstein (1966) suggests the following:

1. Industrial arts has changed as society and disciplines have changed to keep abreast of these trends.
2. There is no national unity in industrial arts regarding the philosophy, aims, objectives, curriculum methods, etc.

3. Industrial arts has emerged as general education due to the inefficiency of manual training as an educational subject along with the impetus of Bonser in establishing elementary school industrial arts.

4. Industrial arts has been ever broadening and expanding its curriculum.

5. Curriculum has been devised to meet the broad area of life needs, a study of industry per se, a study of trade and occupations through tools, processes, materials, and by integration with other disciplines such as science and mathematics.

6. Industrial arts has been searching for a viable base for the study of industry and its relationship to society.

7. Both vocational training and industrial arts have claimed identical subject matter but different objectives have necessitated different courses of study (pp. 22-23).

Present Curriculum Developments

Manual training was conceptualized by Woodward, modified by Bennett, and later given scope and sequence by Russell, Dewey, Richards, and Bonser with further impetus by modern industrial arts men. Hence, one could assume that it would finally have gained an unique body of knowledge and method of instruction. However, today one finds industrial arts involved with the struggle to determine the right combination of curriculum objectives, facilities, and methodology possibly due to a lack of an adequate program evaluation schema.

Industrial arts is an accepted part of the total
school curriculum. However, it has a lingering public image in its trade orientated subject content. Unfortunately the methods of instruction still are based primarily upon slightly modified traditional approaches of manual train-
ing. These traditional approaches include the fabrication of industrial products by means of custom school shop procedures. Even though industrial arts is accepted in the schools, it is criticized for its overuse of job oriented manipulative experiences in the learning situation.

The opportunity to teach industrial arts students through overt techniques to support covert activities of investigation, research, and experimentation is unlimited by using industrial knowledge. According to Sevendson (1963), as one evaluates from a vantage point it becomes clear that one mistake of industrial arts education was its failure to teach the intellectual possibilities inherent in the subject content of industry (pp. 105-106). The past and present have not drastically changed, for even today restriction of activity to learning based on old manipulative instructional methods founded in a hodgepodge of technical facts seems unpardonable. West (1964) concludes that advances in indus-
trial arts instruction were witnessed by more related inform-
ation from textbooks, the adding of more courses, and the updating of laboratories. The fragmented selection of trade orientated course content from wood, metal, and other trades was considered all that was necessary to represent American
industry.

Many graduate schools have course after course of trade and job analysis coupled with curriculum building tied into aims and objectives. It seemed that everyone had a different set of objectives in which they could ascend a soap box and purport that their postulates were the aims and objectives of industrial arts. The average teacher had a nebulous attitude about these aims and objectives and of others which sounded good but their proponents failed to show how one could implement them, let alone evaluate them.

During this time of stagnation there were various research studies trying to determine what is industrial arts' unique body of knowledge. In addition, there were studies on how best to transmit this knowledge to the student to gain desired behavior changes. Streichler (1966), through a Health, Education, Welfare grant, compiled and synthesized research studies in industrial arts. Two categories that he reported on are philosophy and objectives which are found in the following:

1. Hammond (1956) noted less diversity of objectives of general education from industrial education.

2. Miller (1961) indicated that objectives of American Vocational Association (1953) were favored in 38 states, however, they did not recognize certain selected sociological factors of contemporary America.

3. Talkington (1962) stated in a study comparing results of the 1953 American Vocational Association objectives in a Q-sort response method be-
tween thirty-five selected industrial arts leaders throughout United States and industrial arts teachers of Colorado that the two groups had identical ranking for three objectives but disagreed on ranking priority.

4. Hawse (1964) attacked the problem of acceptability and recognition of the objectives of industrial arts by studying opinionnaire responses from selected industrial teacher educators, industrial arts teachers, school administrators, industrial employment officers, and selected parents in Illinois. The responses caused him to conclude that basic agreement existed in the value of industrial arts objectives.

5. Beck and Nelson (1960) viewed industrial arts as a somewhat specific subject matter area making primary contributions to general education.

6. Dudley (1963) held that industrial arts should gain content from science and mathematics, problem solving, and human relations.

7. Duffy (1963) was concerned with technology and with tracks for various levels of ability.

8. Evans (1962) wanted pre-engineering curriculum to obtain direction from engineers.


10. Crawford (1961) believed adult education should be a vital part of an industrial arts educational program because of better public relations.

11. Bateson and Stern (1963) stressed the importance of guidance objectives through the functions of industry.

12. Stadt (1962) and Moss and Stadt (1966) suggested that the secondary school should adhere strictly to general education and stated if industrial arts is to be included in the high school it should be a part of general education.

13. Warner (1965), Olson (1957), and DeVore (1964) commented that industrial arts may have reached the point of maturity where it could organize
its knowledge into a level of a discipline and that this knowledge should be organized about technology (pp. 1-8).

A survey to determine the status of industrial arts as it exists in the American schools was conducted by Schmitt and Pelley (1966) in which they concluded that drawing, metal working, and woodworking are still the three main areas of instruction (p. 28).

Dr. Willis Ray, professor at The Ohio State University (1969) in a lecture presented a chronological breakdown of curriculum innovations as follows:

1933 William E. Warner - Terminology investigation
1934 Ohio perspectus
1937 U. S. Office of Education (Industrial Arts): its interpretation in American schools (Note: all the above were departures from the trade and job analysis.)
1947 Warner - a curriculum to reflect technology
1948 Florida guide - a guide to the new technology-industrial arts
1947-1962 Many new ideas developed in industrial arts curricula
1962 American Industry Project
1965 Industrial Arts Curriculum Project
1962-1969 Over sixty curriculum projects and/or ideas identified by Walter Brown.

Industrial arts remained rather apathetic to its role of interpreting the advancing technology to American youth until Sputnik and other forces turned the public spotlight on education. Several forces external to the school are
federal funds, knowledge explosion, changing American society, technology and cybernation, amplification of curriculum requirements, and the education of socio-economically disadvantaged children. Various eminent authors with research reports uphold this position. Forces internal to the school are lack of adequately trained teachers and evaluators, educators' reluctance to accept change, and administrative behavior toward improvement of facilities, organizational patterns, and appropriate change of content and method.

Tyler (1968) states that as a result of societal forces the schools have become concerned about teaching students with a wide range of abilities (p. 3). Students with wider ability ranges are going to college; therefore, the colleges have to provide a greater diversity of curriculum offerings to satisfy the growing need.

Various industrial arts educators and school administrators are concerned about the worth and purpose of industrial arts in the public schools. They are looking for a viable base from which to establish a disciplined approach to content thereby gaining an organized body of knowledge.

Swanson (1965) supports this fact that industrial arts gain this body of knowledge when he states the following:

A further purpose in defining a body of knowledge is in the integrating force it can provide. Brunner speaks of this as he discusses the importance of structure of knowledge. Any subject involves the study of many details; unless they are organized and fitted into a framework they are not easily comprehended and used.
It seems to this author that industrial arts cannot long delay the definition and acceptance of a body of knowledge from which to draw its content (p. 59).

Through the impetus of public and private funding and the desire to develop a structured body of knowledge various curriculum projects were and are being developed.

Twenty-five of the more notable curriculum development projects and proposals are listed below:

1. Industrial Arts Curriculum Project - Ohio State University in cooperation with the University of Illinois
2. American Industry Project - Stout State University
3. Maryland Plan - University of Maryland
4. Orchestrated Systems - Indiana State University
5. Functions of Industry - Wayne State University, Detroit
6. Enterprise: Man and Technology - Southern Illinois University
7. Partnership Vocational Education Project - Central Michigan University
8. Visual Communication Education (VICOED) - Western Washington State College
9. Maine Plan - Gorham State College
10. Industriology - Wisconsin State University, Platteville
11. Galaxy Plan - Detroit Public Schools
12. Zeil Plan - University of Alberta, Edmonton, Canada
13. Industrial Arts and Technology - North Carolina State University
14. Technology - West Virginia University, Morgantown
15. Georgia Southern College Approach - Statesboro
16. S. E. E. D. for Progress - Pennsylvania State Department of Education
17. Richmond Plan - Richmond, California
18. Correlated Curriculum Project - New York City
19. Project ABLE - Quincy, Massachusetts
20. Crafts as Vocations - Eastern Kentucky University, Richmond, Kentucky
21. OVT - Pittsburgh, Pennsylvania
22. Interdisciplinary Vocational Education - Paola, Kansas
Two of the most prominent industrial arts curriculum projects which have gained national exposure are the American Industry Project (A.I.P.) located at Stout State University in Menomonie, Wisconsin, and the Industrial Arts Curriculum Project (I.A.C.P.) based at The Ohio State University in Columbus, Ohio and in cooperation with the University of Illinois at Urbana.

The American Industry Project identified industry as its source of content. Industry is defined by the project as "an institution in our society which intends to make a monetary profit, applies knowledge, and utilizes natural and human resources to produce goods and services to meet the needs of man" (Nelson, 1969, p. 37). It became evident that one could not study the total industry so it was suggested that a conceptual approach be taken.

Presently, thirteen broad concepts are identified to provide great flexibility and adaptability. This process is considered a powerful tool in inquiry for further learning as compared to the provincial viewpoint of industrial arts. A.I.P. incorporated Bruner's (1958) proposition that a discipline has an underlying structure which is interrelated with the basic ideas found in the discipline. This also lends considerable explanatory power to its postulates,
concepts, and principles (p. 31).

On the basis of Bruner’s conceptual schema, The American Industry Project decided to analyze a variety of industries to isolate the concepts common to them and then identify the relationships among these concepts. In essence this rationale of organizing the knowledge of industry into a conceptual structure is considered a discipline.

The American Industry Program is centered around two broad objectives:

1. To develop an understanding of those concepts which directly apply to industry.

2. To develop the ability to solve problems related to industry (Gebhart, 1968, p. 2).

Face, Flug, and Swanson (1965) define a concept as a psychological construct resulting from a variety of experiences, by a word or idea and having functional value to the individual in his thinking and behavior (p. 65).

It appears that the conceptual orientation of American Industry Project cuts across the established material-tools boundaries of industrial arts. It is designed for the following three levels of experience:

1. Provides a broad frame of reference, or general understanding of the structure of industry

2. Provides greater depth in major conceptual area of the structure

3. Provides the student independent research of a problem of his interest in one of the conceptual areas.

Evaluation of the project has consisted mainly of field testing of instructional materials through achievement
testing and feedback from teachers. Nevertheless, information on its application has not been published, therefore, the educational consumer receives only an information package that describes the program. This is not adequate today when useful information is needed for decision making. Presently the project has been discontinued at Stout State for lack of funds.

The Industrial Arts Curriculum Project (IACP), in developing its rationale, found that the knowledge unique to industrial arts was basic to the economic activities of man. There was a need to make several arbitrary choices about which particular part of the economic institution that could logically serve industrial arts. It was decided that industrial arts must be concerned with that segment of the economic institution which substantially changes the form of materials to provide useful goods to satisfy man's needs. Within this definition IACP identified two broad areas, namely, The World of Construction (on-site production) and The World of Manufacturing (in-plant production).

Logically, then, the economic institution is designed to satisfy man's wants for economic goods. Industry is that subcategory of the economic institution which substantially changes the form of materials in response to man's wants for goods. It can be stated further, that industrial technology is that subcategory of knowledge which is derived from the study of principles of industrial practices of
management, production, and material goods (Towers et al., 1966, p. 3).

The IACP was based on three starting assumptions which are:

1. Industrial arts is a study of industry. It is an essential part of education of all students in order that they may better understand their individual environment and make wise decisions affecting their occupational goals.

2. Man has been and remains curious about industry, its materials, processes, organization, research, and services.

3. Industry is so vast a societal institution that it is necessary for instructional purposes to place an emphasis on conceptualizing a fundamental structure of the field, i.e. a system of basic principles, concepts, and unifying themes (A brief description of IACP, 1966, p. 4).

Additional assumptions were made as the research progressed:

1. For the purpose of analysis, man's knowledge must be categorized and ordered logically.

2. To provide for the most effective and efficient transmission of knowledge, the educator must codify and structure disciplined bodies of knowledge.

3. The structure of a body of knowledge can be developed before the total curriculum is designed.

4. All domains of man's knowledge must be included in an effective general education program (A brief description of IACP, 1966, p. 4).

The objectives of the IACP are:

1. To identify and structure that knowledge to be included in a study of industry.

2. To prepare an educational program representative
of contemporary industrial technology.

3. To design and engineer an instructional system for teaching industrial technology.

4. To improve the instructional system and curriculum through field testing in selecting industrial arts programs.

5. To develop a teacher education program for the preparation of industrial technology teachers.

The program follows in a two-year sequence. The first year is The World of Construction which is taught in the seventh grade. The second year, The World of Manufacturing, is taught in the eighth grade.

IACP has a comprehensive evaluation process which includes an elaborate field center network. Feedback and other evaluation information are presently being used to refine instructional material.

Expressed Desires for Future Industrial Arts Programs

A brief summary of the past and present curriculum developments has presented several interesting points. For example, we have looked at past development of industrial arts in the United States and found it to be a dualism between specialized versus general education. Presently curriculum reforms have added their efforts to building an unique body of knowledge - a discipline. However, many others in the field of industrial arts education feel that all these efforts are still inadequate for the future.

What is the answer for determining the future of industrial arts educational programs? Possibly an answer may
come in a completely different content area which has not been tried before. Or a different means of instructional media will evolve which could completely alter what is presently being taught. The best answer may be in using an interdisciplinary approach which represents an open system.

Industrial arts curricula were built for the most part on a closed system where information for change came from within the profession. However in the past ten years industrial arts curriculum reformers have sought information from other discipline studies in order to gain needed help. This happened because the profession was not equipped to provide an array of information necessary to solve inadequacies in the curriculum programs.

Hopefully, in the future the progress of industrial arts will not be hinged to a closed system where the answers to future curricula are generated only from within the profession. Through continuing interdisciplinary study in an open system, industrial arts may be able to cope with most of the forces of society and build a curriculum which reflects relevance in a day of industrial mechanization and dehumanization.

Goodlad (1966) believes that curriculum will change from the discipline approach to the balanced curriculum and by the year 2000 to the humanist or phenomenological organismic concept. Combs and Kelley (1969) feel the individual
will be the prime importance of curriculum development in
the future and not the discipline approach which presently
is called for by many curriculum reformers. Combs (1969)
further states that the greatest problems facing societies
and individuals no longer are food, clothing, and shelter
because the problems of human interaction have caused a
shift from the physical to the cultural and the psychologi­
cal; that is, from things to people. In most cases, present
curriculum reforms are designed to impart just knowledge
and skills. This comes from a naive assumption that the
acquisition of facts alone will make a difference in human
behavior (p. 121).

Information without meaning is depersonalizing and
alienates the people from the reality of our technological
society. Future industrial arts curriculum reformers
should provide the knowledge to propel the youth in our
highly mechanized society toward meaningful learning ex­
periences.

If industrial arts is to be part of the formal school
in the future, it must teach students the value of what they
are learning as well as how to learn. Obviously, says Fry­
mier (1969),

helping children learn must begin with helping
children learn to value learning as an exquisite,
practical, and life-long human enterprise which
will carry over in countless practical, esthetic,
intellectual, social, and personal ways (p. 31).

Hornbake (1968) adds to Frymier's comments when he
suggests that industrial arts can be a worthwhile investment in the future if the following three functions are supported.

1. If industrial arts can help children and youth better to understand or comprehend the culture now and in the future.

2. If industrial arts can assist children and youth to live more purposeful and more constructive lives... which will have experiences throughout life for richer rewards.

3. If industrial arts can help develop those higher mental processes of problem-solving and decision making (p. 12).

Miel (1964) has made the statement that curriculum reform is a dynamic activity which is in constant change and most generally repeats itself. She further states that the best way to view this repetition is not through the long winding road nor the swinging pendulum but a spiral effect which redefines in sharper focus the recycling of curriculum styles (pp. 155-156). Examples of this are the subject matter curriculum in the 1920's, the progressive educational movement, and recently the discipline centered approach which is a refinement of the subject matter curriculum. It appears that in the future trend will again return to the individual or the phenomenologist approach to curriculum design.

This cycling effect in curriculum is also prevalent in industrial arts. For instance, various industrial arts educators are suggesting the return to the teaching of the
occupations that John Dewey proposed years ago when he was at the University of Chicago. Supposedly this approach will make industrial arts more relevant to the disadvantaged student. Nelson (1968) strongly suggests that not one of the current curriculum developments would survive if introduced in an inner city school. He goes on to state that present curriculum projects in industrial arts could become excellent social studies supplements, but in no sense a substitute for the kind of industrial arts which is needed today. He comes to the conclusion that "what is needed is prevocational or preoccupational education" (pp. 70-71).

There is considerable influence from various other individuals in industrial arts to implement curricula centered around the occupations.

Moss (1968) believes that industrial arts must stop building fences around shaky disciplines. He further states that the practical arts will join cooperatively, plan for, and provide a continuum of occupationally oriented education throughout elementary, secondary, and post secondary schools - a vehicle for coordinating most of the formal educational experiences of youth (p. 77).

Stadt (1969) and staff at Southern Illinois University are revising their total curriculum and implementing a new approach called "enterprise." This proposes to teach students to understand greater varieties of work and ways to prepare for it from the occupational point of view. This
is evident in the following statement:

...Understandings of the human side of the enterprise are as important as understandings of the technical side of enterprise, especially to the teacher who would make the world of work and occupation intelligible to children and youth (p. 24).

Pratzner (1969) presents a strong argument for an occupational development curriculum to replace the present industrial arts program in the secondary schools by changing four goals. These are illustrated by the following:

1. Interest in industry changed to interest in occupation which provides a broader view with education placed on the individual in a given position rather than the type of position.

2. Interest in achievement refined to cope with changing structure of the world of work which is becoming less and less satisfying in and of itself to the worker.

3. Drawing and design and shop skills and knowledge be left to more appropriate instructional areas like fine arts and post secondary vocational education.

4. Developing worthy leisure interest because of the changing world of work, increasing life span and trend toward more free time requires activities which are therapeutic to psycho-social problems (pp. 37-38).

It appears that the study of occupations is another divergent curriculum which must be investigated, as should other curricula for future use in industrial arts.

State of Evaluation

Its Problems

A discussion of the past, present, and expressed
future needs of industrial arts curriculum programs has been reviewed and found to be extremely diverse and lacking relevance for a changing society. Possibly the curriculum development process has failed to generate a generally accepted program due to an inadequate evaluation schema. Added to this perplexity of program development is the problem of consumers of industrial arts programs not having adequate selection information to make decisions. As one can judge, the last two sentences are a reiteration of the underlying problem that this study hopes to help solve.

To focus on the problem of program development and selection that educational consumers must face, one needs only to look at the status of evaluation procedures as found in curriculum change.

In a lecture at The Ohio State University, Klohr (1968) suggested that in curriculum development schemas such as those generated by Tyler's (1950) and Taba's (1962), evaluation was tacked on the end of the process. This at most, represents an afterthought which appears to be merely used as a technique to round out their conceptual schemas. Unfortunately, again this is only after the fact or outcome evaluation which involves assessing the different performances of individual students at the end of the program to determine how well objectives were met. This process is not adequately evaluating the interlocking factors of an instructional program required to provide useful informa-
tion for better decision making. These interlocking factors include those items found in the questioning matrix, Figure 2, page 18.

The need for total program evaluation has been expressed by the generalist as well as the specialist in education. However, there seems to be an inadequate conceptualization in industrial arts as to the actual function of program evaluation. Evidence of this can be observed in the Fifteenth Yearbook of the American Council on Industrial Arts Teacher Education (1967) where program evaluation is discussed in terms of those concerns of teachers and their programs within the schools.

At one time this was an acceptable delineation of what program evaluation should do but presently evaluation must include both the school and non-school environmental factors for making informed decisions. The decisions that need to be made are whether the program should be continued as is, altered, or terminated. When an industrial arts program is terminated, what will fill its place? Since the yearbook made no mention of evaluating industrial arts programs in the broad sense or suggesting a procedure for innovating new programs it appears that the need arises for a schema which possibly can accomplish this feat.

In the Fourteenth Yearbook of ACIATE (1966) one finds two chapters discussing whether industrial arts is determining the outcome value of their objectives. In the second
chapter of the Fourteenth Yearbook Sommers and Face make
the following statement about their research findings from
a survey of industrial arts leaders:

...neither my colleagues nor I are acquainted
with any studies relating to the achievement of
industrial arts objectives... (p. 21).

The authors state further that various reports and articles
logically promote a proposed set of objectives but have
problems as explained in the following:

These statements usually establish a rather
logical base for the objectives they propose
but rarely attempt to evaluate their success
in meeting these objectives... little effort
to evaluate industrial arts in terms of its
own objectives have been found in the litera­
ture... (pp. 22-27).

Even though the above statement was made, the authors did
cite several references that attempted to evaluate objec­
tives.

Sommers and Face in the second chapter of the Fif­
teenth Yearbook suggested a plan to counteract the lack of
research on objectives by setting up a framework to gain a
national commitment on structuring objectives. They go on
to state that "industrial arts will not move ahead until a
clear and precise statement of objectives is made." They
stated six considerations needed in the preparation of ob­
jectives which will adequately assure their soundness
(pp. 28-35).

In the third chapter of the ACIATE Fifteenth Yearbook
Koble and Thrower (1966) make the following statement in
regard to research in evaluation:

A search for research studies reveals that little has been done in the area of research in measurement or evaluation techniques. The majority of research projects have used these techniques but few have researched any phase of them (p. 38).

The authors end the third chapter in the Fifteenth Yearbook by listing four items of needed research in evaluation. These items center upon gaining better instruments and measuring procedures (p. 47).

It appears again that the authors did not find nor did they mention the need to assess the total instructional program. Neither did they propose a possible role evaluation is to play in guiding and directing the change of educational programs. Their views of evaluation emphasize product evaluation rather than program evaluation. This assesses the effects of an instructional program on the individual student rather than the worth it has for all parties involved. Presently this is a problem that needs to be resolved.

Suess and Householder (1969) include a section on evaluation in the second edition of the ERIC publication on industrial arts research. They divide evaluation into achievement, testing, and evaluation of programs. They state that program evaluation has recently gained a renewed interest because of the criticism that is being leveled at industrial arts both from inside and outside the field of
industrial arts (pp. 41-42). Unfortunately, in this publication the provision of useful information to all educational consumers of industrial arts programs is lacking. Objective-outcome congruence was given consideration by Suess and Householder (1969), but even that they recognized this information was based upon an antiquated set of objectives set forth by various organizations.

Possibly the most worthwhile publication on program evaluation for industrial arts education is the spring issue of the Journal of Industrial Teacher Education, edited by Streichler (1969). This special issue on program evaluation is divided into two main parts. The first provides information on theory and practice in the general field of evaluation. In the second part, specific studies for incorporating program evaluation into an actual setting are discussed which give relevance to the theory and practices of evaluation. As one reads this issue of the NAITTE, he becomes aware that the field of industrial education should come to grips with the enormity of the problem of evaluation.

Evaluation procedures to generate useful information on industrial arts educational programs are rather sparse or at best cursory in nature. One evaluative information technique in use is the descriptive comparison of recent industrial arts curriculum programs with a brief definitive statement. This is done mostly through their placement in a criterion category listing. Examples of this can be found
in the works by Swanson (1965), Lux (1967), and Cochran (1969); each of whom fits the various projects into his conceptualized categories.

Another evaluative technique used by industrial arts evaluators to gain information is the survey. One such survey was conducted by Mongerson (1968) who analyzed the curriculum concepts and practices of the new curriculum approaches to industrial arts in selected secondary schools in the United States. Among his conclusions reported (other than what is found in this study on page 9) are:

1. The innovative secondary school programs must be assessed in terms of behavior (task oriented) objectives.

2. At present only some of the educators have developed a set of behavioral objectives.

3. At present only some of the educators have developed a set of behavioral objectives that can be evaluated by either an experienced evaluator or an instructor (p. 4192A).

Buffer (1969) suggested that the diffusion of information about curriculum projects needs to be evaluated to determine the most appropriate means to accomplish this task. Possibly the major problem of informing the educational consumer about alternative instructional programs, lies in the domain of implementation. However, the assessment of the process still requires an evaluative type structure if progress is to be made in communicating information to the consumer.

The assumption can be made that industrial arts educa-
tion needs greater evaluative information for program planning, development, assessing its worth in various situations. Even if this is successfully accomplished, the effectiveness of communicating a program's results to incorporate change may be drastically lacking. There is some evidence that an awareness of the worth of program evaluation is slowly emerging in industrial arts through various publications. Yet the impetus needed by industrial arts educators to incorporate a program evaluation schema into curriculum reform is poor. Educational consumers are demanding answers to their questions about the performance of these individual programs. Presently industrial arts appears inadequate to provide the type of information the consumer should have in order to be able to make an informed judgment about alternative programs.

Noteable researchers in the field of industrial arts gave evidence of change as they defined information needs in a national conference on research in industrial arts held at The Ohio State University campus in the fall of 1968. Suess (1969) gives an accounting of this conference in which he summarizes what information the researchers felt industrial arts should have if it is to continue and progress. This hierarchial summary follows:

1. There is a need of evaluation and synthesis of curriculum innovation proposals and projects. Can common elements be identified in an attempt to determine how to use these elements and where to use them?
2. What is the uniqueness of industrial arts content at various levels?

3. What is the body of knowledge of industrial arts?

4. What is the content for the disadvantaged?

5. Will an historical analysis of content selection method assist in contemporary content selection?

6. How can curriculum change be implemented?

7. What instructional procedures are most efficient?

8. How can content be made more transferable?

9. What support systems improve instruction?

10. How can safety be taught?

11. Have stated goals been met?

12. What is the impact of educational technology on the content and method of industrial arts?

13. What conditions lead to the optimum efficiency organization of content and activities for contemporary industrial arts programs?

14. What, if any, are the educationally unique contributions of industrial arts? (pp. 12-14)

Obviously there are untold other questions to be asked by industrial arts educators to gain answers for providing adequate information so the educational consumer can make a rational choice among alternative programs.

Heath (1969) states that evaluation problems connected with curriculum reforms have lacked enthusiasm for rigorous assessment due to the following reasons:

1. Lack of adequate instruments.
2. Lack of adequate questions to be answered.
3. Lack of concern for organismic and socio-economic differences.
4. Lack of detailed objective descriptions of educational treatment.
5. Lack of educator help in evaluation.

Frymier says that the lack of appropriate information needed to provide alternative choices for making adequate decisions may be due to not asking the right questions (p. 125). Heath (1969) indicates that some of the informational needs should be based on the following questions:

1. How is the program interpreted by different types of teachers?
2. Are optimal sequencing and duration a function of circumstances?
3. What happens to curricula effects when equipment and facilities vary?
4. Does the region, neighborhood, and institution transform the curriculum?
5. How does the program affect students with various intellectual, socio-economic, and emotional characteristics? (pp. 280-281).

It is evident that if logically sound and rationally accurate choices are to be made by the decision makers on curricula, then adequate information must be provided. However a major problem is in gaining useful information and in providing it to the right person at the right time.

Another problem of not generating useful information is with the instrument and the procedures in using these instruments. Stake (1967) concurs with the last statement when he says, "I am dismayed by my contemporary colleagues who believe that evaluation of curriculum begins and ends with achievement testing." He goes on to state that the
standardized test is important for instruction and guidance of individual students, but not for development and selection of curricula which require different rules for test administration and different criterion for test development (pp. 5-6). Generally, when these present tests are used to compare curricula, the results usually end in no significant differences. Nevertheless, these same curriculum innovations in certain instances were found by school personnel to be making a significant difference in student interest (Wrightstone, et al).

As the evaluator tries to discern the issue of comparing curriculum programs, he confronts a major evaluation problem. One cannot adequately compare educational programs, say the adversaries, for one finds the use of norm-criterion tests which obtain their content items from only one of the emphasized programs. Therefore, if one uses an achievement test based upon a traditional or an innovative program, the findings naturally will favor that program from which the test drew its content.

Brownell (1966) indicated that it is impossible to compare program A against B because of six logically sound reasons. They are:

1. One can only sample at best a small fraction of the total content.

2. The same content cannot be held constant for any two programs.

3. The amount of emphasis placed on the same
objectives varies.

4. The marked dissimilarities in pacing of instruction.

5. The variation in teacher practices.

6. The impossibility of controlling the quality of teaching.

Heath (1962) concurs with Brownell (1966) when he states that when an educational consumer asks the question "which curriculum, the old or new, is better?" he is asking an inherently unanswerable question. He further states that pure experimental design will support either the old or the new curriculum. The experiment is not incorrectly run, but the question is unanswerable.

Scriven (1967) disagrees with Crombach (1963) as to the possible soundness of comparing of educational programs. Crombach says that the use of experimental designs in comparing programs is not very suitable. Scriven (1967) disagrees with Crombach when he says comparative evaluation must be done by an outside agency (pp. 62-71). Stufflebeam and Hammond (1969), in a lecture at Ohio State University, indicated that comparative evaluation of educational programs by using an achievement test is on the decline.

The above comparison process has mainly used a norm-criterion method of assessing programs which differentiates the performance of individual students. Gagne (1967), Stake (1967), and Tyler (1967) say what should be used to compare programs is an overarching criterion schema. Here each
item is not based on the concept of difficulty, but a design to measure what the student can or cannot do in terms of what is stated as an overarching objective. In essence, what one really wants to know about a given program is whether it works.

The above device is known as a criterion reference measure that emerges from a consensus of what generally is desired from any program area. For example, industrial arts education consistently promotes as one of its major objectives "the understanding of industry." On the basis of this objective one could design an instrument to determine whether one program is in fact better than another. Gagne (1967) states "in more precise terms, one is interested in finding out whether learning is promoted by the presentation of particular content in a particular sequence" (p. 29). Mehrens (1969) outlines this same process in the program of National Assessment as a procedure for assessing the nation's school programs. What is needed is appropriate information about programs which seems improbably to gain through comparing programs.

Problems in evaluation for gaining appropriate information to make correct educational curriculum decisions have been outlined by Stufflebeam and Guba (1968) as follows:

1. The problem of definition should be broad enough to include the measurement view, the congruence of performance view, and the judgment view.
2. The problem of the educational setting within which evaluation must be conducted

3. The problems in determining information requirement
   a. The need to ask the right questions and to classify appropriately answers to serve the decision making process
   b. Knowledge about locus, focus, timing and criticality are gravely needed to make decisions function effectively in an education program

4. Problems in designing educational evaluations
   a. Experimental design prevents rather than promotes change in treatment because it cannot be altered in process
   b. Useless as a device during planning and implementation of a project experimental design—uses after the fact data
   c. Suited for antisepic conditions of the lab but not the septic conditions of the classroom
   d. Must control variables—evaluation uses the good as well as the bad and invites interference-control of the internal variables at the expense of external variables
   e. Test administered to instruction after treatment—long time to wait for improvement
   f. Evaluation has feedback—experimental design has no feedback
   g. Experimental design accommodates a design—model evaluation accommodates improvement

5. The problems of designing evaluation systems provide an institutional setting in which evaluation can occur to handle both continuous systematic evaluation needs as well as unpredictable ad hoc data that emerge in due process of program change

6. The problem of defining criteria for judging evaluation strategies, designs, instruments, reports, etc. A major concern is that reports of current evaluation programs are neither sufficiently specific nor timely to influence educational improvement (pp. 7-19).

Alkin (1970) agrees with Stufflebeam's and Guba's
point 1, above, when he says evaluation should not be a narrow interpretation by just using measurement, judgment, or performance but using an interrelationship of all three to gain useful information for decision making (p. 2).

These problems depict grave concerns that are in need of correction if evaluation is to support Scriven's (1967) concepts of both formative and summative evaluations (p. 43). Wiles (1963) adds that the problem areas in the evaluation process are:

1. An adequate way has not been developed for society to define and communicate its expectations to educational institutions.

2. The educational institution has difficulty operationalizing educational objectives and therefore there are no adequate methods to determine the effectiveness of operations for achieving these activities.

3. An adequate body of educational theory does not now exist from which educational operations can be derived.

4. It is very difficult for society to judge output of educational organizations since payoff in behavioral change is very difficult to measure.

5. Society does not provide an independent agency to evaluate educational output. It is forced to rely on what the educational organization says or on casual observation (p. 298).

Factors That Affect Problems

Why is it that currently there is an increased emphasis being placed on better assessment of what is happening in industrial arts as well as other educational subject areas? Possibly it is due to the maturation of our culture, of scientific thought, and the application of science which
has created a society that is devoted to newness, self-discovery, and most of all expanding horizons to more people. These interested publics realize that the application of science and technology has altered educational preparation requirements in the fields of agriculture, industry, defense, commerce, health service, and most other fields. Occupations which were often requiring large components of intellectual activity as well as social sensitivity and skills (NSSE, 1968, pp. 2-4).

Another factor which is strongly affecting the expanding horizons of evaluation is federal funds. As federal funds are poured into educational betterment, the educational consumer becomes more sensitive to outdated and poor teaching-learning techniques and practices. The various federal acts starting with the (1958) National Defense Education Act, the (1963) Vocational Act, the (1965) Elementary and Secondary Education Act, and the recent (1968) amendments of the (1963) Vocational Act, testify to the great import of federal funds for the improvement of education. With billions of dollars being spent, Congress and recently the President have required that an accounting of the results be given to show cause for increased appropriations.

A factor which is influencing school administrators to become extremely interested in evaluation is the case of National Assessment. In 1964 initial impetus was given to National Assessment by James Allen, John Gardner, Francis
Keppel, Ralph Tyler, and others to form a committee called Exploration Committee on Assessing the Progress of Education (ECAPE). The task of the committee was to prepare a plan to gather outcome data on education at the national level. In July, 1969 the Education Commission of the States (ECS) officially took over the responsibility for national assessment. The first year of a three-year cycling process is to gather baseline data on where education stands in relation to certain educational objectives. Future assessments will provide evidence concerning the progress made in meeting these objectives. To give substance to the reasoning behind National Assessment, Mehrens (1969) suggests the following:

Educational decisions must continually be made. As society demands more of education, these decisions become harder and more important. To make these decisions on less information than can be obtained is indeed poor administrative and educational practice. National Assessment will provide valuable data (p. 217).

As a result of societal forces, accountability in the use of funds, and the idea of National Assessment, has caused the educationalists to grasp for better ways to evaluate their programs. Regional evaluation centers such as those at The Ohio State University, University of Illinois, and others have sprung up, and evaluation thoughts have been developed to correct present problems. It is important that these problems dealing with program evaluation itself be identified.
The present inadequacies of evaluation to supply useful information on instructional programs to the educational consumer have been found to be serious errors in education that need correction. The extent of this seriousness is expressed by Frymier (1966) when he makes the following assumptions:

1. Few people are satisfied with the state of affairs in American curriculum as it exists today.

2. The inadequacies can be found in any building and in any district of the United States.

3. Too many children hate the very thought of having to learn in school...too many find school an unexciting place to be.

4. Too many children are unsuccessful in acquiring those ways of behavior which seem desirable to those in charge.

5. Evaluation has been ineffectively utilized as part of the total educational schema (p. 124).

It appears that if industrial arts of tomorrow is to advance as a result of curriculum change, there must be new solutions to the problems of evaluation.

The State of Evaluation--Its Solutions

In the educational market place the consumer is demanding evidence to indicate whether or not the worth of these developmental programs is in fact showing improvement over what they have. As time passes, fads should give way to rational decision making by the educational consumers, for they will only settle for complete critical assessment
and not partial facts of intuitive mysticism.

One of the primary roles of evaluation should be to determine which program helps children learn more effectively and efficiently. This means that the evaluation mechanism should make every effort to gain the type of instructional program that enables all youth, regardless of their socio-economic status, color, or creed, to enjoy the fruits of an improved educational environment. If evaluation is to gain this end, it must provide the type of framework that considers all possible sources of information which are desirable in making educational improvements.

There is general agreement today that a logical framework for checking the development of curriculum is lacking (Stake, 1967, p. 7). Stufflebeam and Guba (1968) indicate that there is a lack of skilled personnel, instruments, procedures, but most of all a critical lack of an adequate evaluation theory (p. 8). Stake (1967) also states the following:

The evaluator needs a battery of standard operating procedures. Procedures depend on criteria. Criteria depend on rationale. Rationale depends on theories. From evaluation theory to practice new thinking is needed (p. 7).

It appears that a theory is needed to support a foundation, a rationale, or a conceptual base in which a theory allows the program evaluator to make decisions pertinent to an overall developmental schema. Hastings (1967) gives
what he considers five important background concepts to focus on when building evaluation strategies or tactics. They are: (1) decision making, (2) rationality, (3) description, (4) judgment, and (5) differentiation between individual student assessment and evaluation of a program's progress, personnel, and organization (p. 6). Jerome Bruner (1966) states that after a year or two of curriculum work it became apparent there was the need for setting down philosophical guidelines for evaluation (p. 165).

Heath (1969) suggests through the efforts of Cronbach (1963), MacDonald and Raths (1963), Hastings (1964), Scriven (1965), Abramson (1966), Ausbel (1966), and Stake (1966) that the following three solutions are needed:

1. Specific strength and weaknesses of curriculum and instruction can be evaluated through trials and retrials in developmental process. This will enable objectives as well as the substance of the curriculum to be classified and refined.

2. Evaluation of curricula may be geared to the needs of those who must select from among completing programs. A meaningful and objective description of the content and typical effects of the curricula will probably be more meaningful than expert opinions.

3. Curriculum hypotheses testing requires research evaluation. This will show how curricula influence students which are found through efforts to build internally consistent structures of verifiable knowledge (p. 280).

During the coming quarter century, it is likely that instructional programs will be subjected to close scrutiny.
This possibly will revolutionize curriculum development into systematic processes based on logically sound guidelines rather than rare generalization.

Bruner (1966) suggests the following guidelines in the evaluation of a curriculum:

1. Evaluation is best seen as a form of educational intelligence for the guidance of curriculum construction and pedagogy.

2. Evaluation to be effective must at some point be combined with an effort to teach so that the child's response to a particular process of change can be evaluated, then both product and process evaluation are accomplished.

3. Evaluation can be of use only when there is a full company on board, a full curriculum building team consisting of the scholar, the curriculum maker, the teacher, the evaluator, and the student.

4. Evaluation due to its very nature is likely to create suspicion and concern in the conventional educational setting where it has a history that is inappropriate to present practices of the kind being discussed... the most important is to provide intelligence on how to improve communication. Communication day by day with the team is one of the most important objectives of an evaluation study which should be to discover how this can be done.

5. From time to time the evaluator must design a means of providing and developing general intellectual skills.

6. A curriculum cannot be evaluated without regard to the teacher who is teaching it and the student who is learning it.

7. If curriculum evaluation is to be effective it must contribute to a theory of instruction (pp. 63-66).

The purpose of evaluation for the future as expressed
by these selected evaluators is basically the same, that is, providing information for decision making. This is done by telling a full story which is supported perhaps by both statistics and profiles. Evaluation should be concerned with information coming from a large number of variables at several points in curriculum development rather than only at the terminal point. Stake (1967) says the moral of the story in curriculum evaluation requires collecting, processing, and interpreting data pertaining to an educational program (p. 5). In the future, a sizable part of the school budget will be used to constantly keep abreast with new curriculum changes and their proper implementation into the educational environment.

The purpose of evaluation to Scriven (1967) is to answer certain types of questions about certain entities. The entities are various instruments which he calls processes, personnel procedures, and programs. The questions deal with the performance of these instruments which use certain criteria: Does it perform better than other instruments? What variables are affected by its application? Is the instrument worth what it is costing? (p. 40).

Possibly Hastig’s (1969) schema gives the information necessary for rational program decisions when he states the following three factors:

1. That evaluation has various roles within and across the various levels of educational venture which must be considered.
2. One should gain a wider perspective of evaluation than just looking at the expected and the observed outcomes—even with the use of excellent tests.

3. The methodologies for evaluation will demand that the evaluator call on the resources of many different disciplines (p. 14).

The key question for evaluation is to provide answers to the decision maker on whether the program being suggested is better than the one now being used. Lindvall (1966) in talking about a rationale for planning an evaluation program says any evaluation effort is an attempt to provide answers to a question or some questions. He goes on to state that too many times evaluation is done without knowing what the key question is. Therefore the key question: Does this innovation, in the situation with which we are concerned, do what is desired better than alternatives? (p. 162).

(Note: key words are underlined.)

Accordingly, our needs include the formulation of a theoretical evaluation framework so that adequate questions are posed. This is needed to provide useful information to the educational consumers of industrial arts programs. The type of evaluation deemed necessary is total program evaluation which sociologist Znaniecki (1940) suggests in the following:

You cannot isolate...arbitrarily one practical cultural problem and its solution from the rest of the human cultural problems which are connected with it now and may become connected with it as an actual consequence of your activity—your own problems, those of the individuals and
groups whose cooperation you must enlist, and those of the wider society whom you wish to influence through those individuals or groups. Otherwise, divergent, perhaps conflicting, standards of valuation and norms of conduct will continually interfere with the planful realization of your cultural "end." This "end" as a value and the activity pursuing it must be incorporated into an axiological and normative system organizing conceptually all the values and activities which are or will be connected with it in the active experience of all the people who are or will be involved in the realization of your plan (p. 86).

Education can provide for the demands coming from the educational consumer if it invents, designs, innovates, develops, demonstrates, and improves--all of which represent a way for planned change. Evaluation plays a vital role for it must be a part of these terms serving as a linking process in program development. Sound program evaluation must be functional if educational change is to be guided and directed through a logical process. Therefore according to Wiles (1963) sound evaluation is a prime prerequisite for effective change. It must give direction to and provide for improvement of our schools (p. 364).

To gain these desired ends of providing useful information, a total program evaluation schema or model is needed. Stake (1967) agrees that the purposes of evaluation should reconsider what resources should be produced, what new models of evaluation should be proposed, and what new tactics should be discussed in light of this model (p. 12).

Industrial arts education cannot change unless some
evaluative method is provided to adequately chart the direction and give guidance to that change. Suess (1969) in summary of the National Conference on Research in Industrial Arts suggests strongly that the "industrial arts profession must prepare for change." As stated previously, Wiles (1963) suggested, "Change can only occur through sound evaluation."

If industrial arts is to remain a reality in the formal school setting, then current curriculum reforms and proposals must attempt to take immediate steps to develop an improved approach to evaluation. This can come through the process of developing program evaluation statements which will be used to develop premises. This will give initial guidance and direction to generating a program evaluation schema.

The Generation of Program Evaluation Statements which are Representative of the Purposes, Roles, and Mechanisms as Found in Recent Evaluative Literature

Up to this point in the review of literature the emphasis has been placed upon an overview of industrial arts curriculum programs, current evaluation problems, and the opinion of various educationalists on how to correct these evaluative problems. As has been stated previously, the major overriding problem in this study is how to develop a total program evaluation schema which provides useful information to the educational consumer of industrial arts products. The solution of this problem can be gained by
determining the evaluative roles, purposes, and mechanisms required to develop a theoretical base from which to operate.

Alkin (1970) proposes that the development of a theory of evaluation is central to any evaluative enterprise. He suggests that a theory of evaluation should:

1. Offer a conceptual scheme by which evaluation areas or problems are classified.

2. Define the strategies including kinds of data and means of analysis and reporting appropriate to each of the areas of the conceptual scheme.

3. Provide systems of generalizations about the use of various evaluation procedures and techniques and their appropriateness to evaluation areas or problems (p. 2).

The assumption that can be drawn from Alkin (1970) is that an evaluation theory should provide a schema which can be used to predict the appropriateness of using different evaluation strategies within a system.

The development of a theory to support the assumptions or premises upon which this study is to be built involves first gaining a definition of the roles, purposes, and mechanisms of program evaluation. This definition hopefully will emerge as a result of generating program evaluation statements from selected evaluation literature.

As a result of searching through recent evaluation literature on program evaluation, statements have been written which are representative of the roles, purposes, and mechanisms of evaluation. These statements are con-
sidered in essence, what evaluation is, should be, or ought to be in the future. Therefore, the rationale or the conceptual schema needed to resolve evaluation's problems in industrial arts education starts with ascertaining program evaluation statements. Through an analysis process, these statements will eventually serve as a means of gaining a theoretical framework for guiding and directing the development of the total program evaluation schema.

The evaluation literature reviewed included the areas of:

- industrial arts education
- systems engineering
- curriculum development
- model building
- management
- leadership
- urban education
- social sciences
- testing and measurement
- decision making
- national assessment
- program evaluation
- general field of evaluation
- research and development.

Included in Appendix A are the evaluation statements and the references from which the statements came. These statements are either paraphrased or are direct quotations from the works cited.

Summary

A review of the development and growth of industrial arts instructional programs in the United States has found them diverse and fragmented. One can find changes in an
industrial arts instructional program from its initial inclusion in public schools in 1880 by Woodward to its present status in American culture. However, this change has not kept pace with our progressive technological society.

Recent societal pressures have triggered curriculum reforms to make industrial arts more relevant to what industry is doing. As a result of these reform movements, numerous ideas have been suggested and developed on what direction industrial arts should take in becoming more congruent with today's industry. The two most prominent curriculum reform projects are the AIP and the IACP both of which have been extensively field tested. Nevertheless, other industrial arts educators are demanding a still more relevant instructional program that draws its content from the study of occupations.

The state of evaluation—its problems are common to industrial arts as well as all of education. Industrial arts has many studies dealing with program evaluation. These inquiries, however, are inadequate today since they fail to conceptualize program evaluation as a means of providing useful information about alternatives to the educational consumer. Generally program evaluation is narrowly conceived of as confined to the industrial arts laboratory instead of looking at other factors which can influence an instructional program.

Information available about recent industrial arts
curriculum reforms are only cursory in nature. Evaluation by comparison of these programs is illogical since each emphasizes different viewpoints of industrial arts. However, comparison may be possible through a set procedure. The generalists in evaluation say the problem in evaluation is its narrow interpretation, its lack of instruments, procedures, and a clear conceptual framework from which to work. Possibly this is the reason why evaluation has not received greater prominence in curriculum development.

Presently society is exerting pressure from National Assessment, federal requirements, minority groups, and other sectors to provide more evaluative information about instructional programs. This has forced educators to take a fresh look at evaluation. These findings conclusively substantiate the fact that the achievement test is wholly inadequate to evaluate instructional programs.

The state of evaluation and its solutions are dependent upon gaining an adequate theory which undergirds the foundation that supports evaluation. Therefore, this solution requires a schema which considers an instructional program in the sense of a macrocosmos rather than a microcosmos. Various experts in the field of evaluation and education have made suggested means of solving this problem. These solutions center upon decision making, rationality, description, and the need for greater information.

One authority in evaluation indicates that the solu-
tion can be obtained through the development of a battery of standard operating procedures. This requires the development of a criteria, a criteria depends upon a rationale, and a rationale depends upon a theory. Therefore, if new thinking from theory to practice in industrial arts instructional program evaluation is to take place, one must start with a theory.

If industrial arts has no adequate theory for evaluating instructional programs, then one must generate a theory which acts as a framework for guiding and directing its evaluation procedures. The next step is to initiate a procedure to gain a theory by generating program evaluation statements from a review of pertinent literature.

The generation of program evaluation statements is designed to gather an authoritative consensus as to what roles, purposes, and mechanisms should be involved in evaluating instructional programs. This task was accomplished by surveying pertinent literature. From this review, statements were written summarizing the author's opinions on what evaluation should or ought to entail. An assumption was made that through a rating process these evaluation statements would develop into premises.

These premises would be used to develop a theoretical evaluation model. This model would be the theory or the conceptual framework from which a new total program evaluation model will be developed for industrial arts education.
CHAPTER III

THE DESIGN OF THE STUDY

The educational tools required to develop and test a total program evaluation schema are both diverse and complex. To explicate the research plan as outlined in Chapter I, it becomes necessary to formulate a workable and simplified schema. The design of this schema must encompass the vital elements of program evaluation (the central theme of the study), information (the product sought for decision makers), industrial arts consumers (the decision maker), and management (means of operationalizing the schema).

The function of design is to place in proper context each of these above elements. This can be accomplished by applying a systems analysis process for logically structuring each event or milestone into an integrated unit for building the total program evaluation schema. Hopefully the systems analysis approach will alleviate the complexity and the diversity of the total program evaluation schema for industrial arts education so that one can understand the whole yet not sacrifice the functional utility of each part.

Information is a subsystem of evaluation, and evaluation is a means of informing decision makers about possible alter-
natives. Systems analysis can provide an orderly analytic procedure to help identify a preferred course of action in the development process from among possible alternatives. Therefore, the purpose of this chapter is to incorporate a systems analysis process used in designing the rationale and to develop procedures for generating the total program evaluation schema for industrial arts education.

The objective of Chapter III is an attempt to accomplish the above requirements by answering the following questions:

1. What management design procedure will systematically plan, organize, control, and communicate the development and testing of this study?

2. How can an instrument be developed to generate premises for obtaining the theoretical evaluation model?

3. To what population sample will the instrument be sent in order to gain a representative group of both the generalists in evaluation as well as the industrial arts educators?

4. What methodology is required to collect, organize, and analyze data from the sample respondents?

5. How can one develop an overarching questioning process?

6. What systems rationale and procedure as well as other factors are required to develop a total program evaluation schema?
   a. What overarching questions need to be written to adequately evaluate industrial arts education?
   b. What are the rationale and procedures required to develop a theoretical evaluation model?
   c. How can one develop a rationale and procedures for an operational evaluation model?

7. How can simulation be used to test the total program evaluation schema?
Management of the Study

The design of this study is concerned with incorporating a system analysis approach to aid in structuring the total program evaluation schema. According to Cogswell (1962) system analysis and system design are defined as follows:

**system analysis**, as the term implies, is the analysis or study of a system. The procedure may involve the detailed descriptive analysis of an existing system, in which the various functions, the interactions between subsystems, the flow of information, etc., are analyzed in terms of their effect on total system performance. If the system to be analyzed does not actually exist but has been proposed, a model of the tentatively planned system may be constructed by the use of simulation techniques. By simulating the system and its environment in systems research, functions and interactions can be varied and studied under controlled conditions.

**system design** refers to the actual design of a new system. System design is usually considered iterative in the sense that the initial design is frequently tested empirically by simulation techniques prior to implementation. As a result of the findings, the design is modified before implementation. The system is evaluated following installation and the design is again modified if changes are indicated by the testing (p. 2).

This process and the Critical Path Method network (Figure 1, page 13) would enable this investigator to use management decision processes in planning, organizing, controlling, and communicating the development and testing of the innovative evaluation schema for industrial arts education. Through the application of this design, parts of the evaluation schema can operate as an entity yet belong to and
support an overall conceptual schema of industrial arts education.

Due to the complexity of the variables involved in the evaluative schema and the need to integrate these into a workable plan, a systems design procedure was selected to accomplish this objective. A systems design, according to Johnson (1963), provides the overall framework for implementing the systems concept (p. 89). A systems concept is structured to serve a dynamic situation, identify responsibilities and effectiveness, and adjust activities as situations change.

When a system is responsive to the environment it is an open sequence system. A closed sequence system is concerned with the internal working of a system to maintain a constant equilibrium of all parts. This investigation is mainly concerned with the open sequence system. For if evaluation is to be adequate, it must be sensitive to those environmental factors which can determine educational improvement. One can find a relationship between open system sequence and a general systems theory. Beynon (1965) discusses this point in the following:

1. Open systems interact with the environment; therefore, they have inputs and outputs. (Figure 3 exhibits these two variables.)

2. Open systems tend to maintain themselves in a steady state. A steady state being defined as a constant ratio being maintained among the components of the system.
3. Open systems are self-regulating.

4. Open systems maintain their steady states through the dynamic interplay of subsystems operating as functional processes.

5. Open systems display equifinality, that is, identical results can be obtained from different initial conditions.

6. Open systems maintain a steady state through feedback processes. Feedback refers to that portion of the output of a system which is fed back to the input and affects succeeding outputs, and through the property of being able to adjust future conduct by past performance (pp. 63-64).

A simple systems concept is shown in Figure 3.

```
Input → [Instructional Process] → Output

Feedback
```

FIGURE 3

ELEMENTS OF A SIMPLE SYSTEM

A system is an array of components designed to accomplish a planned objective (Johnson, 1963, p. 257). To design usually means to mark out, designate, or indicate. It includes the features of combining and detailing specifications under which an integration process takes place. Therefore, the function of the systems design, as used in this study, is to plan and establish a relationship between the various stages of the total program evaluation schema. In light of this, the systems design concept will serve as a planning, organizing, controlling, and communicating device to bring all elements of the subsystem into an integrated whole.
The principle of integration is vital not only to this research study but also to the schema of total program evaluation. A system is a flow process where each segment is analyzed and investigated to determine the interrelationship of these segments and their contributions to the whole.

One should conceptualize the integration principle as a means of logically assimilating subsystems of the total program evaluation schema into a workable whole. Credence is given this integration premise by Hopkins (1937) in the following seven points of his vitalist theory of deductive reasoning:

1. The whole is primary and the parts are secondary.
2. Integration is the condition of the interrelatedness.
3. The parts so constitute an indissoluble whole that no part can be affected without affecting all other parts.
4. The nature of the part and its function is derived from its position in the whole and its behavior is regulated by the whole to past relationships.
5. Parts play their role in light of the purpose for which the whole exists.
6. The whole is any system or complex or configuration of energy and behaves like a single piece no matter how complex.
7. Everything should start with the whole as a premise and the parts and their relationships should evolve (pp. 36-49).

It appears that the output of the smallest system becomes input for the next larger system which in turn furnishes
input for a still higher level.

The types of systems fall into two basic categories, namely, man-made and natural. The latter is represented by the solar system or the nervous system of a human. The former, that is, man-made systems can be found anywhere from the simple electrical systems in a home or a fuel system in an automobile engine to the highly complex system that made it possible to put man on the moon.

Regardless of whether the system is natural or man-made, simple or complex, the general theory still is true. That is, there are levels and within these levels there are sublevels, of which all are designed to accomplish a given task or mission according to plan. The concept of integrating levels takes on more meaning when a graphical and verbal explanation is given as found in Figures 4 and 5.

It is not the purpose of this study to discuss in depth the workings of the systems concept. However, through a systems concept the complex nature of the study and the actual evaluation models to be developed will be simplified. An assumption can be drawn that greater simplification is possible through the adoption of a general systems theory. This general systems theory should provide a framework for gaining the type of operational structure in which all systems or part-whole relationships can be arranged in the best possible order.

A system does not exist unless it has a mission, a
FUNCTIONAL ANALYSIS

Shows What must be done
Shows in what Order things must be done
Analyze
Identify
Order

Obtain requirements
Prepare mission objectives
Determine limits & constraints
Identify major function
Identify task
Identify methods-means

Select methods means
Determine Budget
Prepare methods means
Validate prestation materials
Present
Evaluate

The Mission Profile is "Top" level functional analysis
The format which shows our functional analysis is called A Functional Flow Block Diagram

FIGURE 4

A FUNCTIONAL ANALYSIS FLOW BLOCK DIAGRAM
(FROM R. KAUFMAN AND R. CORRIGAN, 1966)
LEVELS IN FUNCTIONAL ANALYSIS
Each top level function may be analyzed into constituent lower level functions

Top Level (mission profile)

1st. Level

2nd. Level

3rd. Level

N Level etc.

FIGURE 5
A FUNCTIONAL ANALYSIS LEVEL FLOW BLOCK DIAGRAM
(FROM R. KAUFMAN AND R. CURRIGAN, 1966)
goal, or an objective. It also must have a design or an established arrangement of the components into a logical organization. This organization may take on the form of the following order as depicted in Figure 6.

<table>
<thead>
<tr>
<th>Requirements</th>
<th>Design</th>
<th>Production</th>
<th>Trial</th>
<th>Evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input</td>
<td></td>
<td>Processing</td>
<td></td>
<td>Output</td>
</tr>
</tbody>
</table>

**FIGURE 6**

THE RELATIONSHIP BETWEEN A SIMPLE ORGANIZATION AND A SIMPLE SYSTEM

To relate systems to industrial arts, one first determines the functional context. This was illustrated by Kaufmann and Corrigan (1966) in Figures 4 and 5.

A functional analysis of industrial arts education starts by obtaining its requirements or its mission in the educational setting. Figure 4 is representative of a comprehensive analysis function which shows what must be done and in what order. The relationship between functional analysis and mission profile is depicted in Figure 5. The top level function or mission profile needs to be analyzed into constituent lower level functions. This gives an input-process-output or system at each level which in essence a hierarchical organizational structure.

The hierarchial organization structure in which indus-
trial arts functions is illustrated in Figure 7. This systems organization is man-made. Its dimension is both receptive to the environment and homeostatic in that it maintains the present systems. This means that the industrial arts educational systems should function adequately within the forces of the environment as well as satisfy the internal workings of a closed system.

For purposes of communication, the system will be related to the total program evaluation schema. The industrial arts organizational system of the first level or the top level mission profile will be known as the macro system. The macro systems will have six levels of which evaluation will be at the sixth level. In brief, the industrial arts organizational system systems, hereafter called the macro system, will have six levels of which evaluation will formally operate at the sixth level. The total program evaluation schema will be known as the system which is part of the macro systems found at the sixth level. It is noted, however, that a total program schema must function with the other five levels of the macro system if adequate information is to be supplied to the decision makers. In the past, program evaluation in industrial arts has not functioned effectively within the intervening levels of the macro system nor has it sought information from the environment to make instruction relevant to a changing society.

The narration of the organization hierarchy, or the
THE INDUSTRIAL ARTS ORGANIZATIONAL SYSTEM, SYSTEMS

Level 1

Societal Institution

Educational  Political  Familial  Religious  Economical

Knowledge

Descriptive  Prescriptive  Praxiological  Formal

Industry Material Production

Industrial Arts Educational Intents

Learner  Society  Content

Specific Objectives of Industrial Arts

Select and Organize Instructional Experiences to Meet Objectives

Select and Organize Instructional Content to Meet Objectives

Industrial Arts Instructional Program in Operation

No Modification Continue to Validate Objectives
No Modification Continue to Validate Objectives

Ind. Arts Total Program Evaluation Schema

Recycle to Meet Objective Change

Terminate Prepare for future Activities

FIGURE 7

THE INDUSTRIAL ARTS ORGANIZATIONAL SYSTEM, SYSTEMS—"MACRO SYSTEM"
macro system, starts with level one. (See Figure 7.) Level one involves the overarching organizational system and subsystems of industrial arts education. It is the initial concept in which the term industrial arts education is found in the formal school setting according to IACP rationale. In level two, there are are five societal institutions. Two of the five, the economical and the educational institutions, have subsystems which directly affect industrial arts education. Industrial arts content is drawn from the economic institutions through specific segments of industry. The educational institution is designed to provide man knowledge about his environment so that he may be able to gain the good life. The other institutions indirectly influence the goal or mission of industrial arts instructional programs in level three.

Level four focuses in on the learner, the society, and the content so that specific objectives can be developed at the instructional program level. Generally 95 per cent of all curricula today in America emphasize one of these three factors or a combination in developing program objectives. They change whenever environment forces change.

Level five's specific purpose is to select and organize appropriate experiences and content to meet the requirements or the mission objectives as found in levels one through four. The scope and sequence of these experiences and content will vary in accordance with the program, the population, and the
desired behaviors sought. When the selected and organized experiences and content are brought together one finds an operational instructional program which tries to incorporate prior planning inputs into a particular instructional setting.

At the sixth level one finds the total program evaluation schema which is the major concern of this investigation. It is at this level, called the systems, that the total operation of the macro system is dependent upon useful information so that informed decisions can be made. These decisions encompass the activity of becoming attuned to the environment as well as the total system and subsystems as found within the industrial arts educational setting. Therefore, the top level mission profile framework is identified through the organization of industrial arts by the systems concept. Evaluation within this system organization also has been identified and given its position of input-process-output schema. Hence, the design of the chapter is to be structured in such a manner that the total program evaluation schema, called the systems, can be developed and tested for both face and empirical validity.

The total research study is managed through a Critical Path Method which incorporates a network analysis process. This process illustrated on page 13 is used to plot the most logical and rational sequence of events from writing the proposal to end of research. Suggested monthly allotments
are given to a set of events to assure adequate distribution of time.

Development of the Instrument

Hopkins' (1937) seventh point of his vitalist theory states:

...that everything should start with the whole as a premise and the parts and their relationship should evolve (pp. 36-49).

It follows that the development of the instrument to generate premises is the logical place to start. Once the premises are generated, the theoretical model can be developed. The theoretical program evaluation model will serve as the framework for the total program evaluation schema. This evaluation schema fits into the macro system at the sixth level. The development of premises began when program evaluation statements were written.

The program evaluation statements were generated from selected evaluation literature which is described in chapter II, The Review of Literature. The actual development of the instrument parts is illustrated graphically in Figure 8.

Rationale

The rationale for selecting program statements from evaluative and other related literature was founded primarily upon the conceptualization that evaluation should provide useful information for decision making. The means to accomplish this task was to solicit from the various au-
FIGURE 8

PROCEDURE IN DEVELOPING AN INSTRUMENT TO RATE PROGRAM EVALUATION STATEMENTS
thors those important points that were congruent with this selected purpose of evaluation. Other factors entered the picture as time passed and different areas of knowledge were searched. These included management, systems theory, model building and curriculum development.

Accordingly, this rationale of evaluation was chosen since it follows the major tenets of Phi Delta Kappan, National Assessment, American Educational Research Association, Regional Laboratory at the University of the City of Los Angeles, Evaluation Center at The Ohio State University, and numerous other sources. The review of literature did cover many of these same sources. However, even though these sources subscribed to the above thoughts on evaluation's purpose, the exact roles, purposes, and mechanisms to accomplish this task were considered different.

An expression of different purposes, roles, and mechanisms needed to accomplish the task of providing information to the educational consumer is central to this study. The plan was to collect into one listing the thoughts of those who believe in gaining information for decision making. Once the list of program evaluation statements was assembled into an instrument, it could be sent for rating to individual authors who were referenced and to others in the field of general evaluation. This procedure is known as the Delphi technique as illustrated by Helmer (1963) in the following:
Another type of group action, somewhat less structured than the operational game, attempts to improve the panel or committee approach by subjecting the views of individual experts to each other's criticism without actual confrontation and its possible psychological shortcomings. In this approach, called the Delphi method, direct debate is replaced by the interchange of information and opinion through a carefully designed sequence of questionnaires. At each successive interrogation, the participants are given new refined information, and opinion feedback is derived by computing consensus from the earlier part of the program. The process continues until either a consensus is reached, or the conflicting views are documented fully (pp. 458-67).

Quade (1966) sums up the thoughts on using qualitative methods instead of quantitative procedures in the following:

It should be emphasized that in many important problems it is not possible to build really quantitative models. The primary function of a model is "explanatory," to organize our thinking. As I have already stated, the essence of systems analysis is not mathematical techniques or procedures, and its recommendations need not follow from computation. What counts is the effort to compare alternatives systematically, in quantitative terms when possible, using a logical sequence of steps that can be retraced and verified by others (p. 303).

It is also believed that if these same statements are submitted to industrial arts college educators for ranking two things happen. First, a consensus of those valued statements by raters from both groups will emerge to form premises in developing a theoretical program evaluation model. Second, it will reveal whether or not the thinking taking place about evaluation, in the general leadership field of evaluation, is congruent with the college leadership found in industrial arts education. If there is a wide gap between the generalists in evaluation and the in-
dustrial arts educators, then recommendations will be suggested as a means to correct this situation.

**Procedures in Developing the Program Evaluation Instrument**

Almost two months were devoted to searching, writing, and revising program evaluation statements. During this time other needed parts of the instrument were being developed and revised. These necessary parts included description and instruction on rating the statements, the rating sheet itself, and the cover letter. (Examples of these necessary parts of the instrument can be found in Appendices B, D, and D.)

The feedback from reviewers one and two was used to alter the entire context of the description and instruction section of the instrument. The program evaluation statements themselves were clarified, shortened, and some eliminated. One reviewer suggested the lead-in phrase "Evaluation should" which was placed at the top of each page. The phrases to complete the statement followed.

The description was changed from trying to compare premises with a definition to asking the raters to respond to the program evaluation statements on the basis of what they personally felt evaluation should be. It appeared that the Phi Delta Kappan definition caused concern with the preliminary reviewers. First, the definition of a premise was not given; therefore, confusion existed in how one could compare a premise to a stated definition.
Further description was given by adding definitions to clarify how the study was using the terms. It was suggested by the reviewers that the program evaluation statements would carry more weight if a list of the authors was given. No attempt was made to identify the author's name with the evaluation statement. This might have influenced the opinions given by the raters.

A cover letter was written to provide the rater with an overview of the study and to ask him to at least read the instructions. (See Appendix D.) The cover letter provides a space at the bottom for the rater to respond as to the reason for not completing the program rating sheet. Instructions were given to the effect if the rater did not want to participate in the study, he should simply mail the instrument back and check his reason.

If persons did want to respond, they were instructed to place the rating sheet in an enclosed self-addressed envelope and return when completed. Restraints were placed on the length of time the returns would be considered so that the study could proceed on the time pattern outlined on page 13. This also was incorporated to enable the investigation to continue without having to consider responses which might or might not be returned.

The total instrument, that is, the program evaluation statements, the description and instruction information sheet, the rating sheet, and the cover letter, was critiqued
by reviewer number three. The entire instrument then was submitted to a final reviewer, number four, for clarity and soundness of evaluation statements. The statements were revised in light of comments received. The rating sheet was changed to provide for a Likert-type response. (See Appendix C.) Final revisions accomplished the task of sorting out those items that all reviewers found to be confusing. Grammatical correctness and clarity were stressed over the substantive value of the original statements.

It was apparent that to ask a group of professional educators to spend several hours rating program evaluation statements was to risk a possible disaster. However, through a process of selecting evaluators from the general field of evaluation and industrial arts college professors, it was felt that a good response could be expected. A mailing list of the prospective raters was assembled and the printed instrument was mailed. Approximately sixteen days were allowed for the rater to return the rating sheets.

The program evaluation statements are very similar in their wording. However, this repetitiveness was not removed because the similarity serves as an informal judge of a rater's reliability in ranking similar statements throughout the instrument. It is also evident that as a result of a rater's progressing through the evaluation statements a
change in behavior or learning may take place. Both of these latter statements might be evident by the comments made in the spaces provided on the instrument. Similar information about attitudes toward evaluation might be implied both through comments on the rating sheets and the responses given for not completing the rating sheet.

Following is a summary of the critical decisions involved in developing instruments for rating program evaluation statements:

Statement 1. The Length of the Instrument

The inclusion of 208 evaluation statements consisting of fourteen typewritten pages goes against all tenets for developing a good survey instrument. A justification for this practice may never be confirmed by the pure researcher; nevertheless, a local pilot, designed to reduce the total number of evaluation statements, could represent the biases of a specific small group of evaluators. Therefore, the larger, more representative group of evaluators would not have the opportunity to rate the entire number of evaluation statements but only those selected by the smaller group from the Columbus area.

Cognizant of the above dilemma, the researcher made the decision to send the entire instrument of 208 items to the population sample of seventy-one. The feedback from this wider dispersion both on the ratings and the reasons why they did not respond will indicate whether the decision to send
all items for collection of data represents the right choice.

Statement 2. Clustering of Evaluation Statements

The question could be asked if the instrument were not shortened, then why were similar statements not clustered under one topic heading? The reasoning behind this approach appears sound on the surface, but as one begins to critically examine its logic, one finds problems. When statements are clustered for the rater it actually pre-sets his attitude as to what the investigator wants. This investigator believes that if the evaluation statements are clustered why should others be asked to respond?

Possibly the most logical reason for not clustering is that the rater's attitude is sampled with similar evaluation statements but at different times. Computer analysis on the Likert-type rating sheet may enable this investigation to extrapolate attitude and behavioral changes as he progresses through the 208 evaluation statements. It must be emphasized that this will not be a part of the study but only a suggestion for further study.

Samples

The raters of the program evaluation statements who represented the various geographical areas of the United States were classified into two main groups. One group was identified by Dr. Robert Hammond, Co-Director of the Evaluation Center, The Ohio State University; and by this investigator. These individuals consisted of knowledgeable
generalists in the field of research evaluation. The second group was identified by Dr. James Buffer, Assistant Director of IACP in Charge of Evaluation, and this investigator as those industrial arts educators and college professors who were cognizant of research evaluation.

The initial mailing of instruments included forty-five of the first group and twenty-six of the second group. The reason more instruments were sent to the generalists than the industrial arts professors was the prior notion that the responses would be less from the generalists than from the industrial arts educators.

Methodology—Collecting, Organizing, and Analyzing Data

The collection of data for developing premises was accomplished through survey instruments. These were designed to determine how experts respond to a set of program evaluation statements. The respondents were asked to rank the statements according to their personal judgment of what evaluation should be. The ranking process followed a Likert-type scale, that is, one represented strongly disagree and five represented strongly agree.

Procedure for Analysis and Interpretation of Data

According to Kerlinger (1964) analysis is the ordering of the breakdown of data into constituent parts in order to obtain answers to research questions (p. 603).

Before one can determine the procedure for analyzing and interpreting the responses to the program evaluation
statements, one must decide what research questions need answers. Therefore, the following list of questions is pertinent to this study.

1. What twenty program evaluation statements received the highest numerical value? These statements will serve as the premises used in developing a theoretical evaluation model.

2. What twenty program evaluation statements from groups one and two received the highest and lowest numerical value? A comparison of groups one and two according to these statements will aid in determining whether selected generalists in evaluation agree with selected industrial arts college professors.

3. What twenty program evaluation statements received the lowest numerical value? This is to determine what twenty statements the two groups considered least likely to represent evaluation.

4. How was the instrument received by the respondents? This information would give a general accounting about the returns of the instrument.

Those twenty statements receiving the highest number of points will be considered as the consensus or the opinions; in this case, the developed premises. This idea of a premise is in accordance with the definition stated in Chapter I under Definition of Terms.

Organization of data will be designed to answer the above-stated questions from both the generalists in evaluation and the industrial arts education professors. Group one will represent the generalists and group two the industrial arts professors.

Analysis of data was accomplished by transferring information from the rating sheets to IBM test sheets. Infor-
mation from IBM test sheets was then transferred to IBM cards by the use of the 1230 IBM scanner so that the 360 could analyze and interpret the data.

Developing the Overarching Questioning Process

Rationale

The purpose for structuring overarching questions for the study is to provide a better means of evaluating instructional programs. The decision maker may or may not possess the awareness of what factors should be considered in a total program evaluation schema. To aid the decision maker in communicating his desires to the evaluator, he can select those items which seem important to him for purposes of identifying specific decision situations.

There is a strong possibility that the perspective of the decision maker will be widened if he merely reads the list of questions. In essence, the asking of pertinent questions through some logical structure of a matrix may greatly influence the decision maker to promote rather than resist planned educational change.

Procedures for Developing the Overarching Questioning Schema

The value in using a three-dimension questioning matrix can be found in its worth as a device to gain information from a panoramic coverage of those interlocking factors that influence instructional programs. The items in the EPIC (1968) Cube or matrix were selected as the representative device to guide the writing of questions which when answered
can provide an universe of information for educational consumers. (See Figure 2.)

The development of the Epic Cube represents a research and development task that required $70,000, and a staff of interdisciplinary experts plus a time period of six months. Hammond, the director of the Epic Project at Tucson, Arizona during its development and now at The Ohio State University, has initiated a questioning schema from the Epic Cube. Hammond calls this process of generating evaluation questions "a schema for identifying relevant factors."

Gibson and McLain (1968) provide a refined classification of the Epic Cube or matrix when they suggest a coding process for the three axes namely X axis for population, Y axis for program, and Z axis for behavioral. The design for Tennessee Assessment (1969) project staff suggests that the three dimensional questioning matrix will serve as a method for asking what instructional programs dimensions are in focus, who is involved, and how the behavior is changed (pp. 36-37).

The structure of variables and its definition and terminology for use in industrial arts education are not strictly Epic or Tennessee Project.

I. Program Dimension--the program evaluation of industrial arts education

A. Organization--the instructional interrelationship of teacher and student which takes place in an industrial arts laboratory. It consists of two components--time and order.
1. Time—the duration and sequence of time blocks denoted to the scope and sequence of greater instructional activities.

2. Order—the vertical and horizontal order of students' instructional program. Vertical order classified students from their point of departure such as by ages or levels of achievement. Vertical order of instructional programs in the sequence of course offerings and administration arrangement 6-6, 6-3-3, or 5-3-4 based on public school grades 1-12. Horizontal order is the number of courses and how students are divided among teachers.

B. Content—the body of knowledge identified with industrial arts including the control of its inquiry.

C. Methodology—the process designed to facilitate learning.
   1. Teaching activities
   2. Types of interaction
   3. Learning theories utilized
   4. Theory of instruction
      a. Predisposition toward learning
      b. Structure knowledge for easiest learning
      c. Most effective sequencing
      d. Plan for reinforcement

D. Facilities—the spaces, tools, materials, and equipment used in support of education.

E. Cost—the cost benefit analysis of the money used to provide instructional facilities, maintenance, and personnel for industrial arts educational programs.

II. Population dimension—the variables of the people who will influence the program.
A. Student—person who is enrolled in the program.
B. Teacher—person who is instructing in the program.
C. Administrator—person who is responsible for the total program or a component of the program.
D. Specialist—supervisors of the program.
E. Family—student's parents and siblings.
F. Community—social environment in which the student is a resident.
G. Other levels—state and federal, university and project.

III. Behavioral dimension—the three domains of behavior which permit definitive classification of the objectives of a program and the related activities.
A. Cognitive domain—the acquisition and/or use of knowledge.
B. Affective domain—the internalization of emotional feelings and/or the degree of acceptance or rejection.
C. Sensorimotor-psychomotor domain—the physical manipulation or use of motor skills and capabilities including the input through the senses to the brain, decoding the input, and sending output signals to muscular coordination are obtained through a feedback servo-mechanism.

A coding system developed by Gibson and Allen for the Epic Cube (1968) is used to identify those subtopics as associated with the three axes. The Cube number systems is formed by using three four-digit numbers in the form XXXX, YYY, and ZZZZ. The X axis is the who or the population dimension, the Y is the what or the program dimension, and
the Z axis is the how or the behavior. A list of these subtopics is found in Appendix E.

A procedure for using the Epic Cube (1968), or in this study the questioning matrix, to identify interrelated factors is suggested by Hammond and others. A factor is the combining of one variable from each of the three axes' dimensions of the matrix. For example, a factor would be how students (population dimension) feel (behavior dimension) about facilities of the laboratory (program dimension). The factors will be written as an interrogative sentence. From this question a behavioral objective can be written which serves as a means for operationally evaluating instructional programs. Once the decision maker or educational consumer identified what factors he is interested in, then an evaluation design can be incorporated into the operational program evaluation model. This will serve as a systems framework from which evaluation, instruments, procedures, and the specific needs of the decision maker are identified. This will form a means of data collecting, organizing, and reporting.

The soundness of the questioning matrix will be determined by the number and degree of questions being answered for the decision maker. If the decision maker's questions are not answered adequately or if the industrial arts instructional program cannot be evaluated by identifying pertinent objectives, then the overarching questioning proc-
ess will require change. The systems analysis approach will help in this capacity.

Development of the Total Program Evaluation Schema

Rationale

The main thesis of this study is the development of a total program evaluation schema. The purpose for this evaluation schema is to provide useful information for decision making. The decision makers in this study are defined as the educational consumers who include all school personnel, students, parents, community, educationalists, and other interested publics.

Information is central to evaluation as well as to management since they both need it if informed decisions are to be made. An adequate information system provides the vital link to all parts of an organization for operating an effective and efficient management process. In addition, information plays an integral role in the managerial function of planning, organizing, controlling, and communicating the purpose of an organization. Johnson (1963) states that information is a key ingredient which allows an organization to function as an open system with some degree of feedback control (p. 73). Logically, it appears that one could equate evaluation with management's information decision systems.

Since information for evaluation and management is tied to the decision making process, it becomes apparent that one
can identify the purposes of the total program evaluation schema as an information decision systems. An information decision systems is a process designed to satisfy a request in light of the decisions to be made throughout the total organization (Johnson, 1963, p. 35).

If evaluation is a means for delineating, obtaining, and providing useful information for affecting decision making, then one needs to know what decisions are to be made throughout the organization. In conjunction with this concept of evaluation, its definition should also include the concept of measurement, judgment, and performance. This gives a broader context in which to work because information production is not wholly focused upon a narrow view as may be apparent in business management's concept of gaining knowledge. Nevertheless, an information decision systems is a key adjunct to evaluation and the education consumer. Consequently, evaluation is providing the information so that the consumer can plan, organize, and control his operation in developing, testing, diffusing, and using industrial arts instructional products.

Evaluation in this capacity links the various stages or phases of program development as well as the various levels or subsystems of the macro system. Critical to developing a total program evaluation schema for industrial arts education is the identification of key decision points. This will enable evaluators to incorporate an adequate in-
formation decision systems concept which not only identifies the source of information but also screens out the intervening variables (Buffer, 1970).

A paramount factor of an evaluation system is the designing of an overall subsystems of information flow. Hopefully, this will alleviate confusion and provide a logically sound and rationally accurate information base for systematically making informed decisions. An example of the difference between confusion and rationality of an evaluation information decision system is illustrated in Figures 9 and 10. One can determine from observing Figures 9 and 10 that an adequately conceived information flow systems can contribute to a succinct information process needed in a complex organizational structure.

The systems or the total program evaluation developmental schema flow pattern is depicted in Figure 11. The numbers indicate the developmental flow pattern. The premise, which is indicated by numeral 1, will be determined in Chapter IV.

The uniting of the theoretical evaluation model and the overarching questioning process and the development of the operational evaluation model are all part of Chapter V. This includes numerals 2 through 4. Chapter VI is the testing of the total program evaluation schema through simulation which eventually makes a decision to modify, terminate, or continue. This is identified in numerals 5 through 6.
FIGURE 9
A TYPICAL INDUSTRIAL ARTS PROGRAM WITHOUT AN EVALUATION INFORMATION SYSTEM (ADAPTED FROM FRANCIS FLERCHINGER)

FIGURE 10
AN INDUSTRIAL ARTS PROGRAM WITH AN ORGANIZED EVALUATION INFORMATION SYSTEM (ADAPTED FROM FRANCIS FLERCHINGER)
FIGURE 11

THE TOTAL PROGRAM EVALUATION DEVELOPMENT SCHEMA
The test of the logic of the evaluation schema is accomplished by experts in the field of educational evaluation, systems theory, and industrial arts research which includes numerals 7 through 9.

Hopefully, this will lead to a research and development process which produces a logical and effective total program evaluation schema or the systems for evaluating industrial arts education.

In light of the above, a simplified systems model for the development and testing of a total program evaluation schema termed the systems is illustrated in Figure 12. This illustration not only provides an informational flow pattern for evaluating the present macro system of industrial arts education but also depicts the means to generate and incorporate new thinking.

Evaluation in combination with an information decision systems concept can expedite and provide useful information for deriving the best possible instructional program now and in the future. In addition, the process enables the systems to sensitize the environment to affect necessary change in the macro system. Through this marriage of evaluation to the information decision systems concept and to the management decisions process it is now possible to actually delineate, obtain, and provide useful information for better judging alternative decisions. In essence, the schema can support the maintenance of the present program yet
FIGURE 12
THE DEVELOPMENT AND TESTING OF SYSTEMS FOR IMPLEMENTING THE TOTAL PROGRAM EVALUATION SCHEMA
provide long-range plans for change based on the ability of the evaluation system to forecast future needs.

Generating Overarching Questions—Rationale

The questioning process is designed to present a survey of possible information topics that the educational consumer may desire to know. Conceivably, however, the same question will not be asked by each individual consumer. Nevertheless, it is also conceivable that the consumer may not have a well structured array of questions that he needs answered. Furthermore, it is conceivable that the type of information the consumer wants on objective outcomes is completely insignificant to his problem.

The consumer needs answers not only to a specific program's objectives but he also needs to be informed as to what other alternative programs are available. This type of knowledge can best be obtained through the systematic schema of an overarching questioning process. Questions will come from the following areas:

1. Overarching questioning matrix of evaluation at the local level
2. Overarching questions from other levels in the matrix
3. Questions from Project Talent
4. Questioning from decision makers
5. Other questions.

These sources will serve as possible information parameters which will directly influence the development of the
operational evaluation model.

Generating Overarching Questions—Procedures

The procedures in structuring these questions, the mechanisms designed to seek answers, and the process of storing, retrieving, and diffusing the results are to be built into the total program evaluation schema. However, the greatest emphasis will be placed on the overarching questioning schema. The exact procedures of storing, retrieving, and diffusing results of the questions will vary considerably because of time and funds available.

Developing a Theoretical Program Evaluation Model—Rationale

It was noted in Chapter II, The Review of Literature, that better solutions to program evaluation problems are possible if an adequate conceptual framework or a model is used. The adoption of a systems model is a way to organize thinking about all matters that are important to developing a total program evaluation schema. In essence, a systems model (1) identifies the elements of a program evaluation schema, (2) states what their relationships are to each other, (3) indicates the principles of organization, and (4) states the administrative requirements under which the organization must operate.

Gage (1963) emphasizes the need for a theoretical foundation as a device to guide and direct practical activities. This is expressed in the following:
Whatever may have been its status in an earlier period, the term theoretical has an attractive connotation now. If it once suggested the opposite of "practical" it now is recognized as referring to the fundamental basis of practice. If "theorizing" once implied an escape from empirical research, it now holds sway as necessary to the planning and interpretation of such research (p. 94).

The terms theoretical and framework have both been discussed as they relate to a model. A model then is a theory, a systematic ordering of ideas, or a conceptualized framework. For example, a model can be a decision concerning the kinds of variables and relationships between variables that will be investigated. Another function that a model can serve is graphic. Gage (1963) gives an accounting of these in the following:

Model represents variables and their relationship in graphic form. Events that have various temporal, spatial, causal, or logical relationships are portrayed in these relationships by boxes, connecting lines, and positions on vertical and horizontal dimensions (p. 95).

It appears that a model for evaluation needs to serve not only as a theoretical framework or rationale but also as a graphic illustration. It also must be noted that the developed model must be logically systematic based on selected premises and hueristic. The hueristic concept built into the model provides a sensing device attuned to our changing society. Therefore, the theoretical model must provide a means to evaluate ad hoc programs as well as systematically changing programs. One will note this total concept is congruent with a general systems theory.
The theoretical program evaluation model must be based on a logically sound and rationally accurate structure. Werkmeister (1948) suggests the following classification for developing a structure when he states:

Traditional logic, furthermore, has formulated at least five distinct rules which should govern all classifications. But of all these rules only one is really important, the rule, namely, that in any classification the different species of a given genus should be mutually exclusive. That is to say, if we arrange our facts in groups, these groups must not overlap. All other so-called "rules of classification" are adequately covered by the general stipulation that the value of a classification is determined by its successes or failure in achieving the purpose which was intended (p. 274).

In light of the above, a sound structure of a theoretical evaluation model requires that:

1. Relationships between major evaluation elements are mutually exclusive.

2. The sum of all evaluation elements are totally inclusive.

3. The evaluation elements must fit into a logically identified pattern.

4. Context of the evaluation model must be easily understood and yet fulfill the purpose for which it was developed.

Developing a Theoretical Program Evaluation Model--Procedures

To develop a theoretical evaluation model for this study it is necessary to utilize the above information on the functions of a model and the requirements of a structure. This is made subsequent to the following:

1. The review of the literature related to program development in industrial arts.
2. The review of the literature related to program evaluation in general.

3. The generation of program evaluation statements from the evaluation literature.

4. The development of premises.

5. The discussion with knowledgeable evaluators.

6. The review of those evaluation models which can relate to industrial arts education.

The sources above will serve as inputs to the system of developing the theoretical evaluation model.

The actual process of incorporating the resource material into the model development is highly complex. The complexity is of such magnitude as described in separate discussions with Stufflebeam and Hammond (1969) that the attempt may result in adopting and or adapting an existing theoretical evaluation model instead of completely developing a new model.

Regardless of how the final product is determined, the model in and of itself must meet the following criteria:

1. Acceptable to the developed premises (a rating of 0 to 3 on each premise).

2. Adequately meets the requirements of a logical structure (a rating of 0 to 3 on each point).

3. Graphically represented with boxes, circles, connecting lines, and positions on vertical and horizontal dimensions (a rating of 0 to 3 on each point).

4. Adequately efficient and economically sound (a rating of 0 to 3 points).

5. Acceptable to the philosophical thoughts of industrial arts instructional programs (a rating of 0 to 3 points).
6. Effectively able to develop an operational model from it (a rating of 0 to 3 points).

The six criteria will serve as the basis for preliminary selection of a theoretical evaluation model. It is reasonable to believe that once a preliminary model is selected, refinement may be incorporated to better adapt the model to industrial arts education. There is a possibility of producing eighty-four points from the six criteria of which the developed premises represent sixty and the other five criteria provide twenty-four. Therefore, the system of developing a theoretical model is based upon the criteria which emphasize the developed premises. Those models that are to be rated will be readily available in the educational and management literature found at The Ohio State University.

Developing an Operational Evaluation Model—Rationale

The operational model's basic purpose is to provide information for decision making. The review of literature substantiated the need for the development of an adequate means to evaluate instructional programs. The completion of the operational program evaluation model represents the end product which has been sought since the beginning of this investigation. What has transpired prior to this time has been mostly theoretical. Now it is time to operationalize these conceptual thoughts into practices which will generate useful information for decision making practices. These practices to a large extent are not common to all instructional
settings. However, for our needs a generalized schema will serve as a basis for closing the gap between theory and practice.

The theoretical evaluative system model will serve as an evaluation framework for guiding and directing the developing of the operational evaluation model. A systems approach will serve as the means of building a logical framework which will help plan, organize, control, and communicate the development and testing of the total program evaluation schema. The overarching questioning schema will initiate an array of questions about an instructional program which needs answered. Stated simply, the function of the operational model is to develop a schema which sets up and operates the total program evaluation machinery necessary to answer the decision makers' questions.

The actual questions posed by various decision makers and the ones generated by the overarching questioning schema hopefully are almost the same. However, if they are not, one must build into the evaluation and systems machinery the capability to expand or contract in order to sensitize a particular instructional situation which requires answers to different questions.

The program evaluation operational scope as illustrated in Figure 13 is designed to portray the applicability of the operational evaluation model. The horizontal scope of the operational model ranges from ad hoc on the left to
AProgram Continuous

Contingency

Ad Hoc

Microcosm

Program Evaluation Operational Model

Continuous Systematic and Developmental

Macrocosm

FIGURE 13
PROGRAM EVALUATION OPERATIONAL SCOPE

continuous on the right. An adequate operational evaluation and systems model should possess the ability to evaluate any contingency on an ad hoc basis and to continuously and systematically assess the emerging instructional program. The latter process applied the forces of planned change through a continuous and systematic evaluation. This assures the incorporation of innovations into the instructional program to help keep pace with environmental change. The vertical scope of the operational evaluation model should possess the ability to evaluate the bit and pieces of an instructional program as well as the overarching concerns. Both the horizontal and the vertical dimensions of the opera-
tional evaluation and systems model will enable the evaluative schema to give wide latitude but yet be able to focus its abilities on collecting, organizing, analyzing, and reporting useful information.

The same structure requirements that were discussed for the theoretical models (on page 116) should also hold true for the development of the operational model. The development of the operational evaluation model is dependent upon utilizing the theoretical model, the overarching questioning schema, and the structure requirements. This is made subsequent to the following:

1. A review of instructional program development as found in Chapter II.


3. A review of operational evaluation models which relate to industrial arts education.

4. A discussion with knowledgeable evaluators.

5. A review of all evaluation statements.

6. A review of general methods of generating information and decision making through a systems approach.

The information gleaned from the six items above will aid in the development process of generating a program evaluation operational model.

Developing an Operational Evaluation Model—Procedures

The actual process of developing the evaluation model capable of delivering operational characteristics considered
essential to the consumer of industrial arts education products involves the use of (1) an evaluation schema, (2) a systems approach, and (3) a management decision process. The systems approach will permit the most effective and efficient method to arrange systems with other systems based on the goals of evaluation and an information decision process.

The first step in developing an operational evaluation model is to identify those decisions that need to be made. The determination of what decision should be made at vital points during the operation of the macro system requires the evaluator to go to the decision maker. In this capacity the evaluation and system process activity functions as a facilitator or an extension of the decision maker's ability rather than a producer of a product.

The underlying characteristics of decision making as they related to the operational evaluation and systems model are illustrated by Simon (1960) in the following:

1. The first phase of the decision making process—searching the environment for conditions called for decisions—shall be called intelligence activity (borrowing the military meaning of intelligence).

2. The second phase— inventing, developing, and analysing possible courses of action—shall be called design activity.

3. The third phase—selecting a particular course of action from those available—shall be called choice activity (p. 27). (The italicized words are underlined.)
One will note that these three phases correspond to Dewey's (1910) three stages of decision making, that is: (1) what is the problem?, (2) what are the alternatives?, and (3) what alternative is best? (pp. 101-15). The decision of what alternative is best in Dewey's three phases is entirely the decision maker's prerogative. However, in light of seeking the best information on alternatives, the evaluator can function with greater effectiveness if he works within the framework of the systems analysis process.

In essence, informed decisions require adequate information. One of the best procedures in gaining information is through an evaluation information decision systems. To develop and operationalize an adequate information decision systems one needs to identify a procedure. One of many sets of procedures is to: (1) identify the objectives and functions of each division of industrial arts, (2) define through various means the information requirement from the decision makers, (3) determine what information is available, (4) document current means of collecting and handling information, (5) initiate procedures of designing an evaluation information decision system to meet the informational requirements by employing an open sequence systems, and (6) identify the criteria and assumptions of the evaluation information decisions system.

Looking at the sixth item, the next procedure is to set forth the criteria for engineering the evaluation model.
The first step in this procedure is to design a system that serves as a logical framework for which the operational model can function. The operational evaluation model must function within the total program evaluation schema. To design an operational evaluation model for generating information, general specifications or criteria must be determined. Stufflebeam and Hammond (1969) in a lecture at The Ohio State University discussed meta evaluation or evaluation of evaluation models. Since meta evaluation requires a criteria, then this same criteria would appear as a suggestive guide in the development of the needed operational evaluation model. The criteria follow:

1. Definition of evaluation
2. Purpose of evaluation
3. Specification of questions to be answered
4. Evaluation types
5. Means of choosing and applying values
6. Criteria for judging evaluation designs and reports
7. Conceptualization of evaluation process
8. Applicability at various levels of education
9. Methodological operationalization
10. Timing of evaluation in relation to the program schedule
11. Relation to the decision making process
12. Position as to the relationship between evaluation and research
13. Coverage of time, cost, and performance variables
14. Costs of applying the model
15. Coherence of evaluation language in the context of education and information science
16. Validation
17. Verifiability
18. Internal consistency
19. Position with respect to objectives
20. Role of the evaluator.

The method of using evaluative criteria to structure an operational evaluation model is an interesting concept. Gagne (1967) has indicated that to develop an educational program one must first determine what the end product should be. Once this has been accomplished, says Gagne, one can systematically proceed step-by-step backwards to the starting point while focusing on the end product. This permits the developer to consistently focus the backward steps on the end goals or objectives which enable him to systematically keep checking to determine if the step is congruent with the objective of the program.

In addition, a number of operational evaluation assumptions as requested in item six of the procedures are stated to possibly help guide the design and development of an appropriate operational evaluation information decision system. The operational evaluation assumptions (see Appendix F) were gleaned from the review of evaluative literature which are synthesized into broad categories as found in the following:
<table>
<thead>
<tr>
<th>Broad Categories</th>
<th>Assumption Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Information</td>
<td>6-8-12-19-25</td>
</tr>
<tr>
<td>2. Planned change</td>
<td>1</td>
</tr>
<tr>
<td>3. Strategy</td>
<td>7-11</td>
</tr>
<tr>
<td>4. Objectives and goals</td>
<td>2-12</td>
</tr>
<tr>
<td>5. Feedback and evaluation procedures</td>
<td>9-12-13-14-19-21</td>
</tr>
<tr>
<td></td>
<td>24-25-28-29-30</td>
</tr>
<tr>
<td>6. Cost</td>
<td>16-18</td>
</tr>
<tr>
<td>7. Questioning</td>
<td>10</td>
</tr>
<tr>
<td>8. Philosophy-ethics</td>
<td>17-22</td>
</tr>
<tr>
<td>10. Assessment of total cycle of curriculum development</td>
<td>6-8-13-14.</td>
</tr>
</tbody>
</table>

The formulating, searching, and testing of the solution to gain an operational model through the other five procedural items that were set forth above can be augmented by a systems analysis iteration process. One example of an iteration process that could be used in developing an operational evaluation and systems model is illustrated in Figure 14. Unfortunately, the designing of an operational evaluation systems model is not one time, but a continuous attempt. Quade (1966) illustrates this in the following:

A key of successful analysis is a continuous cycle of formulating the problem, selecting objectives, designing alternatives, collecting data, building models, weighing cost against performance, testing for sensitivity, questioning assumptions and data, re-examining the objectives, opening new alternatives, building better models, and so on until satisfaction is obtained or time or money force a cut off (p. 297).
Formulating The Problem

Opening New Alternative Models

Selecting Objectives

Reexamining Objectives For Developing Models

Designing Alternative Models

Questioning Assumption

Collection Of Data

Testing For Sensitivity Of Models

Building Models

Weighing Cost Against Effectiveness

ITERATION

FIGURE 14

THE KEY TO DEVELOPING AN OPERATIONAL EVALUATION SYSTEMS MODEL THROUGH AN ANALYSIS PROCESS (ADOPTED FROM E.S. QUADE, 1966, THE KEY TO ANALYSIS)
An operational evaluation model will be designed to function in the capacity of delineating, obtaining, and providing useful information to the industrial arts educational decision maker. This system is vitally needed to plan, organize, control, and communicate information to the macro system. In addition, it also must function within the guidelines set by the theoretical evaluation model.

A simplified operation model of this system is depicted in Figure 15 which is vital to: (1) link various operational evaluation components, (2) predict future needs, (3) aid educational consumers to make decisions, (4) maintain internal systems effectiveness and efficiency, (5) sense environmental change, and (6) foster program improvement in light of mission requirements.

Testing the Evaluation Model through Simulation

Rationale

Simulation is a tool that will be employed to test the significance of the operational evaluation model. Simulation as a research technique, states Dawson (1962), refers to the construction and manipulation of an operating model which is a physical or symbolic representation of some or all aspects of a social or psychological process (p. 3). Cogwells (1962) indicates that in systems design the initial plan is most generally tested through an empirical means by using a simulation technique prior to implementation. This provides for modification before the design actually
The Macro System

The Total Program Evaluation Schema

The Overarching Questioning Process

Overarching Questioning Matrix
Questions from Project Talent
Questions from Decision Makers
Operational Questions

Apply Theoretical Evaluation Model

The Development of an Operational Evaluation Model Using Three Elements

Systems Theory
Evaluation Rationale
Management Decision Concepts

Testing Operational Evaluation Model by Simulation and Experts

Recycle

Decision

Yes

Continue to Validate System

Input to Decision Makers

FIGURE 15

OPERATIONALIZING THE EVALUATION MODEL
is installed.

Dawson (1962) adds that operating models use represent­atives of behaving systems that attempt to reproduce proc­esses or action. In this case, the operating model is the simulation, designed to provide information about applica­bility of the evaluation schema to perform its task.

The relationship of simulation to testing the evalua­tion schema is clearly defined by Naylor (1966) in the following:

A simulation of a system (the evaluation systems) or an organism is the operation of a model which is a representation of system or organism. The model is amenable to manipulation which would be impossible, too expensive, or impractical to per­form on the entity it portrays. The operation of the model (this case the evaluation schema) can be studied and from it properties concerning the behavior of the actual system or the subsys­tem can be inferred (p. 2). (Those items in brackets are added to the original.)

To provide yet another advantage of simulation to testing the evaluation schema, Dawson (1962) states the following:

One of the most significant advantages of simula­tion is that it permits the experimenter to study processes in ways that nature prohibits. The simulation can be run many times with the value of the parameters being modified between runs and the changes in outputs observed. This makes the effective study of operating models containing many different components, variables, and inter­relationships. The experimenter in short exercises a great deal of control through which he can study and evaluate outcomes resulting from a variety of alternative conditions and relationships (p. 12).
The application of simulation to testing the evaluation schema is concerned with two main areas. Beck (1969) identified these two areas of applying simulation in the following:

1. To develop and evaluate a model or plan for a new system (experimenting, prediction) or

2. To provide a learning environment that represents a life situation (training transfer) (p. 45).

These were selected as applicable to this study because they provide the testing of the evaluation schema for its development and modification plus the added dimension of being used as a learning device. The simulation serves as a means of presenting relevant conditions, assumptions, objectives, or other courses of action which are fed into the evaluation schema and the consequences are observed. As a result, the evaluation schema and the simulation both are being tested to determine if both are operational and understandable.

Specifically, the practices of simulation will aid this study in building conviction for the evaluation schema through increased understanding and test of the ability to perform according to its stated objective. That objective is whether the evaluation schema can provide useful information for decision making.

The list of criteria for evaluating the efficacy of the information generated by the evaluation schema follows:
1. Efficiency—two items are involved—first, economically operational; second, collecting information that is relevant, significant, and covers the situation.

2. Timeliness—information should be provided at the correct time—the schema portrays the correct timing in its sequence of events.

3. Pervasiveness—the schema provides for dissemination of decision making information to all levels that need it.

4. Credibility—is the schema able to establish trust through the type of information it can provide?

5. Scope—the schema can generate information on the total environment affecting the instructional program.

6. Relevance—the schema is able to focus on important information to effect a specific decision.

7. Objectivity—the schema provides information through various means—an interface between various levels of decision making.

8. Reliability—the schema functions consistently from start to finish and generates the same information when the process is repeated.

9. External validity—the schema is generalizable to different industrial arts programs.

10. Internal validity—the schema is logically sound.

11. Mechanism for implementing—the schema provides the procedures and for their application to various settings.

12. Relationship to decision making—the schema is able to sensitize problems and incorporate a mechanism to provide useful information to decisions.

13. Definition—the schema's function is congruent with development.

14. Role of the evaluator—the scheme spells out his intended role.
15. Purposes of evaluation--the schema identifies and proposes adequate evaluation machinery.

16. Evaluation types--the schema differentiates between various evaluation subsystems and provides for their implementation.

Other criteria for evaluating information follow:

1. Identification of evaluation stages.
2. Provision for a means to select and apply values.
3. Provision for a means to evaluate the total schema.
4. Position of objectives in the operational mechanisms.
5. Adequacy of the questioning process.
6. The evaluation structure is understandable and can be implemented within a normal school setting.
7. Relationship between research and evaluation is compatible.
8. Adequate criteria for judging the evaluation design and report.
9. The effectiveness of theoretical evaluation model in guiding and directing the operation evaluation model.
10. The adequacy of the systems approach in managing the schema.

The above criteria serve only as a guide, not as an explicit entity. The results of the collective or individual review of the program evaluation schema will greatly aid this investigation in achieving its goal. The goal is to develop a logically sound, rational, and accurate total program evaluation schema for generating useful information for aiding the educational consumer of industrial arts products.

The simulation will depict an industrial arts program as found in a large city. The central problem that the evaluation schema will test is the relevancy of the present industrial arts trade-oriented instructional program which is not attuned to modern industry.

The simulation will provide a set of preliminaries for defining the purpose, roles, and mechanism of a total program evaluation schema (IASIS). The preliminary includes the first four parts of the chapter which are conceptualizing IASIS, operationalizing IASIS, a brief overview of IASIS, and the summation of assessment evaluation. If a reader has not read the previous chapters, he should start the chapter by reading the preliminary parts.

If the reader has read the previous chapters, he may want to start at the fifth part of the chapter or the application of simulation to IASIS. The procedure of the simulation chapter is to provide the reader a full meaning of IASIS either by going through all five parts or by starting where he is able to read without being confused. In each case the individual will determine his own procedure for reading and understanding the evaluation schema.

In essence the emphasis in the simulation procedure will be to provide the reader with an understanding of IASIS and to check for its logic through the five parts. The eval-
uation schema will be checked for its logical soundness by applying a realistic set of problems, then determining if it can provide adequate solutions to those problems. Each part of the schema will come into play as the problem and solution to the problem are identified and action taken. Hopefully this process will adequately test the evaluation schema for its effectiveness.

Possibly the best criteria used in judging a total program evaluation schema is whether the information collected has a useful purpose. An assumption can be made that the amount of data has not always been the problem, but that most of it has been superfluous or irrelevant. Further, most of it is non-uniform, non-comparable, and unorganized. The answer to this problem lies in the ability of the total program evaluation schema to handle a sophisticated information decision systems capable of delivering useful data at the correct time. In any event, the operational evaluation and systems model needs to provide an immediate and a long-range plan for improving education through a pragmatic approach that centers on the tasks of:

1. Clarifying the mission of industrial arts education in terms of what it is and perhaps ought to be.

2. Collecting and analyzing the best information obtainable on how well the industrial arts educational programs are fulfilling that mission.

3. Identifying ways by which the industrial arts instructional program might be improved both
in general and in particular.

Summary

The design schema adopted to structure this applied research investigation as outlined in this chapter was the systems approach. A system is a means of bringing parts into an integrated whole to accomplish a planned objective. A basic system has inputs, processes, and outputs. It can also be either an open or closed sequence system. The former is better for evaluation since it senses the change in the environment. A system falls into two broad categories, namely, natural (e.g., the solar system), and man-made (e.g., the fuel system of an automobile). Systems can range from simple to complex.

The relationship of systems to industrial arts was accomplished through a functional analysis. That is, the functional analysis of industrial arts was graphically illustrated to determine just where evaluation fits. It was determined that industrial arts represents the top level profile mission or macro system of which evaluation was located at the sixth level. However, evaluation was considered the communicator or linking process between and among all levels. This is because evaluation’s mission is to inform the educational decision makers so they can make better judgments and choices.

The survey instrument was designed and developed to obtain a consensus of experts on what evaluation should be.
The instrument included a cover letter, description and instructions, program evaluation statements, and a Likert-type rating sheet. Program evaluation statements were obtained from various authors in evaluation and related fields. These statements were sent to many of these same authors so they could rate their own statements as well as those of other authors. This procedure is known as a modified Delphi technique of building qualified knowledge. The design of the instrument violated several known tenets such as length, clustering of statements, and repetitious statements. However, all decisions for using the instrument design were made with full awareness of these violations and of their possible consequences.

The population sample consisted of groups one and two who were selected on the basis of recommendations from evaluation experts. Group one consisted of generalists in evaluation and group two included industrial arts college professors. Forty-five instruments were mailed to group one and twenty-six to group two.

The methodology of collecting, organizing, and analyzing data for changing program evaluation statements into premises is rather simple computational methods requiring only descriptive statistics. The data collected on designed Likert-rating sheets was transferred to IBM answer sheets, then scanned and punched on to IBM cards for use with 360 computer for item analysis. The data was organized into
group one, group two, and a combination of groups one and two. Analysis of data (Chapter IV) was designed to answer four questions, of which the main one was for determination of the twenty premises needed to develop the theoretical model.

The overarching questioning process involved (1) a three-dimension questioning matrix, (2) questions from Project Talent, (3) questions from decision makers, and (4) questions that appear as a result of operational roles. The main emphasis was placed on the questioning matrix since it held greater promise of being a systematic attempt to generate good questions that covered instruction at local and other levels. The combining of data from each of the three dimensions of the matrix formed a factor. From this factor one would write a specific behavioral objective and from the objective one would design an instrument to determine how well the objective would be met in a particular program.

The development of the total program evaluation schema in Chapter V is designed to (1) generate questions, (2) use premises in developing a theoretical evaluation model, and (3) develop an operation evaluation model. The evaluation schema should provide a systematic flow of information throughout the macro systems if the educational consumer is to make informed decisions. It was determined that the evaluation schema should take on the nature of an informa-
tion decision system. That is, information needed would satisfy a request in light of decisions to be made throughout the organization.

Again a systems process was used to simplify the complexity of the developmental task of building evaluation models. Through the systems analysis approach the proper relationship can exist between the evaluation schema and the macro systems.

The theoretical evaluation model serves as the evaluation framework for the study, while the systems process serves as a means for logically structuring evaluation within the macro system and total program evaluation schema called the systems. The management decision concepts of planning, organizing, controlling, and communicating are used to assure that the theoretical evaluation model and the systems approach function smoothly in accomplishing total program evaluation. These premises form the primary criteria for developing the theoretical model.

The operational model must answer the question from the overarching questioning process. It must function with the macro system, work within the framework both of the theoretical model, the systems process, and the management decision schema. Criteria and assumptions also will dictate the development of the operational model. The key to developing an operational model lies in using a system which continuously recycles the development process until the best
model does develop. Through simulation the total program evaluation model will be tested for logic, operational ability, and understanding.
CHAPTER IV

THE ANALYSIS OF DATA

This chapter is primarily concerned with a brief analysis and interpretation of the data from the survey. (See Appendix G.) The data will be used to generate premises which in turn will be used to develop a program evaluation theoretical model. The theoretical evaluation model will serve as a framework for guiding and directing the development of the operational program evaluation model. This process is better in selecting a theoretical evaluation model because it provides a systematic and logical means of qualifying data by experts as compared to using unsystematic intuitive self-appraisal. Information for generating premises was derived from the instrument (Appendices A, B, C, and D) that was sent to selected generalists in evaluation as well as to industrial arts teacher educators. These groups are designated as one and two respectively. The analysis of data will provide the reader with an overview of those evaluation statements that were considered most and least important by the respondents.

The analysis and interpretation of data are organized under the following headings:

1. The responsiveness of the instrument.
2. The top twenty statements (the premises) from the total group.
3. The twenty statements receiving the lowest number of points.
4. The top and lowest twenty statements from group one.
5. The top and lowest twenty statements from group two.
6. The relationship between groups one and two.

The analysis of data was accomplished by subjecting the data, on IBM punched cards, to the "No corrected answer item analysis" performed by The Ohio State University Testing and Evaluation Center. Data print-out from the computer program gave: (1) how the twenty-two respondents rated each item, (2) the percentage worth of each interval of one through five, (3) the mean, and (4) the standard deviation. (Part of this data is found in Appendix G.)

The Responsiveness of the Survey Instrument

The instrument was sent to selected generalists in educational evaluation and to industrial arts professors. The selection of the generalists was based upon their contributions to the field of evaluation. The industrial arts professors were selected on the basis of their leadership in program development and research. The results of the survey are found in Table 1.

The response to the survey was adequate in accomplishing the task of determining the top twenty statements, or in this case premises which are needed to select a theoretical evaluation model.
<table>
<thead>
<tr>
<th>Description</th>
<th>Frequency</th>
<th>Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group One—Evaluation Generalists</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total instruments mailed</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Total instruments returned</td>
<td>24</td>
<td>53</td>
</tr>
<tr>
<td>Total good responses</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td>Reasons for not completing instrument</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional duties</td>
<td>5</td>
<td>38.5</td>
</tr>
<tr>
<td>Other reasons</td>
<td>8</td>
<td>61.5</td>
</tr>
<tr>
<td><strong>Group Two—The Industrial Arts Educators</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total instruments mailed</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Total instruments returned</td>
<td>17</td>
<td>62</td>
</tr>
<tr>
<td>Total good responses</td>
<td>11</td>
<td>42</td>
</tr>
<tr>
<td>Reasons for not completing instrument</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional duties</td>
<td>2</td>
<td>33.3</td>
</tr>
<tr>
<td>Other reasons</td>
<td>4</td>
<td>66.7</td>
</tr>
<tr>
<td><strong>Total Responses—Groups One and Two</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total instruments mailed</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>Total instruments returned</td>
<td>41</td>
<td>58</td>
</tr>
<tr>
<td>Total instruments—good responses</td>
<td>22</td>
<td>31</td>
</tr>
<tr>
<td>Reasons for not completing instrument</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional duties</td>
<td>7</td>
<td>41</td>
</tr>
<tr>
<td>Other reasons</td>
<td>12</td>
<td>59</td>
</tr>
</tbody>
</table>
One might ask why twenty statements instead of some other number? The reason for selecting only twenty is that a consensus is possible with this number since most of the program evaluation statements are in fact quite similar in content. That is, they can be categorized into about ten items which are repeatedly stated in different terms throughout the 208 program evaluation statement instruments. Therefore, the assumption was made that twenty statements out of the 208 total would give an adequate accounting of the best statements as determined by twenty-two experts.

The Top Twenty Statements (The Premises) From the Total Group

The twenty statements receiving the most points from a possible 110 were placed in rank order. When several statements received the same number of points, then the lowest standard deviation was used to determine which item came first. However, in some cases the number of points, the mean, and the standard deviation were the same. In these instances the rank order was determined randomly.

In Table 2 are the top twenty program evaluation statements, their rank, the total points the item received, the mean, and the standard deviation.
<table>
<thead>
<tr>
<th>Rank</th>
<th>Developed Premise Statement</th>
<th>Item No.</th>
<th>Total Pts.</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Evaluation should: be an integral part of an overall educational system</td>
<td>114</td>
<td>100</td>
<td>3.55</td>
<td>.498</td>
</tr>
<tr>
<td>2</td>
<td>be an integral part of any new program from the planning stage up</td>
<td>111</td>
<td>99</td>
<td>3.5</td>
<td>.50</td>
</tr>
<tr>
<td>3</td>
<td>be a continuous empirical verification of the instructional schema in relation to stated intents and observed results</td>
<td>25</td>
<td>98</td>
<td>3.45</td>
<td>.58</td>
</tr>
<tr>
<td>4</td>
<td>provide feedback information for the innovator during program development process and to the educator for adopting new programs</td>
<td>29</td>
<td>98</td>
<td>3.45</td>
<td>.58</td>
</tr>
<tr>
<td>5</td>
<td>continuously supply information to the decision maker on how and when the program materials work and what their weaknesses and strengths are</td>
<td>41</td>
<td>98</td>
<td>3.45</td>
<td>.58</td>
</tr>
<tr>
<td>6</td>
<td>be a fundamental part of program development, not an appendage</td>
<td>76</td>
<td>98</td>
<td>3.45</td>
<td>.78</td>
</tr>
<tr>
<td>7</td>
<td>function through a feedback mechanism to provide a continuous competence level check on expected criterion behavior that gives constant guidance and direction to instructional programs</td>
<td>26</td>
<td>95</td>
<td>3.32</td>
<td>.76</td>
</tr>
<tr>
<td>8</td>
<td>help in designing and redesigning of instructional processes and materials</td>
<td>24</td>
<td>94</td>
<td>3.27</td>
<td>.54</td>
</tr>
<tr>
<td>9</td>
<td>use different evaluation strategies suitable for specific evaluation purposes</td>
<td>142</td>
<td>94</td>
<td>3.27</td>
<td>.54</td>
</tr>
</tbody>
</table>
TABLE 2, cont'd.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Developed Premise Statement</th>
<th>Item No.</th>
<th>Total Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Evaluation should: be involved with both information and formal data collection and analysis procedures</td>
<td>112</td>
<td>3.18</td>
<td>.57</td>
</tr>
<tr>
<td>11</td>
<td>help improve a program's refinement and future development</td>
<td>68</td>
<td>3.18</td>
<td>.65</td>
</tr>
<tr>
<td>12</td>
<td>evaluate individual program items and their relationship to the total program package</td>
<td>46</td>
<td>3.18</td>
<td>.72</td>
</tr>
<tr>
<td>13</td>
<td>establish goals, collect evidence concerning growth or lack of growth toward goals, make judgments about the evidence, and revise procedures and goals in light of the judgment</td>
<td>3</td>
<td>3.18</td>
<td>1.4</td>
</tr>
<tr>
<td>14</td>
<td>be both macro and micro in nature to provide both general or specific information on programs for the decision maker</td>
<td>42</td>
<td>3.09</td>
<td>.85</td>
</tr>
<tr>
<td>15</td>
<td>use a strategy that includes the functions of feedback, diagnosis, and steering in providing wise judgment and descriptive information to the decision maker</td>
<td>7</td>
<td>3.09</td>
<td>.99</td>
</tr>
<tr>
<td>16</td>
<td>provide data to help in determining whether to improve, maintain, or terminate a program</td>
<td>165</td>
<td>3.04</td>
<td>.37</td>
</tr>
<tr>
<td>17</td>
<td>assess programs during the tryout period as well as at the completion of the development period</td>
<td>38</td>
<td>3.04</td>
<td>1.10</td>
</tr>
</tbody>
</table>
TABLE 2, cont'd

<table>
<thead>
<tr>
<th>Rank</th>
<th>Developed Premise Statement</th>
<th>Item No.</th>
<th>Total Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>Evaluation should: seek differential outcomes of the program as it develops that will provide appropriate information as to its strengths and weaknesses under various situations</td>
<td>43</td>
<td>88</td>
<td>3.00</td>
</tr>
<tr>
<td>19</td>
<td>provide for the clarification of goals and the congruence of the objective-outcome process during, and at the end of, the program development</td>
<td>21</td>
<td>88</td>
<td>3.00</td>
</tr>
<tr>
<td>20</td>
<td>be concerned with alternative evaluative strategies, their application to various target populations, and a comparison of their consequences</td>
<td>31</td>
<td>88</td>
<td>3.00</td>
</tr>
</tbody>
</table>

The Twenty Statements Receiving the Lowest Number of Points

If the twenty items receiving the top points indicate what the respondents thought evaluation should be then the item receiving the lowest number of points would indicate what evaluation is not. In Table 3 are listed the twenty lowest items in rank order. When several items received the same number of points, the statement receiving the highest standard deviation was placed first since it showed less accuracy. The results of the lowest twenty statement are found in Table 3.
TABLE 3
THE STATISTICAL RESULTS OF THOSE TWENTY STATEMENTS RECEIVING
THE LOWEST NUMBER OF POINTS FROM GROUPS ONE AND TWO

<table>
<thead>
<tr>
<th>Rank</th>
<th>Developed Premise Statement</th>
<th>Item No.</th>
<th>Total</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Evaluation should: secure data from the program, the community, the school, etc. and not the pupil</td>
<td>160</td>
<td>38</td>
<td>.727</td>
<td>.75</td>
</tr>
<tr>
<td>2</td>
<td>be mainly concerned with the performance of individual students rather than the total instructional program</td>
<td>208</td>
<td>43</td>
<td>.96</td>
<td>.64</td>
</tr>
<tr>
<td>3</td>
<td>provide information on different instructional programs so the parent, who is in reality the customer of education, can make a choice directly from what his children accomplish within a given program; therefore, deciding which program will be adopted and which will be dropped</td>
<td>94</td>
<td>46</td>
<td>1.1</td>
<td>.85</td>
</tr>
<tr>
<td>4</td>
<td>be fundamentally a research activity with specialized programs of its own since highly quantified information is not as critical</td>
<td>138</td>
<td>51</td>
<td>1.32</td>
<td>.92</td>
</tr>
<tr>
<td>5</td>
<td>be judged on the same basis as research studies are conventionally judged</td>
<td>176</td>
<td>52</td>
<td>1.36</td>
<td>1.02</td>
</tr>
<tr>
<td>6</td>
<td>function within the principles of a scientific methodology to gain administrative consequences rather than the explanation of variables</td>
<td>132</td>
<td>52</td>
<td>1.36</td>
<td>.83</td>
</tr>
<tr>
<td>7</td>
<td>point the strengths and weaknesses of a program and not monitor the institution in which the program occurs</td>
<td>107</td>
<td>54</td>
<td>1.45</td>
<td>1.16</td>
</tr>
</tbody>
</table>
TABLE 3, cont'd

<table>
<thead>
<tr>
<th>Rank</th>
<th>Developed Premise Statement</th>
<th>Item No.</th>
<th>Total Pts.</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Evaluation should: guide and direct the selection of content and learning experiences plus providing criteria on what to teach and how</td>
<td>10</td>
<td>54</td>
<td>1.45</td>
<td>1.07</td>
</tr>
<tr>
<td>9</td>
<td>be a model-paradigm that depicts events that have differing temporal, spatial, causal, or logical relationships by portraying these relationships by boxes, connecting lines, and positions on vertical and horizontal dimensions</td>
<td>193</td>
<td>56</td>
<td>1.55</td>
<td>.94</td>
</tr>
<tr>
<td>10</td>
<td>be based upon the assumption that decision making is not usually an integral part of assessment, but a subsequent activity engaged in by parties not involved in the evaluative process</td>
<td>201</td>
<td>58</td>
<td>1.64</td>
<td>1.02</td>
</tr>
<tr>
<td>11</td>
<td>be based upon the assumption that once the local institution decides the ends-means configuration is not ideal, the evaluative schema would provide the change strategies and decision making designs which will formulate new ends by choosing new content, or by inventing new materials and instructional procedures, or by providing for the adoption of new solutions generated elsewhere</td>
<td>202</td>
<td>58</td>
<td>1.64</td>
<td>.88</td>
</tr>
<tr>
<td>12</td>
<td>be a simplified model that abstracts the cause and effect relationships essential to the evaluative questions to be stated</td>
<td>174</td>
<td>58</td>
<td>1.64</td>
<td>.88</td>
</tr>
<tr>
<td>13</td>
<td>incorporate new concepts and new knowledges into the school programs</td>
<td>13</td>
<td>59</td>
<td>1.68</td>
<td>1.18</td>
</tr>
</tbody>
</table>
TABLE 3, cont'd.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Developed Premise Statement</th>
<th>Item No.</th>
<th>Total Pts.</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Evaluation should: be particularly concerned with describing principles on which to make decisions about instructive programs</td>
<td>98</td>
<td>59</td>
<td>1.68</td>
<td>.92</td>
</tr>
<tr>
<td>15</td>
<td>be a scheme with three functioning objectives which are understanding, prediction, and control of educational programs</td>
<td>182</td>
<td>60</td>
<td>1.73</td>
<td>.96</td>
</tr>
<tr>
<td>16</td>
<td>be a technology for collecting, analyzing, and interpreting data to writers, textbook specialists, and subject matter experts for decisions</td>
<td>146</td>
<td>60</td>
<td>1.73</td>
<td>.91</td>
</tr>
<tr>
<td>17</td>
<td>deal with performance rather than pure researchable objectives which delimit the courses of action open to generating solutions to educational problems</td>
<td>139</td>
<td>60</td>
<td>1.73</td>
<td>.86</td>
</tr>
<tr>
<td>18</td>
<td>provide an overall decision-making process which is common to all evaluative strategies varying in intensity with differing roles of assessment</td>
<td>84</td>
<td>61</td>
<td>1.77</td>
<td>1.17</td>
</tr>
<tr>
<td>19</td>
<td>be a mediator of change which evolves from a competition among alternative offering</td>
<td>93</td>
<td>61</td>
<td>1.77</td>
<td>.99</td>
</tr>
<tr>
<td>20</td>
<td>encompass the principle of cybernation that includes the transmission and interpretation of information to maintain the element of equilibrium.</td>
<td>170</td>
<td>62</td>
<td>1.82</td>
<td>.94</td>
</tr>
</tbody>
</table>

One could draw the following conclusions from comparing the top and the lowest twenty statements selected by the
total group:

1. Evaluation is not looking at just one or several variables of instruction but all factors which may influence weaknesses and strengths of a program.

2. Evaluation is not ad hoc but a continuous systematic procedure from planning the program throughout its entirety.

3. Evaluation is not a separate entity but a part of the whole of education.

4. Evaluators are not decision makers but facilitators of evaluation.

5. Evaluation is not a producer of products but a means of informing decision makers about how and when program materials work and do not work.

6. Evaluation is not change but provides the information to justify the basis of change.

7. Evaluation is not concerned with the individual student but the continuous empirical verification of the program in relation to stated objectives.

It was noted that the twenty top items are mostly found in the first 100 items and they are shorter in length in comparison to the twenty lowest items selected.

The Top and Lowest Statements from Group One

The generalists in evaluation were comprised of experts serving various capacities as deans of colleges, directors of research and development laboratories, and directors of commercial enterprises. The percentage of respondents in this group was less than group two. Those who did respond may have done so because they were extremely interested in they study. The statistical results of the survey involving
group one are found in Tables 4 and 5. The actual statements which correspond to the twenty item statements are found in Appendix A.

**TABLE 4**

THE TOP TWENTY STATEMENTS SELECTED BY THE GENERALISTS IN EVALUATION—GROUP ONE

<table>
<thead>
<tr>
<th>Top Twenty by Points</th>
<th>Item No.</th>
<th>Total Points</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>114</td>
<td>52</td>
<td>3.73</td>
<td>.45</td>
</tr>
<tr>
<td>2</td>
<td>111</td>
<td>51</td>
<td>3.64</td>
<td>.48</td>
</tr>
<tr>
<td>3</td>
<td>41</td>
<td>50</td>
<td>3.55</td>
<td>.49</td>
</tr>
<tr>
<td>4</td>
<td>76</td>
<td>49</td>
<td>3.45</td>
<td>.89</td>
</tr>
<tr>
<td>5</td>
<td>112</td>
<td>48</td>
<td>3.36</td>
<td>.48</td>
</tr>
<tr>
<td>6</td>
<td>24</td>
<td>47</td>
<td>3.27</td>
<td>.45</td>
</tr>
<tr>
<td>7</td>
<td>25</td>
<td>47</td>
<td>3.27</td>
<td>.62</td>
</tr>
<tr>
<td>8</td>
<td>58</td>
<td>47</td>
<td>3.27</td>
<td>.86</td>
</tr>
<tr>
<td>9</td>
<td>21</td>
<td>46</td>
<td>3.18</td>
<td>.57</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>46</td>
<td>3.18</td>
<td>.83</td>
</tr>
<tr>
<td>11</td>
<td>20</td>
<td>46</td>
<td>3.18</td>
<td>.94</td>
</tr>
<tr>
<td>12</td>
<td>110</td>
<td>45</td>
<td>3.0</td>
<td>.20</td>
</tr>
<tr>
<td>13</td>
<td>165</td>
<td>45</td>
<td>3.0</td>
<td>.28</td>
</tr>
<tr>
<td>14</td>
<td>141</td>
<td>45</td>
<td>3.0</td>
<td>.51</td>
</tr>
<tr>
<td>15</td>
<td>122</td>
<td>45</td>
<td>3.0</td>
<td>.66</td>
</tr>
<tr>
<td>16</td>
<td>68</td>
<td>45</td>
<td>3.0</td>
<td>.66</td>
</tr>
<tr>
<td>17</td>
<td>60</td>
<td>45</td>
<td>3.0</td>
<td>.66</td>
</tr>
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<td>.79</td>
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<td>19</td>
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<td>1.0</td>
</tr>
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<td>20</td>
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<td>45</td>
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</tbody>
</table>
### TABLE 5

**THE LOWEST TWENTY STATEMENTS SELECTED BY THE GENERALISTS IN EVALUATION—GROUP ONE**

<table>
<thead>
<tr>
<th>Lowest Twenty by Points</th>
<th>Item No.</th>
<th>Total Points</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
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<td>.82</td>
<td>.57</td>
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<td>1.2</td>
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<td>.57</td>
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<td>.75</td>
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<tr>
<td>7</td>
<td>132</td>
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<td>1.3</td>
<td>.75</td>
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<td>.84</td>
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</tr>
<tr>
<td>15</td>
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<td>98</td>
<td>29</td>
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</table>

The Top and Lowest Twenty Statements From Group Two

Group two represents industrial arts college educators who are involved with curriculum innovations and others who were thought to be interested in evaluation. The response was extremely good from this group which confirms the assumption that was made on page 99 of this study. The statistical results from group two on what they selected as the top and lowest twenty program evaluation statements are found in Tables 6 and 7. The twenty statements are found in Appendix A.
### TABLE 6

THE TOP TWENTY STATEMENTS SELECTED BY GROUP TWO--THE INDUSTRIAL ARTS EDUCATORS

<table>
<thead>
<tr>
<th>Top Twenty by Points</th>
<th>Item No.</th>
<th>Total Points</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>3.4</td>
<td>0.643</td>
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<td>0.44</td>
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<td>0.61</td>
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<td>47</td>
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<td>0.61</td>
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<td>0.57</td>
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<tr>
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<td>96</td>
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<td>46</td>
<td>3.2</td>
<td>0.57</td>
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<tr>
<td>20</td>
<td>2</td>
<td>46</td>
<td>3.2</td>
<td>1.19</td>
</tr>
</tbody>
</table>
TABLE 7

THE TWENTY STATEMENTS RECEIVING THE LOWEST NUMBER OF POINTS FROM GROUP TWO--THE INDUSTRIAL ARTS EDUCATORS

<table>
<thead>
<tr>
<th>Lowest Twenty by Points</th>
<th>Item No.</th>
<th>Total Points</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>160</td>
<td>18</td>
<td>.63</td>
<td>.88</td>
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<tr>
<td>2</td>
<td>208</td>
<td>19</td>
<td>.73</td>
<td>.62</td>
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<tr>
<td>3</td>
<td>94</td>
<td>26</td>
<td>1.46</td>
<td>.98</td>
</tr>
<tr>
<td>4</td>
<td>132</td>
<td>27</td>
<td>1.45</td>
<td>.84</td>
</tr>
<tr>
<td>5</td>
<td>139</td>
<td>27</td>
<td>1.45</td>
<td>.99</td>
</tr>
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<td>.98</td>
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<td>1.1</td>
</tr>
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</tr>
<tr>
<td>11</td>
<td>98</td>
<td>30</td>
<td>1.73</td>
<td>.96</td>
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<td>12</td>
<td>174</td>
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<td>1.73</td>
<td>.96</td>
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<td>30</td>
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<td>1.05</td>
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<td>1.73</td>
<td>1.58</td>
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<tr>
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<td>19</td>
<td>70</td>
<td>31</td>
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<td>1.11</td>
</tr>
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<td>20</td>
<td>15</td>
<td>31</td>
<td>1.8</td>
<td>1.3</td>
</tr>
</tbody>
</table>
The Relationship Between Group One and Group Two

The analysis and interpretation of the difference between groups one and two are not part of this study. Nevertheless, it may be of general interest to the reader to knowing whether there is a difference between what the generalists feel evaluation should be and what industrial arts college educators say. The interest of this report is not in pairing group one against group two or vice versa. Furthermore no attempt will be inaugurated to single out individuals within the group. What will be attempted is to determine the following two items:

1. Whether the weight given the top twenty statements by each group is the same. This will determine whether the two groups differ significantly but not who or which group is better.

2. Whether the weight given to those statements which both groups include as their top twenty is different.

To answer these two questions simply a statistic called The Sign Test has been adopted. A description of this method is given in the following by Porter, et al. (1964) when who state:

Research studies in which observable behavior of subjects can be described as "greater than" or "less than" in comparison of other subjects, are particularly adaptable to the sign test...the sign test may be employed with small samples and/or when it is unreasonable to assume that the variables under consideration are normally distributed....In comparing the performance of subjects, differences are recorded as pluses and minuses. The null hypothesis is that the median of the differences of the pluses and minuses equals zero (p. 48).
The hypothesis for group one:

Question 1

Null hypothesis: There is no significant difference in weight given to the top twenty statements of group one when compared with group two.

Question 2

Null Hypothesis: There is no significant difference in weight given the nine statements that both groups placed in the top twenty when group one is compared to group two.

The hypothesis for group two:

Question 1

Null hypothesis: There is no significant difference in the weight given to the top twenty statements of group two when compared to group one.

Question 2

Null hypothesis: There is no significant difference in weight given the nine statements that both groups placed in the top twenty when group two is compared to group one.

The results of testing the null hypothesis of group one can be found in Table 8. The results of testing the null hypothesis of group two is given in Table 9. (Note: all tests of the hypothesis are for a one-tailed test.)

TABLE 8

THE COMPARISON OF GROUP ONE WITH GROUP TWO AT THE .05 LEVEL OF SIGNIFICANCE

<table>
<thead>
<tr>
<th>Top Twenty Statements</th>
<th>Group One Means</th>
<th>Group Two Means</th>
<th>Sign Test</th>
<th>Rank Between Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item No.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>114</td>
<td>3.73</td>
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<td>2</td>
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</tr>
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<td>41</td>
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<td>+</td>
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<td>3.46</td>
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<td>Rank</td>
<td>Item No.</td>
<td>Group One Means</td>
<td>Group Two Means</td>
<td>Sign Test</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>-----------------</td>
<td>-----------------</td>
<td>-----------</td>
</tr>
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<td>5</td>
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<td>-</td>
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<td>-</td>
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<td>68</td>
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<td>3.27</td>
<td>-</td>
</tr>
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<td>2.36</td>
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<td>150</td>
<td>3.09</td>
<td>2.91</td>
<td>+</td>
</tr>
</tbody>
</table>

**Question 1**

All items of group one to all items of group two

| Number of pluses (+) | 13 | Number of minuses (-) | 4 | Number of ties | 3 |

\[ N = 17 = .025 \]
\[ x = 4 \]

Result on all items in the top twenty is that the two groups are significantly different. The null hypothesis was rejected at the .05 level of significance.

**Question 2**

All items that are within the top twenty of both groups one and two

| Number of pluses (+) | 3 | Number of minuses (-) | 4 | Number of ties | 2 |

\[ N = 7 = .773 \]
\[ x = 4 \]

Results show that the nine items that both groups one and two agreed to in the top twenty are not significantly different. The null hypothesis was accepted at the .05 level of significance.

*NR - Item of group one not related to group two
### TABLE 9

THE COMPARISON OF GROUP TWO WITH GROUP ONE AT THE .05 LEVEL OF SIGNIFICANCE

<table>
<thead>
<tr>
<th>Rank</th>
<th>Item No.</th>
<th>Group Two Means</th>
<th>Group One Means</th>
<th>Sign Test</th>
<th>Rank Between Groups</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
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<tr>
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<td>46</td>
<td>3.64</td>
<td>3.00</td>
<td>+</td>
<td>NR*</td>
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<td>41</td>
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<td>3.36</td>
<td>3.64</td>
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<td>2</td>
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<tr>
<td>9</td>
<td>52</td>
<td>3.36</td>
<td>2.27</td>
<td>+</td>
<td>NR*</td>
</tr>
<tr>
<td>10</td>
<td>58</td>
<td>3.36</td>
<td>3.27</td>
<td>+</td>
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<td>43</td>
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<td>2.73</td>
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<td>142</td>
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<td>3.27</td>
<td>0</td>
<td>NR*</td>
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<td>+</td>
<td>NR*</td>
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<td>68</td>
<td>3.27</td>
<td>3.09</td>
<td>+</td>
<td>16</td>
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<td>24</td>
<td>3.27</td>
<td>3.27</td>
<td>0</td>
<td>6</td>
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<tr>
<td>16</td>
<td>7</td>
<td>3.27</td>
<td>2.91</td>
<td>+</td>
<td>NR*</td>
</tr>
<tr>
<td>17</td>
<td>77</td>
<td>3.18</td>
<td>2.64</td>
<td>+</td>
<td>NR*</td>
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<tr>
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<td>2</td>
<td>3.18</td>
<td>3.18</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>

*NR - Item of group one not related to group two

**Question 1**

All items of group two to all items of group one

Number of pluses (+) 12
Number of minuses (-) 3
Number of ties 5

\[
N = 15 = 0.018
\]

\[
x = 3
\]

Result on all items in the top twenty is that the two groups are significantly different. Null hypothesis was rejected at the .05 level of significance.

**Question 2**

Items that are within the top twenty for both groups one and two

Number of pluses (+) 3
Number of minuses 3
Number of ties 3

\[
N = 6 = 0.656
\]

\[
x = 3
\]
### TABLE 9
THE COMPARISON OF GROUP TWO WITH GROUP ONE AT THE .05 LEVEL OF SIGNIFICANCE

<table>
<thead>
<tr>
<th>Rank</th>
<th>Item No.</th>
<th>Group Two Means</th>
<th>Group One Means</th>
<th>Sign Test</th>
<th>Rank Between Groups</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

*NR - Item of group one not related to group two

**Question 1**

All items of group two to all items of group one

- Number of pluses (+) = 12
- Number of minuses (-) = 3
- Number of ties = 5

\[
N = 15 = 0.018
\]

\[
x = 3
\]

Result on all items in the top twenty is that the two groups are significantly different. Null hypothesis was rejected at the .05 level of significance.

**Question 2**

Items that are within the top twenty for both groups one and two

- Number of pluses (+) = 3
- Number of minuses = 3
- Number of ties = 3

\[
N = 6 = 0.656
\]

\[
x = 3
\]
Results show that the nine items that both groups one and two agreed to in the top twenty are not significantly different. The null hypothesis was accepted at the .05 level of significance.

From the two tables above it appears that group one and group two are compared they are significantly different at the .05 level of significance for a one-tailed test. However, when the nine items of the top twenty statements were selected by both groups no significant difference was found at the .05 level of significance for a one-tailed test. One could assume that the generalists in evaluation and the industrial arts educators differ in what they think the top twenty evaluation statements should be. They do agree, however, on at least nine statements.

Summary

The main purpose of this chapter was to determine the top twenty program evaluation statements generated from the analysis of the survey instrument. The top twenty statements in essence are the premises which will be used to develop the theoretical evaluation model. Six items were covered in the chapter. They are: (1) the responsiveness of the instrument from the survey, (2) the top twenty statements (the premises) from the total group, (3) the twenty statements receiving the lowest number of points, (4) the top and lowest twenty statements from group one, (5) the top and lowest twenty statements from group two, and (6) the relationship between group one and two.
The responsiveness to the survey was not more than was expected due to its length and similarity of statements; however, it was more than adequate for this study.

Both groups agreed on what the main differences were between the top and the lowest twenty statements that they selected. The top twenty statements identified evaluation as a continuous all encompassing task of providing information for decision making while the lowest twenty statements depicted evaluation as a decision maker or a producer of a finished product.

The top and lowest twenty statements for both groups one and two were not the same except for nine statements to which they both agreed. However, some of these same statements ranked much differently; for example, number two ranked tenth in group one and twenty in group two.

The comparison of the two groups which is not a part of the study was accomplished by using the statistic called The Sign Test. Its main function was to roughly determine agreement or disagreement when comparing two groups on a related variable. It was found that the ratings of the top twenty statements in both groups did not compare or the null hypothesis was rejected at the .05 level of significance. It was also found that the ratings of the nine statements which both groups used in their top twenty were not significant; therefore, the null hypothesis was accepted at the .05 level of significance.
CHAPTER V

DEVELOPMENT OF THE TOTAL PROGRAM EVALUATION SCHEMA (IASIS)

It now is necessary to incorporate the preceding planning into developing the total program evaluation schema. A systems process was adopted as a means of organizing the total program evaluation schema into a logical sequence of events. The management concepts of planning, organizing, controlling, and communicating are used to make critical decisions when moving through the evaluation sequence. Finally, an evaluation rationale will serve to obtain and provide useful information for decision making. The overarching questioning process will aid in identifying useful information. Using these resources, one finds the parts of the evaluation schema falling into a logical sequence. (See Figure 11, page 110 and Figure 15, page 129).

Figure 7, page 87, shows that the total program evaluation schema will function within the macro system at the sixth level. In Figure 11, on page 110, there is a graphic illustration of the steps to be taken in developing the total program evaluation schema. The operationalizing of the schema is depicted in Figure 15, page 129, which shows
the operational evaluation model components required to delineate, obtain, and provide useful information to decision makers.

The total program evaluation schema will be identified through the acronym (IASIS) or Industrial Arts System Information Service. This term is defined in Webster's New Word Dictionary (1966), college edition, as "a combining form meaning: process or condition." The acronym letters I.A.S.I.S. mean:

**I** - Industrial - sub-element of the economic institution which changes raw materials into useful goods.

**A** - Arts - practices of doing or making things.

**S** - Systems - generally, any orderly analytic study designed to help a decision maker identify a preferred course of action from possible alternatives. Specifically, the sum total of parts working independently and in interaction to meet previously specified objectives.

**I** - Information - the process of delineating, obtaining, and providing useful knowledge to answer questions posed by decision makers. This concept is congruent with the definition of evaluation used in this study.

**S** - Service - providing useful information to the decision maker in order that he can make an informed choice among alternative strategies.

Total program evaluation premises have been generated to develop the theoretical evaluation model. This model will serve as a framework for guiding and directing the development of an operational evaluation model. Both models form the total program evaluation schema called IASIS.
By answering the following three questions it is hoped that the total program evaluation schema can be developed:

1. What overarching questions are necessary for evaluating industrial arts programs from the planning stage at local, state, federal, university, and project levels?

2. What type of theoretical evaluation model will be selected to guide and direct the development and application of an operational evaluation model?

3. What type of operational systems evaluation model can be developed which will function within the theoretical evaluation model to answer the overarching questions for providing information to various levels of decision makers?

The Overarching Questioning Process

The purpose of asking questions is to direct the evaluation process. Once the evaluator identified those questions that the decision maker wants answered, then he can begin to implement strategies to collect, organize, and report information back to the decision maker. The decision maker not only may have his own questions, but also the overarching questioning process may aid him in determining other pertinent areas of interest. Both the decision maker's questions and the questions from the overarching questioning process should provide more useful information at all levels of decision making.

Questions from the Overarching Questioning Matrix

The questions will be grouped into the three behavioral domains. First, the cognitive domain; second, the affective domain; and third, the psychomotor domain. In
Appendix H are the full length questions (the factor) for all three domains.

Information on writing questions involving the three domains came from (1) Bloom (1957) and Magar (1962), the cognitive domain; (2) Kraftwahl (1964), the affective domain; and (3) Simpson (1966), the psychomotor domain.

The overarching questioning matrix is depicted in Figure 16.
Bloom (1956) defines the cognitive domain as those behaviors which deal with recall or recognition of knowledge and the development of intellectual abilities and skills (p. 7). This domain has been stressed more than the other two in curriculum development for the reason that it has been possible to clearly state cognitive behavioral objectives. When objectives are clearly stated it becomes possible to measure those objectives against terminal outcomes. (See Figure 16).

The affective domain as defined by Krathwohl et al. (1964) is those behaviors which emphasize a feeling, tone, emotion, or a degree of acceptance or rejection (p. 7). This behavioral domain has not been as explicit as the cognitive domain. It is assumed that interest, personality, attitudes, and the other feelings of emotion are developed slowly and at times are relatively difficult to measure successfully. The evaluation of specific objectives in this domain requires more conclusive evidence. Possibly through identification of relevant factors which require specific instruments one can obtain reliable and valid information on whether the objectives have actually been met. This is a difficult task since the relationship between the cognitive and affective domains is not always clear. (See Figure 16.)

The psychomotor domain as defined by Simpson (1966)
...those behaviors which emphasize some muscular or motor skill, some manipulation of materials and objects, or some act which requires a neuromuscular coordination. These behaviors are stated in terms of abilities and skills (p. 130).

The psychomotor domain is not as succinct in its classification schema as the other two domains. Simpson (1966) speaks to this when she states:

It is not always an easy task to ascertain whether a given objective was primarily of one type or another. One problem was related to type of performance called for in the objective...performance of a particular sort, that involves motor activity...performance may be almost wholly cognitive... (p. 129).

Simpson (1966) further states:

Another problem, one that is frequently encountered in analyzing educational objectives in all three domains, had to do with the lack of specificity of the objectives. That is, many that certainly involved a great deal of motor activity, almost equally also involved the other domains. These were broad objectives, such as: Ability to give a successful speech. Ability to conduct a meeting. Ability to conduct a play period for small children. The investigators finally concluded that these were in the "action-pattern" domain, hence behind and encompassing the other three domains (p. 129).

The psychomotor domain is considered as an integrator of the other two domains. It becomes difficult for the evaluator to assess objectives in this domain because motor performance requires the use of intellectual skills and is influenced by the student's interest in the activity. This domain is characterized by overt activities or action performance through applied abilities. It is an observable
behavior involving skills with which the industrial arts program is highly concerned. (See Figure 16.)

A summary of the overarching matrix application to the collection of information is depicted in Figure 17.

The population dimension under the broad headings of local level and other levels starts the process of generating information. Added to the population dimension or the X axis of the matrix one finds the program dimension or Y axis and the behavioral domain or Z axis. When these three domains are combined, representing one cube in the matrix, a factor or question results. Once the question is identified, specific behavioral objectives can be written for each question.

Once the objectives have been written, instruments can be identified or designed for collecting information to determine if the objectives are being met. In essence, the instrument must be designed to answer the question posed by combining the three dimensions of the matrix.

A coded breakdown for computer use of each sub-element in the three dimensional matrix can be found in Appendix E. This coded breakdown was developed by Gibson and McLain for Epic and adapted to this study.

**Questions from Project Talent**

Questions from Project Talent (1964) were initiated and tested by American Institute of Research for the purpose of identifying, developing, and utilizing human
FIGURE 17
THE OVERARCHING QUESTIONING MATRIX—
APPLICATION TO THE COLLECTION OF INFORMATION
talents. Flanagan, et al. (1964) reinforce the above by stating the following seven objectives of Project Talent and what these objectives can hopefully produce:

1. To survey available talent—to undertake an inventory or census of the potential manpower pool that would provide a sound basis for planning national policies and meeting the country's needs in key professional fields such as science, medicine, and engineering, and in important non-professional fields.

2. To identify interests, aptitudes, and background factors—to investigate the interrelationships of patterns of aptitudes, preferences, interests, socio-economic status, and the motivational factors prevailing in our secondary school population.

3. To determine effects of lack of interest and motivation—to study the extent to which lack of interest on the part of some of our talented young people tends to deter them from undertaking the further training that might qualify them for careers in highly specialized fields.

4. To identify factors affecting vocational choice—to investigate the dynamics of personal decisions and environmental factors that ultimately determine the individual's choice of an occupation or career.

5. To identify predictors of creativity and productivity—to study the patterns of aptitude, interest, and motivation that underlie creativity and productivity in several different fields.

6. To determine the effectiveness of various types of educational experience—to study the effectiveness of various types of educational experiences in producing learning and in developing special talent.

7. To study procedures for realizing individual potential—to investigate procedures for assisting each individual to make full use of his potential abilities.

With these objectives in view, Project Talent hopes
to produce:

1. An inventory of human resources
2. A set of standards for educational and psychological measurement
3. A comprehensive counseling guide identifying patterns of aptitude and ability that are predictive of success in various careers
4. A better understanding of how young people choose their life work
5. A better understanding of the educational experiences that prepare students for their life work (pp. 3-4).

Project Talent is still being supported by the United States Office of Education. These funds presently are being used for follow-up studies of graduates.

Project Talent conducted a survey using a series of 394 questions designed to gather data about the background, activities, and aspirations of 440,000 sampled high school youth. An example of the questions is "How many times in the last three years have you been president of a class, club, or other organization?" Flanagan and Jung (1970), who worked with Project Talent, made the following statement about the survey questions:

Even though such items could be thought to represent the honesty of the respondent, the answers are verifiable and overt rather than covert. As such, they are preferable to items requesting opinions, beliefs, and feelings since their greater stability and predictive value has been demonstrated (p. 13).

Questions from Decision Makers and Other Sources

The decision maker will have specific questions based
upon needs, desires, and interests. It will be apparent that the decision situation, level, and the value placed on that decision will determine the type of information the evaluator will need to generate. It is hoped the questions from the questioning matrix and Project Talent will aid the decision maker in finalizing his specific questions. Additional questions will emerge as the evaluation process is applied. These questions eventually will fit into a matrix schema which will make it possible to simplify the questioning process.

The Development of a Theoretical Evaluation Model

As was stated on page 117, Chapter III, the actual development of a theoretical model is of such complexity that it is better to adopt or adapt an existing model. The preliminary selection of two theoretical evaluation models from a list must meet the six criteria outlined on pages 117-118 in Chapter III. Final selection of the theoretical model from the two preliminary selections is based on a second set of criterion measures which will be identified later.

Preliminary Selection of Theoretical Evaluation Model

The actual number of existing theoretical models which hold promise for this investigation have been initially identified by this researcher based on knowledge gained from research and study of evaluation models. They
are as follows:

A. Context, Input, Process, Product (CIPP) evaluation model by Daniel L. Stufflebeam, Evaluation Center, The Ohio State University.


C. Discrepancy Evaluation Model by Malcolm M. Provus, Pittsburgh Public Schools.

D. Evaluation Need Areas of Evaluation Educational Systems and Evaluating Instructional Programs by M. C. Alkin and staff, Center for the Study of Evaluation at University of the City of Los Angeles.

E. The Methodology of Evaluation by Michael Scriven, formerly Indiana University.

F. American Industry Project Evaluation System by Orville Nelson, Stout State University, Menomonie, Wisconsin.

These theoretical models are considered pertinent to the needs of developing a total program evaluation schema for industrial arts education. This assumption is based on the knowledge and experience of this investigator. The six criteria used in selecting the top two theoretical evaluation models are listed on page 176.

The rating scale for the preliminary selection of a theoretical evaluation model will be based upon the following .0 to 3 rating scale:
Rating Description

0 Those models which do not mention the criterion measure in their write-up.

1 Those models which mention the criterion measure but do not give any treatment.

2 Those models which mention and give treatment of the criterion measure but fail to show how to implement the treatment.

3 Those models which mention, give treatment, and indicate ways to implement the criterion measure.

The criterion measures and the rating of each model are depicted in Table 10. Breakdown of rating is found in Appendix I.

TABLE 10

RESULTS OF PRELIMINARY SELECTION OF A THEORETICAL EVALUATION MODEL BY USING THE SIX CRITERIA
The rating of the six theoretical models by using the six preliminary criteria was done exclusively by this evaluator. It is noted that eventually, when making a choice among alternatives, a judgment must be made by the decision maker. However, in this case the premises have been determined logically through a survey instrument. In addition, the six theoretical models were selected with prior knowledge of what they possibly could offer to IASIS.

After the models were selected, the six criteria were arranged, the rating scale determined, and the selection process started.

The procedure follows:

1. All models were reread and rated on the same day.

2. After the information was read on each model a rating was given to each item in the criterion measures.

3. After all models were rated they were quickly reviewed and corrections were made.

4. Finally the results were totaled and the top two theoretical models were determined.

The complete listing of each rating can be found in Appendix I, and the results of this rating are in Table 11.

**Final Selection of the Theoretical Evaluation Model**

From the six theoretical models the two models receiving the most points will be scrutinized further by subjecting these two models to a second set of criterion measures. Johnson (1962) suggests a set of criterion measures for assessing systems design. These same criterion
measures have been adapted for selecting the final theoretical model (p. 106). The second set of criterion measures for selecting a theoretical evaluation model follows:

1. Simplicity - there is a direct correlation between simplicity and reliability. Learning of evaluation schemas takes place faster and actual operation will be more efficient if the model is understood by those who must work it.

2. Flexibility - evaluation should have a set of generalizable strategies applicable to various settings yet it must be simple and well defined.

3. Reliability - a means of consistent operation of the components. Information output will vary from zero to 100 per cent. Hopefully it will be effective, efficient, and consistent. If a component is a critical factor, then back-up components should be built in to correct the deficiency. This can be corrected through the use of modules.

4. Economy - is the cost of evaluation worth the expenditure of time, money, and personnel? Back-up systems to correct critical points must be economically feasible.

5. Acceptability - must be accepted as worthwhile by those who use it. (Decentralization of responsibility of evaluation should go to as many individuals as possible without jeopardizing the operation of the evaluation schema.) Where is the model being used, for what purpose, and is it accepted as worthwhile?

The two models that received the highest ratings were
A, the CIPP model by Stufflebeam, and D, the model by Alkin of the Center for the Study of Evaluation at the University of the City of Los Angeles. Since Stufflebeam's model received the highest rating, an explicit delineation of the reasons for selecting it over the Alkin model should be given to further certify why the choice of the CIPP model was made. To help in this choice, five criterion measures were identified.

1. The Alkin model appears simple in the information that is available. CIPP appears complex; however, the Alkin model is only in the developmental stages, and the CIPP model has been empirically tested. This may indicate at the outset that evaluation is not a simple activity. Furthermore, it may mean that evaluation does not lend itself to simple graphic and verbal explanations.

Evidence of this complexity can be seen by observing the overwhelming variables found in any instructional program that is totally evaluated. If an evaluation model is to adequately consider all the variables found in an instructional program, it requires the proper methods and means. Alkin's model does not, CIPP does.

2. The Alkin model appears flexible, but one cannot tell specifically because of the lack of available information. CIPP, on the other hand, provides for various educational settings and incorporates a generalizable set of design strategies which simplifies its application to the
four different types of evaluation.

3. The Alkin model seems to be reliable. The explanation of the five need areas within the context of evaluating the total school instructional systems, or the development of new programs, appears to provide reliable information. The CIPP model has a built-in component which provides a means of checking the consistency of information flow. The Stufflebeam and Guba report (1968) included a set of criteria to measure the relevance of the evaluation activity to provide useful information not spelled out in the Alkin model. The total CIPP model illustration is encompassed by context evaluation. This allows for a reliability check of the CIPP system during its varied activities. No indication is given of this in the Alkin model.

4. The economy of the Alkin model versus the CIPP model is not known since information is lacking about their costs. The cost of implementing the Alkin and the CIPP models is practically the same since they both function from a similar theoretical base. It is possible that the CIPP model is less costly since it identifies the specific strategy to use under various settings.

5. The acceptability by the profession of an evaluative theoretical model is a major factor to be considered in determining which model is to be selected. The Alkin model does not appear to be fully developed at this time.
Furthermore, Alkin (1970) indicates in his writings that he was greatly influenced in the development of his model by Stufflebeam (p. 3).

An indication of the acceptability of Stufflebeam's CIPP model follows:

1. Used in the concerted Service Project which involves North Carolina University, The University of Minnesota, and New Mexico University.

2. A possibility that it is used by 50 per cent of the states for developing evaluation units under Title III programs.

3. Used by the Hawaiian Curriculum Center.

4. Used as self-evaluation for the Research Development and Training Operation of the Center for Vocational and Technical Education located at The Ohio State University.


6. Used by the South West Regional Research and Development Laboratory at Austin, Texas.

7. Used by the Columbus, Ohio Public Schools.

8. Used by the Xenia, Ohio Public Schools.

9. Used by the Saginaw, Michigan Public Schools.

10. Used by Robertson (1969) of The Journal of Industrial Education to organize CIPP to measure and to provide change for industrial education.

11. Used as the basis for developing the Phi Delta Kappa monogram on evaluation.

In summary, the following steps were used in arriving at the selection of the CIPP model:
1. Exhaustive review of pertinent evaluation-type literature to write program evaluation statements.

2. Development of a survey instrument to solicit opinions from experts in evaluation and industrial arts on the evaluation statements.

3. Subjection of the responses to computer analysis to generate twenty program evaluation premises.

4. Application of the twenty premises and other pertinent criterion measures to the six theoretical models of which Alkin and Stufflebeam models were selected as the top two.

5. Application of a second set of criterion measures of which CIPP was superior on all counts to Alkin's model except possibly cost.

Based on the evidence accrued through following the above processes, an assumption was made about which theoretical evaluation model was best for this study. That is, the CIPP model is the best theoretical evaluation model that could be selected for guiding and directing the development of an operational model for the Industrial Arts System Information Service, IASIS.

Explanation of the CIPP Model

Only a brief descriptive account of the CIPP model will be given since readily available information can be located from the bibliography of this study and elsewhere. The acronym CIPP represents four types of evaluation, namely, context, input, process, and product.

The Stufflebeam work is founded on the concept that evaluation is a means of providing information for decision making. To gain useful information, the evaluator must make
specific decisions so that he can function adequately. Stufflebeam (1970) calls these decision planning, structuring, programming (implementing), and recycling (p. 18). Stufflebeam (1970) identifies these four as follows:

...planning decisions are those which allow the decision maker to determine objectives. Programming decisions allow for the specifications of procedures. Implementing decisions are those relating to the monitoring of project activities. Finally, recycling decisions involve the judgment of outcomes (The Institute Report, p. 18).

These four types of decisions are related to the four evaluation strategies found in CIPP. The definition and explanation of the four types of evaluation strategies will enable one to understand their objectives, methods, and relation to decision making as found in Figure 18.

Stufflebeam applies to the four evaluation strategies a set of generalizable steps which are designed to identify what must be done by the evaluator studying instructional programs. These generalizable steps are:

A. Focusing the evaluation.
B. Collecting the information.
C. Organizing the information.
D. Analyzing the information.
E. Reporting the information.
F. Administrating the evaluation.

Through the guidance and direction obtained from Stufflebeam's work it becomes possible to develop an operational evaluation model for the industrial arts instruc-
<table>
<thead>
<tr>
<th>OBJECTIVE</th>
<th>METHOD</th>
<th>RELATION TO DECISION-MAKING IN THE CHANGE PROCESS</th>
<th>FIGURE 18</th>
</tr>
</thead>
<tbody>
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<td>To define the operation context, to identify and assess needs in the con-</td>
<td>To identify and assess system capabilities, available input strategies,</td>
<td>To identify or predict, in process, defects in the</td>
<td>To relate outcome information to objectives and</td>
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<td>text, and to identify and delineate problems underlying the needs.</td>
<td>and designs for implementing the strategies.</td>
<td>procedural design or its implementation, and to</td>
<td>to context, input, and</td>
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<td></td>
<td></td>
<td>maintain a record of procedural events and</td>
<td>process information.</td>
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<td></td>
<td></td>
<td>activities.</td>
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<td>By describing individually and in relevant perspectives the major sub-</td>
<td>By describing and analyzing available human and material resources,</td>
<td>By monitoring the activity's potential procedural</td>
<td>By defining operationally</td>
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<td>systems of the context; by comparing actual and intended inputs and</td>
<td>solution strategies, and procedural designs for relevance, feasibility</td>
<td>barriers and remaining alert to unanticipated ones.</td>
<td>and measuring criteria</td>
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<td>outputs of the subsystems; and by analyzing possible causes of</td>
<td>and economy in the course of action to be taken.</td>
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<td>associated with the objectives, by comparing</td>
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<td>discrepancies between actualities and intentions.</td>
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<td>these measurements with pre-</td>
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<td>determined standards or</td>
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<td>comparative bases, and by</td>
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<td>in terms of recorded input</td>
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<td>and process information.</td>
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<td>For deciding upon the setting to be served, the goals associated with</td>
<td>For selecting sources of support, solution strategies, and procedural</td>
<td>For implementing and refining the program design</td>
<td>For deciding to continue,</td>
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<td>meeting needs and the objectives associated with solving problems, i.e.,</td>
<td>designs, i.e., for programming change activities.</td>
<td>and procedure, i.e., for effecting process control.</td>
<td>terminate, modify or</td>
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<td>for planning needed changes.</td>
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<td></td>
<td>refocus a change activity,</td>
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CIPP EVALUATION MODEL - CLASSIFICATION SCHEMA OF STRATEGIES FOR EVALUATING EDUCATIONAL CHANGE (ADOPTED FROM STUFFLEBEAM MODEL)
tional program.

The Development of the Operational Evaluation Model

The basic purpose of the operational evaluation model is to provide the methods and means required to apply the theoretical evaluation model to the macro system. To accomplish this task in the realm of the total program evaluation schema, it is necessary to properly set the parameter of evaluation by identifying the vertical and horizontal scope as depicted in Figure 13, page 120.

Setting Operational Parameters

On the horizontal scope, this schema conceptualizes evaluation as a means of providing not only ad hoc but also continuous systematic evaluation of a program. On the vertical scope, the operational model should be adaptable to evaluating individual bits and pieces to the total program. Incorporating both the vertical and horizontal dimensions into the operational model's development assures a total program evaluation rather than a narrow limited version incapable of adequately functioning in a sophisticated educational environment.

Management Decision Strategies

First one must identify what decision strategies are needed to develop an operational model. It was stated on page 123 that the three phases of decision making involved: (1) becoming aware of the problem, (2) identifying the alternative solution to the problem, and (3) selecting the
best alternative.

For this study the management decision terms of planning, organizing, controlling, and communicating will be used. Possibly these terms are better understood by the industrial arts profession than Stufflebeam's four decision settings mentioned on page 20 since they basically depict what management does in industry.

**Planning** decisions functions to formulate, research, design, and determine short and long-term evaluation's objectives within certain specifications and standards. It involves selecting the best alternative solution after assessment evaluation of the macro system has taken place.

**Organizing** decisions involves structuring the evaluation systems by identifying the work that needs to be done and where it is to be done. In addition, it serves to supply the evaluation systems with personnel and other necessary equipment and materials to accomplish the objective of input evaluation. Simply, it makes decisions on creating a structure to carry out a plan suggested by input evaluation.

**Controlling** decisions performs the duties of directing, monitoring, reporting, and correcting to specifications and standards. It makes decisions in respect to process evaluation's output.

**Communicating** decisions in the evaluation system involves the two-way flow of information to all levels of decision-making for the purpose of informing everyone of the
strengths and weaknesses of the program. Communication plays an integral role in the other three decision types and allows the systems and subsystems to function in an open environment with some degree of feedback control. The total change process of research, development, diffusion, and adoption requires communication of information to link each of these four elements together into an unified articulate system.

Evaluation Strategies and Their Relationship to Decisions

The four types of evaluation strategies for this study were changed from CIPP to AIPO: assessment, input, process, and output. The reason for the change was to better communicate the meaning of the four types of evaluation to the industrial arts profession. Possibly the meaning of assessment can better be understood when compared to context. Manufacturing, a concept studied in industrial arts education, uses the cycle input-process-output to produce useful goods from materials. CIPP uses input-process-product. The decision was made to use output rather than products for the final evaluation type because it corresponds with the normal manufacture cycle which is studied by most industrial arts teachers.

The relationships between the four types of evaluation strategies and the four management decisions are: (1) planning decisions are related to assessment, (2) organizing decisions are related to input evaluation, (3) con-
trolling decisions are related to process evaluation, and
(4) communicating decisions are related to output evalua-
tion.

The design strategies used for meeting the objectives of the four types of evaluation are theoretically the
same. But operationally they may vary as to the emphasis
placed on individual components by different evaluators,
decision makers, the behavior domains assessed, and the in-
structional situations in which the evaluation takes place.
Nevertheless, it is hoped that the design strategy is ade-
quately generalizable to the four types of evaluation for
the purposes of simplicity and brevity.

Three Design Elements for Developing an Operational Model

The design strategy for developing an operational
takes place.
model incorporates three elements: (1) evaluation as de-
ined in this study, (2) systems procedures as defined in
Chapter III, and (3) the management concepts of decisions.
All three are given further explanation in the paragraphs
which follow.

(1) It should follow that the definition of evalua-
tion as selected for this study and found in Chapter I (un-
der definitions) will serve as a primary factor in design-
ing a set of generalizable operational evaluation strategies
applied to the four types of theoretical evaluation strate-
gies.

The definition of evaluation and key terms as given
by the Phi Delta Kappa National Study Commission on Evaluation follows:


Term 1: Process. A particular, continuing, and cyclical activity subsuming many methods and involving a number of steps or operations.

(This indicates that the definition fits the structure of a system concept by its continuous cyclical activities and one of the main elements used in developing IASIS.)

Term 2: Delineating. Focusing information requirements to be served by evaluation through such steps as specifying, defining, and explicating.

(This subsystem forces the industrial arts evaluator to sort out irrelevant factors for identifying the real issues involved.)

Term 3: Obtaining. Making information available through such processes as collecting, organizing, analyzing, and reporting, and through such formal means as statistics and measurement.

(This subsystem forces the industrial arts evaluator to apply the best evaluative mechanisms to gain total program information rather than specific data.)

Term 4: Providing. Fitting information together into systems or subsystems that best serve the needs or purposes of the evaluation.

(This subsystem forces the industrial arts evaluator to use an information storing and retrieving process.)

Term 5: Useful. Information appropriate to prede­termined criteria evolved through the interaction
of the evaluator and the client.

(This subsystem forces the industrial arts evaluator to be sure that the information meets the needs, interest, and desires of the decision makers.)

Term 6: Information. Descriptive or interpretive data about entities (tangible or intangible) and their relationships.

(This is a common element to all the other seven items.)

Term 7: Judging. Assigning weights to alternative solutions in accordance with a specified value framework, criteria derived therefrom, and information which relates criteria to each entity being judged.

(This subsystem forces the industrial arts evaluator to consider the different environmental value sets which can influence the relevance of the information.)

Term 8: Decision Alternatives. A set of optional responses to a specified decision question.

(This subsystem forces the industrial arts evaluator to generate enough information on a specific decision to make an informed choice possible.)

(2) The systems procedure as depicted in Figures 4 and 5, pages 92 and 93, is a means of systematically analyzing, identifying, and ordering parts into a workable whole to accomplish the specified mission of developing IASIS. A Mission Profile and a Functional Analysis will be used to illustrate IASIS graphically.

(3) The management decision concepts of planning, organizing, controlling, and communicating provide the
systems and evaluation elements operational guidance and direction to accomplish a specified objective. Basically these four management decision concepts serve as linking devices between the four types of evaluation to assure operational performance meets specified standards.

**Generalizable Strategies for Developing Evaluation Design**

CIPP uses a set of generalizable steps to develop evaluation designs which are applied to the four evaluation types. (See page 181.) IASIS also will follow CIPP's theoretical guidance and develop a similar set of generalizable steps in developing evaluation design. The purpose of the generalizable strategies is to provide information for decision making which is congruent with the Phi Delta Kappan definition of evaluation. It follows that the major terms in the Phi Delta Kappan definition should provide the main headings for the generalizable strategies.

The generalizable design strategy or subsystems of the four types of evaluation are: (1) determining program requirements by delineating information, (2) obtaining information, (3) providing information, (4) managing decision information systems, (5) evaluating total systems. A categorical listing in Figure 19 illustrates the subsystems of the generalizable design strategy.
6.1.1. Delineating Program Requirement Information
  6.1.1.1. Mission objectives
  6.1.1.2. Program definition and description
  6.1.1.3. Decision levels and situations to be served
  6.1.1.4. Identification of questions to collect data
    6.1.1.4.1. Questioning matrix
      6.1.1.4.1.1. Cognitive domain
      6.1.1.4.1.2. Affective domain
      6.1.1.4.1.3. Psychomotor domain
    6.1.1.4.2. Project Talent questions
    6.1.1.4.3. Decision makers questions
    6.1.1.4.4. Evaluation
  6.1.1.5. Preparation of program behavioral objectives
  6.1.1.6. Identification of program specifications and standards
  6.1.1.7. Identification of methods and means
  6.1.1.8. Decision on whether to continue, modify, or terminate
  6.1.1.9. Evaluation

6.1.2. Obtaining of Information: Descriptive-Behavioral
  6.1.2.1. Collection of information
    6.1.2.1.1. Items of information to be collected
    6.1.2.1.2. Sources of information
    6.1.2.1.3. Sampling methods and means
    6.1.2.1.4. Methods and means of generating instruments
    6.1.2.1.5. Development of master schedule for collecting data
    6.1.2.1.6. Evaluation
  6.1.2.2. Organization of information
    6.1.2.2.1. Processing of data
    6.1.2.2.2. Data control center—coding, storing, and retrieving information
    6.1.2.2.3. Evaluation
  6.1.2.3. Analysis of information
    6.1.2.3.1. Methods and means strategies
    6.1.2.3.2. Data interpretation
    6.1.2.3.3. Evaluation
6.1.2.4. Report of information within evaluation system
  6.1.2.4.1. Identification of groups and individuals or audiences
  6.1.2.4.2. Identification of methods and means strategies
  6.1.2.4.3. Evaluation

6.1.2.5. Judge information decision alternatives
  6.1.2.5.1. Awareness-re-identify information specifications and standards
  6.1.2.5.2. Design-assign value weights to alternative methods and means used to generate information about programs
  6.1.2.5.3. Choice-determine whether information is adequate to judge intents with outputs
  6.1.2.5.4. Actions-determine if information is adequate to continue, inadequate but can be modified, or terminate and start again to generate new knowledge
  6.1.2.5.5. Evaluation

6.1.2.6. Evaluation

6.1.3. Provide Useful Information
  6.1.3.1. Re-identification of decision makers' questions
  6.1.3.2. Order and highlight data into report to answer questions
  6.1.3.3. Supply information that is timely and relevant to answer program objectives
  6.1.3.4. Evaluation

6.1.4. Manage Decision Information Systems
  6.1.4.1. Plan-selecting evaluation objectives, programs, procedures, and methods
  6.1.4.2. Organize-helping coordinate people and resources into a system so that activities they perform lead to accomplishment of generating information
  6.1.4.3. Control-assuring that the various subsystems of the set of generalizable evaluation strategy design are performing according to plans
  6.1.4.4. Communicate-transfering of control information among subsystems of the set of generalizable evaluation
strategy design to assure a coordinated effort

6.1.4.5. Evaluation

6.1.5. Evaluate Systems

6.1.5.1. Evaluation of systems design according to the development criteria and operational criteria

6.1.5.2. Provision of systematic check and renewal of the systems which keeps it abreast of current evaluative thinking

6.1.5.3. Evaluation of system concepts and the management decision process to improve methods and means of operation

6.1.5.4. Evaluation

FIGURE 19

A SET OF GENERALIZABLE STRATEGIES FOR DESIGNING AN INDUSTRIAL ARTS SYSTEMS INFORMATION SERVICE PLAN

Suggested Criteria for Developing Operational Model

The set of twenty criterion factors listed on page 124 was suggested as a means of identifying certain considerations for developing an operational evaluation model. A summary of these suggested factors follows:

1. The definition of evaluation is a process of delineating, obtaining, and providing useful information for judging alternative decisions. This includes the three areas of measurement, performance, and judgment.

2. The purpose of evaluation is to provide information for decision making about existing programs and about the researching, developing, trying-out, and implementing of new programs. This purpose logically follows the developed premises found in Table 11 and the operating assumptions located in Appendix F. Succinctly, evaluation's
purpose is to generate useful information about industrial arts program goals, plans, operating procedures, and effectiveness so that the educational consumer can make an informed decision.

3. Specifications of questions to be answered are the identification of specific requirements from the decision maker as well as from particular evaluation types. It follows that the evaluator should ask how much is good enough, what are the ranges and limits, what are the required accuracies, what reliabilities are required or are reasonable to expect, and what errors can be allowed? In this study the overarching questioning matrix identified relevant factors of possible information sources. The specification can only be determined when the evaluation schema is applied.

4. Evaluation types are identified through the theoretical evaluation model and then adapted to IASIS.

5. Means of choosing and applying values will determine what judgment should be applied by the evaluation teams, the educational consumer, and other interested participants in decision making. The determination of needs, uses, and purposes of evaluation from the various decision makers and other interested population also affect what values are placed on the information collected. Through the interrelationship of population, behavior, and the industrial arts program in the affective domain of the
questioning matrix, the evaluation team can identify and apply values in guiding and directing their efforts. Evidence of useful information should always take precedence over biases in educational improvement.

6. **Criteria for judging evaluation design and reports** will be assessed on whether it is able to perform at a level which accomplishes the objectives spelled out by the decision makers. Specifically the reports should be timely, relevant, reliable, valid, efficient, objective, effective, creditable, and pervasive. The iteration process as depicted on page 127 is a method of more effectively accomplishing this task.

7. **Conceptualization of evaluation process** is founded in the decision making requirements needed to make informed judgments among alternatives. The basis for this concept comes from the scientific method which identifies a logical and systematic theory for identifying the problem and providing the best solution to that problem. In essence, evaluation is the means of extending the ability of the decision maker to make better choices among alternatives.

8. **Applicability at various levels of education** is first done in the initial stages of generalizable strategies of developing evaluation designs. This is called delineation of requirements. Second is the overarching questioning matrix under population. (See Figure 17.) Once the requirements are identified, then specific mission objec-
tives are written in behavioral terms.

9. Methodological operationalization involves applying generalizable operational methods to implement different types of evaluation activities. This is accomplished by applying the generalizable strategies of developing evaluation designs, the four types of management decisions, and the four evaluation types. To organize these items into a logical structure, a systems approach is used which assures that the operation of evaluation incorporates proper methods.

10. Timing of evaluation in relation to the program schedule is dependent upon effective and efficient management of the evaluation scheme. The Industrial Arts Systems Information Service (IASIS) uses both a systematic and continuous assessment of the macro system. In addition, it is able to employ an ad hoc evaluation mechanism design to quickly correct discrepancies in program operation due to its built in feedback evaluation mechanisms with each system and subsystem. In all cases evaluative information must be timely, relevant, reliable, valid, and efficient within the limits and restraints of the evaluation process. This usefulness of information is accomplished by all parts of the evaluation schema working as an integrated whole.

11. The relation of evaluation to the decision making process is conceptualized as a provider of information for decision making and not a decision maker in and of
itself. Obviously, the evaluator must make decisions within his realm of responsibilities; otherwise, he would fail to accomplish his task. In specific cases the evaluator functions to identify the best possible alternatives for the decision maker to consider. However, in all cases the decision maker always has the final judgment on those items for which he is directly responsible.

12. Position as to the relation between evaluation and research has been identified in The Review of Literature. Specifically, evaluation is generalizable across time and population units. It relies heavily on empiricism and lightly on history, philosophies, and inquiry. It is specific, socially directed, and decision seeking. Research on the other hand is general; emphasizes enquiry, light on history, philosophies, and evaluation. It is autonomous, knowledge building, and conclusion seeking.

13. Coverage of time, cost, and performance variables is built into each stage of generalizable strategies of developing evaluation designs. These items are identified as limits (time, money, and performance) and constraints (people, material, and facilities).

14. Cost of applying the model will be dependent upon the mission objectives, the limits and constraints, the specifications and standards, and the methods and means used in obtaining information. If information identifying, coding, storing, and retrieving can be accomplished with
technology, possibly the eventual cost can be reduced.

15. **Coherence of evaluation language in the context of education and information science** should be logical. IASIS has been developed to apply the logic of systems to the decision processes of management, and the rationale of educational evaluation. This will bring about a cohesive interrelationship of education and information science.

If industrial arts education is to improve, a broader knowledge from other areas of study must be obtained. One such area is information science which can be used for identifying, trying out, and implementing technological discoveries by having more information about their worth. Therefore an evaluation system which is attuned to the needs, desires, and interests of a changing environment must use knowledge gained from information science.

16. **Validation** of all systems and subsystems has a built-in evaluative mechanism which assures that the output of each system meets certain specified standards. Also assessment of the evaluation-type strategies provides ways to consistently update the evaluation system.

17. **Verifiability** is accomplished through the application of more than one means of obtaining data about the effects of a program upon a specified learner. The overarching questioning matrix process at the local level provides seven different means of information input about the program in various behavioral categories. Also, the use of
various evaluation procedures and instruments can help verify the reliability of the data without threatening specific individuals. One example of this technique is using unobtrusive and interest inventories to determine student interest for a particular industrial arts program.

18. **Internal consistency** is obtained by applying a generalizable set of design strategies to all four evaluation types. The set of generalizable strategies are cyclic in nature at the various levels which provide feedback in the system to accomplish internal consistency. Many mini-systems and other systems at various levels identify their inputs and outputs to accomplish a given task. If the systems output does not match the mission objective, then corrective feedback is initiated.

19. **Position with respect to mission objectives** must be identified by the evaluator through the decision maker. The process defines the boundaries of what the evaluation system is being used for and why. The evaluator must be concerned with the delineation of objectives because the decision maker may not understand the significance nor fully comprehend the importance of the objectives. Problems with objectives come to light when they are (1) not precisely stated, (2) thought to be objectives but in actuality are not, (3) subjected to conflicting value priorities, and (4) thought to be attainable but are not.

20. The role of the evaluator is to facilitate the
decision maker through the provision of providing timely, relevant, reliable, and effective information. The specific task may involve cutting across various audiences to obtain objectives. The position of the evaluator should be separate from overbearing influences of power groups yet be able to function with all groups. It is known that the role of an evaluator will change according to the uses, purposes, and needs of information requirements as determined by his clients.

For IASIS the evaluation role will involve accomplishing those tasks found in the four evaluation types, the four management decisions, and the generalizable strategies used in developing evaluation designs. Looking at the array of duties required to accomplish these tasks, it can be assumed that the various demands upon the evaluation unit are dependent upon its ability to deal with complexity. The range of the evaluator's duties could be from performing all the evaluation tasks to one of being a director of others who perform evaluation. The magnitude of the evaluator's role as seen for IASIS involves the ability to maintain continuous contact with all decision makers involved.

Duties of an evaluation unit director are: (1) coordinating evaluation activities of all groups involved, (2) identifying and reducing restraints from all educational consumers, (3) disseminating the purposes and advantages of
evaluation to all educational consumers, (4) directing the planning and delineating of the evaluation methods and means to accomplish a given mission, (5) defining staff and resource requirements and planning for meeting these requirements, (6) reviewing all evaluation methods, means, and reports before they are used or released for distribution, (7) applying cost benefit analysis techniques to evaluation and programs, (8) arranging for external evaluation of the unit activities, (9) writing or approving the evaluation section of new proposals, and (1) supervising and coordinating the evaluation activities, training, research, and consulting performed by members of his staff (Owens, 1963, p. 8). Naturally, specific tasks are assigned to other evaluators in an evaluation unit.

Assumptions for Developing Operational Model

The thirty operational evaluation development assumptions are in accord with the four evaluation types, the four management decision strategies, and the generalizable process of developing evaluation designs. (See Appendix F.)

Apply Systems Concepts to Developing an Operational Evaluation Flow Block Diagram

The operational evaluation model is developed first through a mission profile, and second by using a functional analysis. Examples of these items are found on page 202 and 203. The mission profile identifies the major evaluation events which will occur during its operation. Arabic nu-
merals in the profile represent the order by which the events flow through the block diagram. The profile is the logical order in which the four evaluation types usually occur. These events or milestones are called the critical path for achieving the mission objectives of the total program evaluation schema. This occurs at the sixth level in the macro system and is identified in Figure 7, page 87.

The two system concepts of Mission Profile and Functional Analysis are used to graphically depict the operation of the total program evaluation schema. (See Figures 20 and 21.) Kaufman and Corrigan (1967) provide an explicit delineation of these terms in the following:

First Mission Profile:
1. Shows a critical path for achieving a mission objective.
2. Shows the major functions which must be done.
3. Shows order and sequence of the major functions.

Second Functional Analysis:
1. Shows the task that must be done.
2. Shows in what order each task is to be performed.
3. Shows a logical breakdown of each major constituent by analyzing, identifying, and ordering into component parts.

Once the Mission Profile and the Functional Analysis are completed, one can begin: (1) to determine the limits and constraints of each evaluative task or job to be done and (2) to identify the total array of methods and means
FIGURE 20

THE MISSION PROFILE OF IASIS
A FLOW BLOCK DIAGRAM
FIGURE 21
A PARTIAL FUNCTIONAL ANALYSIS OF IASIS - A FLOW BLOCK DIAGRAM
for meeting the objectives. The above steps were used to structure the total program evaluation schema or to operationalize the theoretical model.

The Narration of IASIS Mission Profile

The narration of the operational evaluation model is designed to bring all components into a working whole for accomplishing the mission objectives of IASIS. This evaluates the macro system for the purpose of providing answers to questions which consumers of industrial arts products need if they are going to improve instructional programs.

The first narrative will involve the Mission Profile as depicted in Figure 21. The Mission Profile of IASIS begins by fixing the total program evaluation schema within the macro system at its sixth level. The macro system provides the input to the evaluation program since it represents industrial arts organizational system systems.

Basically, the evaluation schema assesses this input to determine whether the macro system output should be modified, continued, or changed.

If change is suggested and adequate information is lacking, the input-process-output evaluation mechanisms are utilized. This mechanism provides information for making decisions on the what, how, and where of research, development, and diffusion of innovative program data back to the macro system for adaption. When the program change data runs through the macro system, it is reassessed. This cy-
The above is a brief overview of how the total program evaluation schema or IASIS functions to provide continuous and systematic evaluation. Continuous and systematic evaluation is a vital factor today for providing relevant instructional experiences in a rapidly changing society.

The total program evaluation schema is a modification of CIPP evaluation model which was selected to serve as the theoretical framework for guiding and directing the development of the operational model as depicted in Figure 20, the Mission Profile of IASIS.

By using graphic symbols it is possible to better understand the major evaluation events in the flow block diagrams of the Mission Profile and Functional Analysis as they are applied to the macro system. Rectangles with diamonds below are used to indicate decisions of planning, organizing, controlling, and communicating. The diamonds depict the four steps in making decisions. The rectangles (with protruding loops) are representative of the four types of evaluation. The loops depict the cyclic activity of generalizable strategies used in developing evaluation designs. Numerals in the flow block diagram show sequence of events. Solid lines show forward flow while dotted lines show feedback (or modification). Levels in the functional analysis represent the subsystems of the systems.

One will note that the same general strategy is ap-
Applicable to all four evaluation types which are:

6.1.1. Delineating program requirements for information.

6.1.2. Obtaining of information.

6.1.3. Providing useful information.

6.1.4. Managing the evaluation information decision systems.

6.1.5. Evaluation of systems.

A step-by-step written explanation of IASIS's operation is given by the Arabic numerals which appear as paragraph headings or within the text of the paragraphs which refer correspondingly to portions of the model being explained. (See Figure 20.)

(6.0) Perform Total Program Evaluation. This is the mission objective of IASIS. The purpose of the total program evaluation is to study the total environment in which the macro system functions so that decision makers' questions can be answered. This requires studying all dimensions of the industrial arts instructional program which directly or indirectly may influence its performance. This process usually starts by assessing the existing program.

(6.1) Assessment Evaluation. Its underlying purpose is to determine the discrepancy between desired intents of the industrial arts program and the actual outputs by generating baseline data. Baseline data is generated by the five generalizable strategies as outlined in Figure 17. Once the baseline data is generated and discrepancies iden-
tified, specific outcomes are determined. These outcomes which the educational consumers at the local level have indicated as important are changed into behavioral objectives. This process should be continuous and systematic to consistently provide information for determining discrepancies existing in the industrial arts program.

(6.2) Management Planning Decisions. Once the baseline data is cycled back to assessment evaluation, a management planning decision must be made. At this point a decision is made to continue, modify, or terminate the existing programs and prepare for future action. If the program continues as is, it means that the input matches output. Modification is incorporated if slight change can remove the discrepancy. Usually this means that adequate information is available for the decision maker to initiate slight change. (An example of this type of change would be shortening each period seven minutes to gain an additional period required to increase course offerings.) Preparation for future action means that a high discrepancy exists between inputs and outputs and a significant change must take place. The magnitude of the change is determined by the amount of available intellectual abilities and skills to solve the problem.

(6.3) Input Evaluation. Its purpose is to specifically determine what knowledge is available for providing solutions to a problem. The identification of alternative
solutions is first done by searching readily available sources such as other industrial arts programs, research and development centers, universities, or private enterprises. (It should be noted that the same five generalizable design steps as used in assessment evaluation are used to guide and direct evaluation activities. However, the sequence may vary according to the need.) A specific set of questions about the innovation should be developed in order that each alternative is rated equally. This may require an instrument specifically designed to answer those questions deemed important by the decision makers.

Eventually, an innovation is selected for testing (9.4) which shows the greatest promise of succeeding. A try-out (9.5) period is initiated to test and improve the selected program. The decision then is made (6.6) for the final (9.7) check on the particular strengths and weaknesses of the program. Once this is accomplished, the decision to diffuse (9.8) the total program or specific parts (9.10) is made. The diffusion system is assessed (6.12), and feedback is provided for modifying the communication decision (6.8) mechanisms. Eventually, the total program or specific parts of the program are (6.9) implemented into the macro system (9.11) as output from the research and development system. Possibly all these steps may not be investigated in depth since some information may be available from other sources.

If there is a complete lack of information to solve
the problem, then it becomes necessary to generate completely new knowledge for program development. This may require going through the Guba-Clark model of educational change, that is, research, development, diffusion, and adoption stages. (An example of this is the IACP rationale and program development.) Primarily the same procedures that were required to plan, develop, and diffuse those readily available solutions to a problem are used with the totally new program schema.

(6.4) Management Organization Decision. Its purpose is to identify what work is to be done and where. It also makes decisions on the types of evaluative personnel and necessary materials and equipment which could be used in process evaluation (6.5). Input evaluation (6.3) has provided the necessary information about the particular requirements to solve a specific problem in the macro system. However, specific decisions about the adequacy of the information for entering the process evaluation (6.5) stage must be made.

(6.5) Process Evaluation. This type of evaluation is designed to provide information to improve the program while it is still flexible. This process requires that information must be continuously and systematically supplied to the decision maker for correcting discrepancies between intents and performances. In essence, the process evaluation mechanism monitors the program continuously to provide rele-
vant feedback for making corrections in program testing and development.

(6.6) Management Control Decision. This is the final decision of the program before it is subjected to a final output evaluation (6.7). The controlling decision works within the processes evaluation (6.5) mechanism. Its purpose is to direct, monitor, report, and correct discrepancies between the intents of the program being tested and the performance standard.

The correction is made according to specific performance standards as outlined in the behavioral objectives of the program being developed. Simply, the management control decision determines whether the output from process evaluation adequately meets the performance objectives within the limits and constraints of the input (6.3) and process (6.5) evaluations.

(6.7) Output Evaluation. This provides for the final judgment of the innovative program under consideration. This process determines the efficacy with respect to initial input and final outcome in relation to mission objectives. The strengths and weaknesses of the innovative program are basically determined by its effects on students, teachers, administrators, specialists, parents, school board members, and the community. Total program evaluation looks at all factors which will provide useful information to educational consumers. Conventional pure experimental researchers can
apply their expertise to add further information to subsequent implementation of the innovative product into the normal school setting. However, comparison type research is not a relevant measure of a program's efficacy because it is extremely difficult due to the intervening variables such as teachers.

(6.8) Management Communication Decisions. The purpose of this evaluation activity is to decide the best methods and means for diffusing, implementing, and installing products from the research and development process to the macro system. The innovative program needs to be adequately communicated to the macro system if change is to occur through added information. This activity requires a two-way flow of information between the research and development system and the macro system. To assure that this two-way flow is adequate, the management communication decision system (6.8) must function as a linking device.

In essence, the communication decision mechanism is the decision linking process between evaluation output (6.7) and the macro system. In the main, it determines whether the diffusion process does its job. The criteria for measuring performance are whether the information is timely, relevant, reliable, objective, valid, and pervasive to those who must use it.

(6.9) Information Storage and Retrieval. Once the decision has been made to communicate evaluation output,
(9.7) a central place must be designated to store and retrieve pertinent data about innovative industrial arts programs. Possibly this facility could be part of the Eric system but with the added features of wider coverage and high speed data processing for faster retrieval (9.10). This same facility should have the capability of screening out irrelevant and obsolete information so the data continuously is being replaced with new knowledge.

(6.10) Implementing Total or Specific Parts of an Innovative Program. This activity evaluates what program and its specific parts the decision makers actually use. Knowing this may aid in either debugging the diffusion process or informing the research and development people of specific problems existing in a particular program. This evaluation activity works in conjunction with the information storage and retrieval center (6.9).

(6.11) Output to Macro System. This is the end product of diffusing information to the macro system for implementation. Implementation is assessed at this time through the assessment evaluation (6.1). The results from the diffusion and program implementation process are fed back from assessment evaluation (6.1) to the management communication decision process (6.8). This information is used to modify the data in the storage and retrieval center (6.9), the implementation of the program (9.10), and the research and development process (6.3-6.7).
(6.12) Assess Management Communication Decision System. The purpose of this activity is to provide the machinery necessary to systematically make improvements in the system. Its job is to maintain a vital link between the educational consumer and research and development systems.

Communication at all levels of decision making has been mentioned by most evaluators as one of the most pressing problems facing evaluation and it requires solution. Possibly the communication problem can be solved through the application of cybernation to evaluation. This may provide useful solutions for education.

The Narration of IASIS—A Partial Functional Analysis

A partial Functional Analysis is illustrated in Figure 21 which shows the subsystems of assessment evaluation. Although not all the subsystems of assessment evaluation are given, a more comprehensive breakdown is found on pages 190-192 of this chapter.

(6.0) Perform Total Program Evaluation. This is the top level Mission Profile of IASIS.

(6.1) Assessment Evaluation. It is considered the first level. This level would include all Arabic numerals from 6.1 through 6.12 in the Mission Profile. (See Figure 20, page 202.)

(6.1.1 - 6.1.5) The Generalizable Strategies for Developing Evaluation Designs. This is the second level of assessment evaluation which is common to the four types of
evaluation. It is represented in the Mission Profile by a loop.

(6.1.1.1 - 6.1.1.8) Steps in Delineating Program Requirement Information. This system functions at the third level under assessment evaluation (6.1). The purposes are to focus specifically on the program and to identify the parameters of the evaluation.

(6.1.1.4.1 - 6.1.1.4.4) Steps in Identifying Questions for Collecting Data. This system is located at level four within assessment evaluation (6.1). Its important purpose is to help identify and clarify objectives for the decision makers; furthermore, it helps to identify what instruments are needed to obtain information.

(6.1.1.4.1.1 - 6.1.1.4.1.4) Steps in the Questioning Matrix. This system is located at level five in the assessment evaluation (6.1). Its purpose is to identify fifty-five questions from each behavioral domain.

At each level there is feedback provided. Therefore, each level represents an individual system which functions to provide information to the next higher level until the mission objective is accomplished. The levels can continue down until one stops asking what and starts asking how about the particular item above it.

The operational model was developed from CIPP, the theoretical model. Its purpose is to improve industrial arts education information for decision makers. This was
accomplished by building a total program evaluation schema. The total program evaluation schema as applied to industrial arts education has been defined as IASIS - Industrial Arts Systems Information Service. Within this concept of IASIS, information for the consumer of industrial arts products can be made available.

Summary

This chapter synthesized all previous information into development of the theoretical and operational models which are referred to as IASIS or Industrial Arts Systems Information Service. The definition of this concept was given as the total program evaluation schema as it relates to evaluation in industrial arts education.

The three elements of systems theory, management concepts, and evaluation rationale were combined into developing and operationalizing IASIS. The first major item considered in the chapter was the overarching questioning process. The questioning matrix was given major emphasis because it provided the best structure for generating a set of questions which systematically covered both the descriptive and behavioral aspects of evaluation at local and other levels.

By combining the three dimensions of the matrix, that is, the population dimension, the program dimension, and the behavioral dimension, one can develop questions or factors. These questions are changed to specific behavioral
objectives and provide a means of designing instruments for answers. In this way the discrepancies between the objectives and the outputs can be determined. One hundred sixty-five questions were written. They are found in Appendix H.

The second questioning technique comes from Project Talent which has 394 questions that are designed to determine aptitudes and abilities. The third set of questions comes from the decision makers. The prior two questioning techniques can help the decision maker identify relevant questions which, when answered, can provide him with useful information. The process of answering these questions is the domain of evaluation.

The preliminary selection of the theoretical model was accomplished by using the premises developed and eight other pertinent criterion measures. Six theoretical models were selected for preliminary consideration. This investigator read and re-read the literature containing the six models and rated them on a 0-3 scale. The top two models from this process were subjected to a second set of criteria which resulted in selecting the CIPP (content, input, process, and product) theoretical evaluation model.

Subsequently, the operational model was developed following the design initiated in Chapter III. The operational model consisted of two diagrams. The first was the Mission Profile which depicts in a flow block diagram the major events of the IASIS. The second was a partial Func-
tional Analysis flow block diagram which shows how the levels or subsystems of the system's major events are logically structured to provide information to the next higher level until the Top Mission Profile objective has been met.
CHAPTER VI

TESTING IASIS THROUGH SIMULATION

The total program evaluation schema, IASIS, was conceptualized, and an operational narration was presented in Chapter V. The narration gives only a brief hypothetical accounting of IASIS' evaluation operation. No specific problem or instructional situation was identified and applied logically to IASIS to determine whether it actually works. When the narration is applied to an operational industrial arts instructional problem within a specific environment, IASIS can be tested adequately and better understood. Hammond (1970) suggests that it is impractical to test an evaluation schema by applying it to an instructional situation. He further states that the best means of testing an evaluation schema is through simulation that allows easier manipulation of variables than is possible in an actual situation.

Simulation, according to Quade (1966), is a means of making up a situation to test a model or schema. When the actual implementation of a model or schema is impractical and when the model developer wants to debug the schema as much as possible before application, simulation is the best way to accomplish the objectives.
The objective of this chapter is to design a simulation capable of testing IASIS with an industrial arts instructional problem found in an urban community. The purposes of this simulation are: (1) to test IASIS for determining its reliability, validity, and objectivity when applied to realistic instructional problems in an urban society, and (2) to build conviction for its operation by increasing the reader's understanding.

By design, this chapter provides a brief review of previous information reported in the first five chapters. The purpose of this review is to enable the potential consumer of this simulation chapter to select one of three options which is dependent upon his prior knowledge of the study.

First, if the consumer has not studied the previous five chapters, he would review the entire simulation chapter. Second, if the consumer has reviewed the previous chapter, he would start on part IV, page 237, with A Summation of Assessment Evaluation. Third, if the consumer has reviewed the prior chapters, he may want to start with part V, page 255, The Application of Simulation to IASIS. It is imperative, however, that the previous five chapters be reviewed to completely understand the simulated total program evaluation schema as reported in this study.

The chapter will attempt to answer the following five questions:

1. How was IASIS conceptualized?
2. What factors were used to operationalize IASIS?
3. What important information is covered in a brief overview of IASIS?

4. What steps are involved in a summation of assessment evaluation?

5. How can simulation be applied to IASIS?

Part I - IASIS Conceptualized

The total program evaluation schema IASIS (Industrial Arts Systems Information Service) has been developed through the following steps:

1. A survey instrument was developed and pilot tested for the purpose of generating responses to 208 program evaluation statements. The top twenty responses from the selected sample constituted the premises used for developing the total program evaluation schema.

2. Premises were developed from the analysis of data from the survey instrument responses.

3. An overarching questioning process was developed to generate questions from the questioning matrix, Project Talent, and/or other general questions that may arise during application of evaluation.

4. The premises were used primarily to select a theoretical evaluation model. The model was to be used as the framework for guiding and directing the development of an operational evaluation model.

5. The development of IASIS to function within the rationale obtained from the theoretical evaluation model required the elements of systems theory and management decision process. Systems theory provided the logical structure through a Mission Profile (Figure 20) and Functional Analysis (Figure 21). These two figures identify numbering systems and levels of operation. The management decision process of planning, organizing, controlling, and communicating provides the overarching decision mechanisms which monitor the evaluation schema.
The above steps are covered in detail in the prior five chapters. Before giving a resume of IASIS' operation and simulation, it is necessary to define evaluation, its purposes, and how it is conceptualized.

1. Evaluation is defined as a process of delineating, obtaining, and providing useful information for judging alternative decisions. This includes the three areas of measurement, performance, and judgment.

2. The purpose of evaluation is to provide information for decision making about existing programs and about the researching, developing, trying-out, and implementing of new programs.

Conceptualization of the evaluation process is founded in the decision making requirements needed for informed judgments among alternatives. This concept comes from the scientific method which generates a logical and systematic theory for identifying the problem and providing the best solution to that problem.

Evaluation is a means of extending the ability and intelligence of the decision maker so he can make better choices among alternatives. In essence, the evaluation process is a service function for providing useful information to the decision maker.

School officials have asked what is the role of the evaluator in this process. The evaluator's role is to assist the decision maker by providing timely, relevant, reliable, and effective information. This may involve contacting various audiences to obtain objectives. The position of the
evaluator should be separate from overbearing influences of power groups, yet he should be able to efficiently function with all groups. The role of an evaluator will change according to the uses, purposes, and needs of information requirements as determined by his clients.

For IASIS, the evaluation role will involve accomplishing those tasks found in the four evaluation types, the four management decisions which are clearly identified later in the simulation, and the generalizable strategies used in developing evaluation designs. The array of duties required to accomplish these tasks appears complex which places heavy demands upon the evaluation unit. The range of the evaluator's duties could be from performing all the evaluation tasks to directing others who perform evaluation. The magnitude of the evaluator's role for IASIS involves the ability to maintain continuous contact with all decision makers involved.

Duties of an evaluation unit director are: (1) coordinating evaluation activities of all groups involved, (2) identifying and reducing restraints from all educational consumers, (3) disseminating the purposes and advantages of evaluation to all educational consumers, (4) directing the planning and delineating of evaluation methods and means to accomplish a given mission, (5) defining staff and resource requirements and planning for meeting these, (6) reviewing of all evaluation methods, means, and reports be-
fore they are used or released for distribution, (7) applying cost benefit analysis techniques to evaluation and programs, (8) arranging for external evaluation of the unit activities, (9) writing or approving the evaluation section of new proposals, and (10) supervising and coordinating the evaluation activities, training, research, and consulting performed by members of his staff (Owens, 1963, p. 8). Specific tasks are assigned to other evaluators in the evaluation unit.

Part II - Operationalizing IASIS

The operational evaluation model (See Figure 22) is designed to bring all components into a working whole for accomplishing the purposes of the evaluation schema of IASIS. The purpose of this evaluation system is to provide answers to questions which consumers of industrial arts products need if they are going to improve instructional programs. Systems theory concepts as depicted in the Mission Profile Diagram will help in understanding the part-whole relationship in IASIS.

The graphic symbols of the major evaluation events in the Mission Profile's flow block diagram (see Figure 22) must be identified. Rectangles (with protruding diamonds) are used to indicate decisions of planning, organizing, controlling, and communicating. The diamonds depict the four steps in making decisions, that is, awareness, design, choice, and action. The rectangles (with protruding loops)
FIGURE 22
THE SYSTEMS THEORY APPLIED TO THE MISSION PROFILE OF IASIS
A FLOW BLOCK DIAGRAM
are representative of the four types of evaluation. The loops depict the cyclic activity of generalizable strategies applicable to all four evaluation types which are used in developing evaluation design activities as shown in level 2, Figure 23. Numerals in the flow block diagram show sequence of events. Solid lines show forward flow while dotted lines show feedback (or modification). Levels in the Functional Analysis represent the subsystems of the systems and will be discussed later.

Figure 22, the Mission Profile of IASIS, has identified the major events in logical order by Arabic numeral 6.0. The Arabic numerals start with 6.0 which is representative of the sixth level as depicted in Figure 24 of the macro system. The macro system has six levels or subsystems in which total program evaluation is performed at the sixth level and designated by the numerals 6.0 in both Figures 22 and 23. Accordingly, all numerals in the evaluation system and subsystem start with two digits of 6.0 as a prefix to all other numerals.

Numerals 6.1 and 6.12 indicate the major events or milestones in the program evaluation schema or IASIS as illustrated in Figure 22. The reader also should understand the Partial Functional Analysis flow block diagram (see Figure 23) with its levels in relationship to the set of generalizable strategies of evaluation activities as found in Figure 25. There are sixty-one steps listed in numerical order of
Perform Total Program Eval. 6.0

Assessment Evaluation 6.1

Delineating Program Requirement Information 6.1.1

Obtaining of Information 6.1.2

Providing of Useful Information 6.1.3

Mgt. of Decision Information Systems 6.1.4

Evaluate System 6.1.5

Mission Obj. 6.1.1.1

Prob. Def. & Description 6.1.1.2

Decision Levels & Situations 6.1.1.3

Identify Questions 6.1.1.4

Prepare Behavioral Objs. 6.1.1.5

Specs. and Std. 6.1.1.6

Methods Means 6.1.1.7

Evaluate System 6.1.1.8

Questioning Matrix 6.1.1.4.1

Project Talent Questions 6.1.1.4.2

Other Questions 6.1.1.4.3

Evaluate System 6.1.1.4.4

Cognitive Domain Questions 6.1.1.4.1.1

Affective Domain Questions 6.1.1.4.1.2

Psychomotor Domain Questions 6.1.1.4.1.3

Evaluate System 6.1.1.4.1.4

FIGURE 23

A PARTIAL FUNCTIONAL ANALYSIS OF ASSESSMENT EVALUATION - A FLOW BLOCK DIAGRAM
THE INDUSTRIAL ARTS ORGANIZATIONAL SYSTEM, SYSTEMS

1. Societal Institution
   - Educational Knowledge
     - Descriptive
     - Prescriptive
     - Praxiological
     - Formal
   - Political
   - Familial
   - Religious
   - Economical

2. Industry Material Production

3. Industrial Arts Educational Intents

4. Specific Objectives of Industrial Arts
   - Select and Organize Instructional Experiences to Meet Objectives
   - Select and Organize Instructional Content to Meet Objectives

5. Industrial Arts Instructional Program in Operation
   - No Modification
     - Continue to Validate Objectives
   - Recycle to Meet Objective Change

6. Ind. Arts Total Program Evaluation Schema
   - Yes
     - Decision Loop
   - No
     - Terminate Prepare for future Activities

FIGURE 24
THE MACRO SYSTEM AND ITS SIX LEVELS OF OPERATION
the activities found in Figure 25. These are common to the four types of evaluation. (These are rectangles with a protruding loop found in Figure 22.)

The interrelationship between the sixty-one steps in Figure 25, the levels found in Figure 23, the Functional Analysis, and the logic of Arabic numerals of the systems theory found in Figure 25 is explained below.

The sixty-one steps are evaluation activities which are most generally performed in the order in which they occur. Besides each step in Figure 25 is another numeral of two to six digits that represents levels of two through five as found in Figure 23. For example, step one in Figure 25 is also located at level two in Figure 23 with a systems theory numeral of three digits such as 6.1.1. In this case it is called Delineating Program Requirements for Information. In step two, Figure 25, there is a four digit numeral (6.1.1.1.) in the systems theory which is located at level three in the Functional Analysis, Figure 23. In essence, digits with two numerals are found in level one three digit numerals in level two, etc. until level five has been reached which is six digits.

The generalizable steps for Assessment, Input, Process, and Output Evaluation are:

Steps
1  6.1.1. Delineating Program Requirements for Information
2  6.1.1.1. Mission objectives
Steps

3 6.1.1.2. Program definition and description
4 6.1.1.3. Decision levels and situation to be served
5 6.1.1.4. Identification of questions to collect data
   6.1.1.4.1. Questioning matrix
   6.1.1.4.1.1. Cognitive domain
   6.1.1.4.1.2. Affective domain
   6.1.1.4.1.3. Psychomotor domain
10 6.1.1.4.1.4. Evaluation
11 6.1.1.4.2. Project Talent questions
12 6.1.1.4.3. Decision makers questions
13 6.1.1.4.4. Evaluation
14 6.1.1.5. Preparation of program behavioral objectives
15 6.1.1.6. Identification of program specifications and standards
16 6.1.1.7. Identification of methods and means
17 6.1.1.8. Decision on whether to continue, modify, or terminate
18 6.1.1.9. Evaluation
19 6.1.2. Obtaining of Information: Descriptive-Behavioral
20 6.1.2.1. Collection of information
21 6.1.2.1.1. Items of information to be collected
22 6.1.2.1.2. Sources of information
23 6.1.2.1.3. Sampling methods and means
24 6.1.2.1.4. Methods and means of generating instruments
25 6.1.2.1.5. Development of master schedule for collecting data
26 6.1.2.1.6. Evaluation
27 6.1.2.2. Organization of information
28 6.1.2.2.1. Processing of data
29 6.1.2.2.2. Data control center—coding, organizing, storing, and retrieving information
30 6.1.2.2.3. Evaluation
31 6.1.2.3. Analysis of information
32 6.1.2.3.1. Methods and means strategies
33 6.1.2.3.2. Data interpretation
34 6.1.2.3.3. Evaluation
35 6.1.2.4. Report of information within evaluation system
<table>
<thead>
<tr>
<th>Steps</th>
<th>6.1.2.4.1. Identification of groups and individuals or audiences</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>6.1.2.4.2. Identification of methods and means strategies</td>
</tr>
<tr>
<td>37</td>
<td>6.1.2.4.3. Evaluation</td>
</tr>
<tr>
<td>38</td>
<td>6.1.2.5. Judge information decision alternatives</td>
</tr>
<tr>
<td>39</td>
<td>6.1.2.5.1. Awareness-re-identify information specifications and standards</td>
</tr>
<tr>
<td>40</td>
<td>6.1.2.5.2. Design-assign value weights to alternative methods and means used to generate information about programs</td>
</tr>
<tr>
<td>41</td>
<td>6.1.2.5.3. Choice-determine whether information is adequate to judge intents with outputs</td>
</tr>
<tr>
<td>42</td>
<td>6.1.2.5.4. Actions-determine if information is adequate to continue, inadequate but can be modified, or terminate and start again to generate new knowledge</td>
</tr>
<tr>
<td>43</td>
<td>6.1.2.5.5. Evaluation</td>
</tr>
<tr>
<td>44</td>
<td>6.1.2.6. Evaluation</td>
</tr>
<tr>
<td>45</td>
<td>6.1.3. Provide Useful Information</td>
</tr>
<tr>
<td>46</td>
<td>6.1.3.1. Re-identification of decision makers' questions</td>
</tr>
<tr>
<td>47</td>
<td>6.1.3.2. Order and highlight data into report to answer questions</td>
</tr>
<tr>
<td>48</td>
<td>6.1.3.3. Supply information that is timely and relevant to answer program objectives</td>
</tr>
<tr>
<td>49</td>
<td>6.1.3.4. Evaluation</td>
</tr>
<tr>
<td>50</td>
<td>6.1.4. Manage Decision Information Systems</td>
</tr>
<tr>
<td>51</td>
<td>6.1.4.1. Plan-selecting evaluation objectives, programs, procedures, and methods</td>
</tr>
<tr>
<td>52</td>
<td>6.1.4.2. Organize-helping coordinate people and resources into a system so that activities they perform lead to accomplishment of generating information</td>
</tr>
<tr>
<td>53</td>
<td>6.1.4.3. Control- assuring that the various sub-systems of the set of generalizable evaluation strategy design are performing according to plans</td>
</tr>
<tr>
<td>54</td>
<td>6.1.4.4. Communicate-transfering of control information among subsystems of the set of generalizable evaluation strategy design to assure a coordinated effort</td>
</tr>
</tbody>
</table>
Steps 56—61

6.1.4.5. Evaluation

6.1.5. Evaluate Systems

6.1.5.1. Evaluation of systems design according to the development criteria

6.1.5.2. Provision of systematic check and renewal of the systems which keeps it abreast of current evaluative thinking

6.1.5.3. Evaluation of system concepts and the management decision process to improve methods and means of operation

6.1.5.4. Evaluation

FIGURE 25

A SET OF GENERALIZABLE STRATEGIES FOR DESIGNING INDUSTRIAL ARTS EVALUATION ACTIVITIES WHICH ARE COMMON TO ALL FOUR TYPES OF EVALUATION

The following summarizes the numbering system and steps as related to the five levels found in Figure 23, the Partial Functional Analysis flow block diagram.

(6.0) Perform Total Program Evaluation. This is located at the sixth level in the macro system and is the top level Mission Profile of IASIS.

(6.1) Assessment Evaluation. This is considered the first level which would include all Arabic numerals from 6.1 through 6.12 in the Mission Profile. (See Figure 22, page 224)

Steps 1-61

(6.1.1. - 6.1.5.) The Generalizable Strategies for Developing Evaluation Designs. This is the second level of assessment evaluation which is common to the four types of evaluation. It is represented in the Mission Profile by a
loop.

Steps 2-18

(6.1.1.1. - 6.1.1.8.) Steps in Delineating Program Requirement Information. This system functions at the third level under assessment evaluation (6.1). Its purposes are to focus specifically on the program and to identify the parameters of the evaluation.

Steps 6-9

(6.1.1.4.1. - 6.1.1.4.4.) Steps in Identifying Questions for Collecting Data. This system is located at level four within assessment evaluation (6.1). Its purpose is especially important because it helps identify and clarify objectives for the decision makers; furthermore, it helps to identify what instruments are needed to obtain information.

Steps 10-13

(6.1.1.4.1.1. - 6.1.1.4.1.4.) Steps in the Questioning Matrix. This system is located at level five in the assessment evaluation (6.1). Its purpose is to identify fifty-five questions from each of three behavioral domains.

At each level in Figure 23 there is provision for feedback which is indicative of the cyclic process of a system. Not all of the generalizable strategies are given; the other items are located in Figure 25.

Each level represents an individual system which functions to provide information to the next higher level until either the descriptive or behavioral mission objective is
accomplished. The levels continue until an arbitrary set of demands is met for the system. Cook (1970) says "generally it is better to have five levels but this rule is not always held to."

Part III - A Brief Overview of IASIS

A step-by-step written explanation of IASIS's operation is given by the Arabic numerals which appear as paragraph headings or within the text of the paragraphs which refer correspondingly to portions of the model being explained. (The Mission Profile, see Figure 22.)

The Mission Profile of IASIS starts with fixing the total program evaluation schema within the macro system at its sixth level. The macro system provides the input to the evaluation program since it represents industrial arts organizational systems.

IASIS always starts with assessment evaluation (6.1) by applying sixty-one steps (see Figure 25) to determine the discrepancies between what is and what ought to be in the outcomes of the industrial arts program. These results will go to management decision planning (6.2) for purposes of determining whether output from the macro system should be continued, modified, or terminated.

If the decision is to continue, then this process of assessment evaluation (6.1) will be continuous and systematic to consistently provide information for determining discrepancies. If the decision is to modify the program then a
quick search for readily available information is pursued. If the decision is to terminate and change the program, then the next step in the sequence of events is input evaluation (6.3). Input evaluation (6.3) also goes through the same sixty-one steps as assessment evaluation to determine what knowledge, if any, is available for providing solutions to a problem identified in assessment (6.1) evaluation.

Eventually an innovation is selected for testing (9.4) what gives the greatest promise of success. A try-out (9.5) period is initiated to test and improve the selected program. The decision then is made (6.6) for the final (9.7) check on the particular strengths and weaknesses of the program. Once this is accomplished, the decision to diffuse (9.8) the total program or specific parts (9.10) is made. The diffusion system is assessed (6.12), and feedback is provided for modifying the communication decision (6.8) mechanisms. Eventually, the total program or specific parts of the program are (6.9) implemented into the macro system (9.11) as output from the research and development system. It is possible that not all these steps will be investigated in depth since some information may be available from other sources.

If there is a complete lack of information from which to solve the problem, then it is necessary to generate completely new knowledge for program development. This may require going through the Guba-Clark model of educational change; that is, research, development, diffusion, and
adoption stages. Primarily, the same procedures that were required to plan, develop, and diffuse those readily available solutions to a problem are used with the totally new program schema. These are explained below.

6.4 Management organizational decisions identify the how, what, and where of work that needs to be done and methods and means to accomplish the task in process evaluation (6.5). Process evaluation (6.5) uses the same sixty-one generalizable steps to monitor the program for providing information to the developer while the program is in the formative or flexible stages.

The next step is the management control decision (6.6) which makes the final judgment about the program before it goes to the final evaluation. The management control decision monitors, reports, and corrects discrepancies between performance and standards set for the new program before it goes to output evaluation (6.7). Output evaluation (6.7) determines the strengths and weaknesses of the new program as it is being applied to students, teachers, administrators, and the community. Output evaluation (6.7) is being performed continuously during the development stage again by using the sixty-one general evaluation steps. Output evaluation is where the pure experimental researcher can apply his expertise.

The management communication decision (6.8) is a means of providing a two-way flow of information between research
and development people and the consumer of industrial arts products. Its purpose is basically to diffuse, implement, and install new program information from the information, storage, and retrieval center (6.9).

Implementing only part or a whole new program (6.10) comes as a result of the management communication decision process (6.8). This process identifies the problem that needs solved through information developed which is output to the macro system (6.0). The management communication decision systems is assessed (6.12) which will provide the machinery necessary to systematically make improvements not only in the management communication decision process but the total IASIS system. The management communication process (6.8) can provide feedback information to all systems and subsystems. It explains if IASIS works, whether change is needed, and more important, how the innovation is functioning.

When assessment evaluation (6.1) is functioning in the macro system it has a direct feedback line to the assessment of the communication decision (6.12) mechanism. This assures that the information is meeting standard specifications and helping the assessment evaluator to determine whether the output from the research and development section is doing what it had stated it would do.

Now that an overview of the various parts of IASIS has been given, more detailed explanation is needed of the
generalizable strategies for developing evaluation designs as they apply to assessment evaluation. This explanation will illustrate what procedures and mechanisms are required in applying the common sixty-one steps for achieving the goals of assessment evaluation. It should be noted that assessment evaluation was chosen instead of the other three types of evaluation. The logic of this decision is that input, process, and output evaluation types do not function on a continuous and systematic basis as does assessment evaluation but on an ad hoc or contingency plan. The three types of evaluation are used when change is suggested from the management planning decision process. The other three types of evaluation will be described in more detail when simulation is applied to IASIS.

Part IV - The Summation of Assessment Evaluation

The purpose of this section is to explain the total steps in performing assessment evaluation by using generalizable strategies applicable to the four types of evaluation. The sixty-one steps (see Figure 25) will be used as a guide instead of the numbering logic. The transfer from the sixty-one steps to the logical numbering system is a simple matter of referring to a selected step numeral in Figure 25, then going across until the logic numeral is given. The procedure was utilized by Dr. Robert Hammond, Associate Director of Ohio State University, Center for Evaluation (1970). He used it to apply the Phi Delta Kappa evaluation schema to
the state educational needs assessment studies.

(6.0) Perform Total Program Evaluation. This is the objective of IASIS. Total program evaluation studies the total environment in which the macro system functions so that decision makers' questions can be answered. This requires studying all dimensions of the industrial arts instructional program which may directly or indirectly influence its performance. This process starts with assessment of the existing program.

(6.1) Assessment Evaluation. The underlying purpose here is to determine the discrepancy between desired intents of the industrial arts program and the actual outputs by generating baseline data. Baseline data is generated by the five generalizable strategies as outlined in Figure 25. Once the baseline data is generated and discrepancies identified, specific outcomes are determined. These outcomes, which the educational consumers at the local level have indicated as important, are changed into behavioral objectives. The process should be continuous and systematic to consistently provide information for determining discrepancies existing in the industrial arts program.

Step 1. Delineating Program Requirement Information

The process includes steps 2-18 in Figure 25 and is completely illustrated in Figure 23, A Partial Functional Analysis Flow Block Diagram. Its purpose is to focus on information requirements to be served by evaluation through
such steps as specifying, defining, and explicating.

Step 2. Mission Objective. The purpose of the mission objective is determined if the information to be collected falls under descriptive or behavioral requirements or both (see Figure 26). Different types of instrument procedures are required. For example, a descriptive item might identify laboratory facilities. A behavioral item might identify performance on a national industrial arts achievement test.

Step 3. Program Definition and Description. The purpose of these items is to spell out what type of program is operating with adequate descriptive information to properly illustrate its characteristics. An example of a program definition might be a traditional trade-oriented industrial arts program. A description would be that the teacher has ten years trade experience in machine shop.

Step 4. Identification of Decision Levels and Situations to be Served. It is noted that four management decision strategies are common to each system. These are planning, organizing, controlling, and communicating. These are also related to two levels, the local level such as students and teachers, and other levels such as state and federal. The interrelationship of these is illustrated in Figure 27.

Step 5. Identification of Questions. These are used by the evaluation team in helping the decision makers and others to
FIGURE 26

AN EXAMPLE OF AN OPERATIONAL MANAGEMENT CHART FOR IDENTIFYING AND COLLECTING DESCRIPTIVE AND BEHAVIORAL DATA
<table>
<thead>
<tr>
<th>Mgt. Decision Types</th>
<th>Local Level</th>
<th>Other Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Decision Situation</td>
<td>Decision Level</td>
</tr>
<tr>
<td></td>
<td>Operational Scheme</td>
<td>Student Administration Specialist Family School Board Teachers Community</td>
</tr>
<tr>
<td></td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
<tr>
<td>Organizing</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
<tr>
<td>Controlling</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
<tr>
<td>Communicating</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
</tbody>
</table>

**FIGURE 27**

RELATIONSHIP AMONG MANAGEMENT DECISION TYPES AND SITUATIONS AND LEVELS OF DECISIONS
consider broad areas of concern that possibly have not been examined previously.

Step 6. Questions from the Overarching Questioning Matrix. This is illustrated in Figure 17, page 169, which brings together the population dimension, the program dimension, and the behavior dimension to generate questions which can provide useful information for decision making. (Questions are identified in Appendix H. In Appendix E there is a coded breakdown of subelements of each item in the Matrix which is used for data storage and retrieval mechanisms.)

Step 7. Questions from Project Talent. These are 394 questions designed to identify the development and utilization of the talent found in high school students. A sample question may be "How active have you been in any one or more of the following organizations? Hobby clubs, such as photography, model building, hot rod, electronics, woodworking, crafts." These items are considered preferable to items requesting opinions, beliefs, and feelings since they exhibit greater stability and predictive value (Flannagan and Jung, 1970).

Step 8. The Other Questions Come from Decision Makers and Other Sources. These are specific questions based on needs, desires, and interest of decision makers. They also involve other questions that are generated as a result of operational
problems which require some means of solution. Solutions start by asking pertinent questions which help structure instruments for data collection. (See Appendix J.)

Step 9. Evaluate System Based on Usefulness of Questions. Are the questions valid, reliable, timely, and do they meet with decision makers' requirements? (Steps 6 through 10.)

Step 10. Cognitive Domain Questions. Fifty-five questions are written in this domain which relates to the questioning matrix. (See Appendix H.) An example of this type of question might be: Does the teacher comprehend the type of instructional methods in the industrial arts program which promote the learning of industrial concepts.

Step 11. Affective Domain Questions. Fifty-five questions are written in this domain which relates to the questioning matrix. (See Appendix H.) An example of this type of question is: Is the school board sensitive to the content being taught in the industrial arts instructional program?

Step 12. Psychomotor Domain Questions. Fifty-five questions are written in this domain which relates to the questioning matrix. (See Appendix H.) An example of this type question is: Can the administrator provide the needed resources for the industrial arts program?

Step 14. Prepare Behavioral Objectives. Behavioral objectives need to be identified from the industrial arts program so that measuring devices can be generated. These must be identified by the evaluator through consultation with the decision maker. The process defines the boundaries of what the evaluation system is being used for and why. The evaluator must be concerned with delineation of objectives because the decision maker may not understand the significance nor fully comprehend the importance of the objectives. Problems with objectives come to light when they are (1) not precisely stated, (2) thought to be objectives but in actuality are not, (3) subjected to conflicting value priorities, and (4) thought to be attainable but are not.

Examples of behavioral objectives are:

(1) Cognitive Domain. The student will be able to perform at the seventy-fifth percentile for national norms on a standardized achievement test. Measured by the standardized test.

(2) Affective Domain. A student will display a cooperative attitude with other students by helping them in moving large boards from the storage room. Measured by direct observation check list.

(3) Psychomotor Domain. The student will be able to do an orthographic drawing by using a drafting machine. Measured by an overlay.

Step 15. Specifications and Standards. These come under the general term of performance and are determined by limits and constraints. How well students meet standards according
to specific objectives results in a level of performance. The differences are identified as discrepancies between intents and outcomes.

Limits are restrictions within which performance must be obtained. They include time, money, and personnel which are set by the school decision makers.

Constraints are restriction specifications which are related to materials and facilities. They also are related to the ability of the personnel involved. These elements determine the ability of assessment evaluation to meet information requirements.

Step 16. Methods-Means. The purpose of this item is to determine the methods-means strategies, the advantages of each, and the disadvantages so that a final decision can be made.

Step 17. Decision on Whether to Continue, Modify, or Terminate. This affects the delineation process. Possibly after going through the first sixteen steps it was found that the information requirements were too broad, not specified, or not defined specifically enough for the evaluation process to continue to the next step. Possibly the wrong question was asked and was eventually discovered to be inadequate. For example, the question being posed by the decision maker required more cost for answering then the budget allowed within standards set. The result would be modification in the standards, asking another question, or
Step 18. Evaluative System. The purpose of this is to update and renew the procedure of the system. This is based on whether the system's mission objective is met.

Step 19. Obtaining Information. This process includes step 20 through 44. These are the evaluation activities which actually generate information to answer the questions posed by the decision makers.


Step 21. Items of Information to be Collected. These include scores on the standardized tests, observation check list of attitude, and results of drawing to 1/64th of an inch.

Step 22. Sources of Information: Students, Teachers, Administrators, Parents, and others.

Step 23. Sampling Methods and Means: Randomization, Item Sampling, and others.


Step 25. Development of Master Schedule for Collection of Data. Give the month, day, hours, etc. Have a planned se-
quence. An example of the operational management chart for collecting descriptive and behavioral data is found in Figure 26. A means of evaluating various instruments is illustrated in Figure 28. Identification of multiple criterion measures is depicted in Appendix J. An example of items for collecting descriptive data is found in Figure 29.

Step 26. Evaluation of Steps 20 through 25, a Subsystem.

Step 27. Organization of Information. Part-whole for different audiences.

Step 28. Processing of data.

Step 29. Data Control Center Coding, Organizing, Storing, and Retrieving Information and Information Sources.

A. Innovative Program and Practices Bank
B. Research Bank
C. Demographic Bank
D. Objectives Bank
E. Test and Test Item Bank
F. Information Resources Bank
   1. Instruction Objectives Exchange, University of the City of Los Angeles
   2. National Data Resources for Behavioral, Social, and Educational Research - American Institute of Research
   3. Research and Development Center
   4. Universities - Consultants
   5. Association and Professional Organizations
### Figure 28

**THE RELATIONSHIP AMONG DATA COLLECTION INSTRUMENTS AND THE TYPE OF STIMULUS INPUT AND RESPONSE OUTPUT BY THE PARTICIPANT (ADAPTED FROM A MODEL BY ROBERT BARGAR)**

<table>
<thead>
<tr>
<th>Stimulus: Input</th>
<th>Response: Output</th>
<th>Response Record</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Questionnaire</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>E. Interview</strong></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td><strong>C. Observation</strong></td>
<td>X X X X X</td>
<td>X X X</td>
</tr>
<tr>
<td><strong>D. Opinionnaire</strong></td>
<td>X X X X X</td>
<td>X X X X</td>
</tr>
<tr>
<td><strong>E. Conference</strong></td>
<td>X X</td>
<td>X X X</td>
</tr>
<tr>
<td><strong>F. Simulation</strong></td>
<td>X X X X</td>
<td>X X X</td>
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<tr>
<td><strong>G. Diary</strong></td>
<td></td>
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<tr>
<td><strong>H. Unobtrusive</strong></td>
<td>X X X</td>
<td>X</td>
</tr>
<tr>
<td><strong>I. Projective</strong></td>
<td>X X</td>
<td>X X X X</td>
</tr>
<tr>
<td><strong>J. Sociometry</strong></td>
<td>X X</td>
<td>X X</td>
</tr>
<tr>
<td><strong>K. Sensorimotor</strong></td>
<td>X X X X</td>
<td>X X X X X</td>
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<tr>
<td><strong>L. Q Sort</strong></td>
<td>X</td>
<td>X X X X</td>
</tr>
</tbody>
</table>

**A Partial List of Instruments Used in Obtaining Information**

<table>
<thead>
<tr>
<th></th>
<th>Visual</th>
<th>Aural</th>
<th>Taste</th>
<th>Smell</th>
<th>Tactual-Kinesthetic</th>
<th>Conceptual</th>
<th>Memory</th>
<th>Imagery</th>
<th>Emotional</th>
<th>Physiological</th>
<th>Verbal</th>
<th>Written</th>
<th>Other</th>
<th>Self Recording</th>
<th>Observer</th>
<th>Machine</th>
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<tbody>
<tr>
<td>A. Questionnaire</td>
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<tr>
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<td>L. Q Sort</td>
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</table>

**FIGURE 28**

**THE RELATIONSHIP AMONG DATA COLLECTION INSTRUMENTS AND THE TYPE OF STIMULUS INPUT AND RESPONSE OUTPUT BY THE PARTICIPANT (ADAPTED FROM A MODEL BY ROBERT BARGAR)**
Teacher Instrument Only

Please answer the following questions with a check under Yes or No according to your best knowledge of the situation. Be sure to mark a space for each number.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Is there sufficient illumination?</td>
</tr>
<tr>
<td>2.</td>
<td>Is there a boy's toilet adjacent to the facility?</td>
</tr>
<tr>
<td>3.</td>
<td>Are suitable lockers provided for students?</td>
</tr>
<tr>
<td>4.</td>
<td>Is there an efficient system for handling supply accounts?</td>
</tr>
<tr>
<td>5.</td>
<td>Do students assist in keeping the facilities clean and attractive?</td>
</tr>
<tr>
<td>6.</td>
<td>Are reference books provided in the facility?</td>
</tr>
<tr>
<td>7.</td>
<td>Do you have a part-time job?</td>
</tr>
<tr>
<td>8.</td>
<td>Have you taken any university courses or attended any professional inservice preparation for credit within the past two years?</td>
</tr>
<tr>
<td>9.</td>
<td>Do you participate in any professional organizations?</td>
</tr>
<tr>
<td>10.</td>
<td>Do you operate from a course of instruction?</td>
</tr>
<tr>
<td>11.</td>
<td>Are facilities available for developing instructional materials such as transparencies, etc.?</td>
</tr>
<tr>
<td>12.</td>
<td>Do you operate from a written statement of objectives which are stated in terms of anticipated student behaviors?</td>
</tr>
<tr>
<td>13.</td>
<td>Do girls have the opportunity to take your class?</td>
</tr>
<tr>
<td>14.</td>
<td>Do you have a budget for equipment and operation?</td>
</tr>
<tr>
<td>15.</td>
<td>Are class sizes and teaching loads maintained at levels that allow for feasible planning and teaching situations?</td>
</tr>
<tr>
<td>16.</td>
<td>Are you and the students exploited as &quot;fix it&quot; men?</td>
</tr>
<tr>
<td>17.</td>
<td>Are class schedules adequate for promoting good learning environment?</td>
</tr>
<tr>
<td>18.</td>
<td>Do you have a free period during the school day for instructional preparation?</td>
</tr>
<tr>
<td>19.</td>
<td>Are you going to continue to teach industrial arts?</td>
</tr>
</tbody>
</table>

FIGURE 29

EXAMPLE OF ITEMS USED FOR COLLECTING DESCRIPTIVE DATA
6. ERIC Centers

Step 30. Evaluation of Steps 27 through 29, a Subsystem.

Step 31. Analysis of Information.

Step 32. Methods and Means Strategies.

Step 33. Data Interpretation.

Step 34. Evaluation of Steps 31 through 33, a Subsystem.


Step 36. Identification of Audience to be Served within the Evaluation Systems.

Step 37. Identification of Methods and Means Strategies.

Step 38. Evaluation of Steps 35 through 37, a Subsystem.

Step 39. Judgment of Information Decision Alternatives. Decide on whether to continue, modify, or terminate the process of obtaining information. This is determined by the specifications and standards of the system. This process would require calling together the evaluation team by the director of evaluation to analyze and synthesize the information obtained. The decision situations are weighed in accordance to criterion measures set by the decision makers with the help of the director of evaluation.
Step 40. **Awareness.** Re-identify information specifications and standards.

Step 41. **Design.** Assign value weights to alternative methods and means used to generate information about programs.

Step 42. **Choice.** Determine whether information is adequate to judge intents with outputs.

Step 43. **Action.** Determine if information is adequate to continue, inadequate but can be modified, or terminate and start again to generate new knowledge. Note: These same four steps are used in each management decision process of planning, organizing, controlling, and communicating.

Step 44. **Evaluation of Steps 39 through 43, a Subsystem.**

Step 45. **Evaluation: Obtaining of Information.** (See 6.12)

Step 46. **Providing Useful Information.** The evaluation activity includes steps 46 through 50 which are designed to report information back to the decision makers through the assessment evaluation mechanisms.

Step 47. **Re-identification of Decision Makers' Questions.** This is a continuation of questions of both a descriptive and behavioral nature. It also includes those questions from the questioning matrix, Project Talent, and other ques-
tions from decision makers.

Step 48. Order and Highlight Data into Report to Answer Questions. The information will be editorialized for different audiences and designed primarily to answer questions.

Step 49. Supply Timely and Relevant Information to Answer Objectives. Other criteria for judging usefulness of information are:

A. Validity - does the information depict what it was meant to, and is it applicable to cases to which one wishes to generalize?

B. Reliability - can procedures for obtaining information be used equally well by different people to provide logically sound and rationally accurate information?

C. Objectivity - do various parties involved agree that strong preferences found in the information are made explicit?

D. Economy - is the information worth the cost to obtain it?

E. Pervasiveness - does the information reach all decision makers who have been designated as logical recipients or audiences?

Step 50. Evaluation of Steps 45 through 49, a Subsystem.

Step 51. Manage Decision Information Systems. The process includes steps 52 through 56. It is a vital function in the generalizable strategies of developing evaluation designs because it gives coordination of efforts to accomplish the major mission objective. The director of evaluation usually performs the task of getting things done by others. There-
fore, the entire evaluation activity is dependent upon the coordination of efforts by the director of evaluation. This includes four areas of concern which are common to all systems and subsystems of IASIS. These are planning, organizing, controlling, and communicating. Communicating is the means of providing information flow within the evaluation team to assist in integrating all components of IASIS toward answering the questions to gain useful information.

Step 52. **Plan.** Selects evaluation objectives, programs, procedures, and methods and means of achieving them.

Step 53. **Organize.** Helps coordinate people and resources into a workable system so that activities they perform lead to the accomplishment of generating useful information.

Step 54. **Control.** Assures that the various subsystems of the set of generalizable evaluation strategy designs are performing in accordance to plans.

Step 55. **Communicate.** Distributes and integrates information among the subsystems of the various components of the generalizable evaluation activities to assure a coordinated effort.

Step 56. **Evaluation of Steps 51 through 55, a Subsystem.**

Step 57. **Evaluate Systems Which Include Steps 1 through 56.**
Step 58. Evaluation of Systems Design. This is done according to the development criteria and the operational criteria of the purpose of the generalizable strategies as they relate to the four types of evaluation.

Step 59. Provision of Systematic Check and Renewal of the Systems. This keeps it abreast of current evaluative thinking.


Step 61. Evaluation of Steps 47 through 61, a Subsystem.

Once the sixty-one generalizable evaluation strategies are completed, the information is assembled into an evaluation report. This is presented to the various audiences for their review, and it is judged on its usefulness to answering the questions posed by the decision makers. The criteria for judging the usefulness of the information are validity, reliability, objectivity, pervasiveness, etc. The next step, after the report is reviewed by the various audiences, is holding a management planning decision conference between the decision maker and the evaluation team. Management Planning Decisions. The purpose of this process is to determine the unmet needs and unused opportunities of the industrial arts system. In essence, planning decisions
occur after assessment evaluation to determine short- and long-term mission objectives within certain specifications and standards. Planning decisions are continuous and systematic within the school setting to constantly improve any instructional programs within the limits and constraints placed on the program.

There also are three other management decision strategies: organizing, controlling, and communicating, which function on an ad hoc basis in the systems change mechanism. That is, if management planning decisions determine that there is a lack of information available to correct instructional programs or meet objectives, then an ad hoc change mechanism must be incorporated.

In this mechanism input evaluation is used, then the management organizational decision schema. The next item is process evaluation which is followed by management control decisions, and finally output evaluation followed by the management communication decisions. The change mechanism includes three types of evaluation and the three types of management decision schemas which are used to solve specific ad hoc problems related to various industrial arts instructional programs.

Part V - The Application of Simulation to IASIS

Let us turn to a realistic hypothetic application of IASIS to Upland City School District's Industrial Arts Program. (See Figure 30, page 256.) The industrial arts
Program Title: High School Industrial Arts at Upland City

The program is built around the traditional trade-oriented industrial arts instructional program of metalworking, woodworking, and drawing. Changes in content are made on the basis of knowledge gained from new textbooks, tools, machines, and remodeled laboratories. Generally the laboratories are well equipped to teach those traditional industrial arts subjects.

The industrial arts teachers in Upland City School District are characteristically like those teachers found in similar large city schools. They received their training in traditional industrial arts subjects at various state universities. About fifty per cent have advanced degrees and several years of industrial work experience. Most have extra jobs to supplement their income. The constructed project is used primarily as their way of teaching trade-oriented subject matter. Very little non-project instruction is given.

The students who usually select industrial arts in the Upland City secondary schools are generally below average in academic abilities. These students generally live within a three-mile radius from the center of Upland City and are socially and economically disadvantaged black and white boys.

FIGURE 30

A BRIEF EXAMPLE OF A PROGRAM DEFINITION AND DESCRIPTION
program at Upland City had shown steady growth but the students and parents became disturbed by its lack of relevance to modern industry. The parents complained that their children brought home tie racks, foot stools, and other projects that were brought home by their brothers before them. One parent had three tie racks of exactly the same design.

The students realized that the purpose of industrial arts was to help them gain skills. Yet they saw content and method which were not related to what their brothers said they were doing in modern industry. A side effect of the irrelevance of the industrial arts program was poor attitudes and low motivation in the shop classes. This was expressed by one student who said that tools were always missing, teachers found student conduct hard to control, and there was very little respect shown for the shop facilities and the teacher. This may be normal for a large city school, but the school officials became concerned with the situation because the school board also received complaints and it asked the administration just what was the problem in the industrial arts program.

The evaluation team in the school district was contacted by the administration to generate both descriptive and behavioral data about the industrial arts program. In this case, Upland City evaluation team performed an assessment evaluation by applying the sixty-one generalizable strategies (see Figure 25) for determining unmet needs and unused
opportunities of the industrial arts program. The same type activities previously performed in the explanation of assessment evaluation on pages 237 - 254 are applicable here. Several possible questions that could emerge from the decision makers are listed below:

1. What is the expressed belief that the parents have for the content taught in the industrial arts program?

2. What attitude do teachers exhibit toward the content found in the industrial arts program which would assure a desired attempt to devote adequate energies to instructional activities?

3. Are the specialists sensitive to the strengths and weaknesses of various organizational patterns used in the industrial arts program?

4. Does the student learn the type of content in the industrial arts program which is relevant to his needs, interests, and desires and which will enable him to be flexible and adaptable in a changing technological society?

The type of instrument required to collect such information to answer the above questions can be determined by studying Figure 26. A questionnaire may be developed and sent to parents, plus a random number may be interviewed by the evaluation team. The evaluation team also will refer to Figure 26 to identify management possibilities of collecting data.

The results of assessment evaluation produced a written report titled "The Upland City Industrial Arts Evaluation Report." The next step was for the school decision makers and evaluation team to have a conference to make management planning decisions (6.2).
6.2 Management Planning Decision. In the summer of 1965, an assessment evaluation of the industrial arts instructional program at Upland City found a large discrepancy between intents and outcomes. The evaluation team submitted a report to the school administration. A brief summary follows:

A. Organization of program was depicted as individual fragments of various skilled job shops rather than an orchestrated instructional system with all learning activities functioning toward a common goal.

B. Content was centered on materials, processes, and trade occupations rather than broad concepts of industry represented by construction and manufacturing.

C. Method of instruction was based on the project as an end rather than a means to an end. The teacher directed the entire learning process rather than letting students choose activities that interested them. The four step procedure of preparation, presentation, application, and evaluation was used instead of methods and means needed to develop a student's thinking capacities.

D. Facilities represented specific trade skilled areas. Program updating depended primarily upon new textbooks, new tools, new machines, and laboratory remodeling.

E. Funds for operation and improvement amounted to the particular biases of the industrial arts supervisor who was unsympathetic to innovation.

F. The purpose of industrial arts held by various groups such as administrators, teachers, state directors, and national leaders varied from training in the use of tools, materials, and processes for developing skills to teaching the understanding of the world of work.

G. Seventy per cent of the students received scores below the national mean on the newly developed industrial arts achievement test which emphasized understanding of industry rather than skill knowledge and development.
Each management decision process has four common steps which are: Step I, awareness, Step II, design, Step III, choice, and Step IV, action. These steps follow in regard to the simulation as it relates to Upland City.

Step I in the management planning decision process is Awareness. Identify industrial arts program's unmet needs and unused opportunities and rank needs and opportunities for possible solutions.

In June, 1965, the evaluation team submitted its report which identified specific problems to the Upland City administration. The administration, after reviewing the report, made short- and long-term commitments to generate and implement solutions to the high school industrial arts program by September, 1967. The administration requested the evaluation team to determine alternative solutions to the identified problems.

Step II in the management planning decision process is Design. Identify alternative solutions to the problems to be solved within the specifications and standards set. This determines the methods and means of generating solutions.

The evaluation team and the curriculum department programmed a series of conferences with the teachers, administrators, industrial arts supervisor, and three representatives from the industrial arts student body, a local industrialist, three parents, and a member of the school board. The purpose of these conferences was to identify possible
causes and solutions to the problems. Instruments were created to analyze and synthesize the causes generated from the group so that ranking of the conceptions could be given priority of treatment.

The problem declarations fell into the following five categories:

A. The teachers lack specific knowledge about modern industrial concepts.

B. There is a lack of communication about student needs, desires, and interest between parent-teacher, teacher-pupil, and teacher-industry.

C. Evaluation theory, instruments, and roles used in the laboratory are based entirely on skill and related knowledge of projects rather than concepts dealing with the understanding of industry.

D. The major image of the industrial arts program is one of a dumping ground for academic misfits, rather than a challenging learning activity.

E. Teachers are influenced greatly by vocational methodology which is basically the same methodology they learned in their university training. These methods and content are related to development of specific trade skills and not to the understanding of broad industrial concepts.

A report was submitted to the administrators and the following decisions were made:

A. The administration requested that the evaluation team assess alternative problem declarations from various value positions. These value positions will come from the students, teachers, principals, industrial arts supervisor, parents, school board, community, state, federal, and university groups.

B. Criteria used to assess the problem declarations were:

1. Internal validity - Is there evidence that the
problem declaration actually exists and is it related to the identified discrepancies?

2. External validity - Is the problem declaration universal or just related to Upland City and is the problem confined to one high school grade level or common to all four grades?

3. Objectivity - Is the problem declaration developed from the vested interest of the specific individuals or from the competencies of those who are able to identify specific problems?

4. Reliability - Does the same problem declaration result if other selected groups from the same population are brought together?

C. Acceptability of the problem declaration must meet the above criteria before it is accepted.

Step III in the management planning decision process is Choice. Determine worth of alternative problem declarations from different value positions and select the problems to be solved. We need to investigate which problem declarations are trusted, suspected, or rejected by various educational consumers.

The evaluation team developed an instrument designed to assess different value positions of educational consumers in Upland City. The participants were asked to rank the five problem declarations (p. 261 ) in relation to the unmet needs of the high school industrial arts program. The results of this ranking process identified the top three de-
clarations according to importance.

A. The teachers lack specific knowledge about modern industrial concepts.

B. The image of the industrial arts program is one of a dumping ground for academic misfits rather than a challenging learning activity.

C. Teachers are greatly influenced by vocational methodology which is basically the same methodology they learned in their university training.

It was felt by the administration, the curriculum department, and the industrial arts supervisor that problem declaration A should be selected for further research and development. The administration requested that the evaluation team assess whether information was available to correct the problem.

Step IV of the management planning decision process is Action. Determine whether to: (1) continue program as is which is the systematic process of evaluation; (2) recycle, a means of providing slight modification or change in operation such as change in scheduling, start an inservice training program, or other uses of readily available information; or (3) terminate program and prepare for future activities which are designed to search the environment for available information or create new information. In any case, planned change in the industrial arts program would be required.

As a result of information generated from the assessment
evaluation strategy and the action taken through the management planning decisions process, the decision was made to terminate the existing program. The report listed the following reasons for the decision:

A. The present program is completely antiquated by the on-rush of modern industrial technology.

B. Teachers, by and large, do not change teaching content and methods as a result of institutes, in-service training, programs, or other didactic means. It takes a complete new instructional package to aid teachers in changing content and methodology along with excellent year-round in-service training.

C. Teachers and local curriculum departments cannot adequately develop a completely new instructional program. This is because they lack funds, time, personnel to research, develop, test, and implement new comprehensive programs.

In accordance with the above, the school officials developed a set of objectives and decided to determine the methods and means to solve the problem declaration. The goal was to generate a change in the industrial arts program to reflect modern industry. Furthermore, it was to design methods and means of increasing knowledge and understanding in teachers, principals, supervisors, students, and other interested publics of the organization, content, method, facilities, and cost of a relevant industrial arts instructional program. It was hoped this would improve the students' achievement and the attitude of students, parents, community, school board, and school personnel toward the industrial arts program. The following specific instruc-
tional objectives were listed:

A. Eighty per cent of the industrial arts students will score at grade norms for the national industrial arts achievement test which draws its content from the concepts of understanding industry.

B. Seventy-five per cent of the students, parents, community, and school board will support the industrial arts program as indicated on an opinionnaire measuring instrument.

C. Teachers will score in the seventy-fifth percentile on an achievement test designed to measure understanding of industrial concepts.

The evaluation team was requested to proceed in generating solutions to the problem which in this case required an ad hoc evaluation mechanism. IASIS provides for this in its researching, developing, and testing change system as noted by the inclusive number of 6.3 through 6.7 in Figure 22.

6.3 Input Evaluation. The purpose is to determine what knowledge is available so that specific strategies can be applied to solving the selected program declaration. The various alternative strategies are investigated, and one is selected which shows the greatest promise of success within the specifications and standards. (It should be noted that the same set of generalizable evaluation design strategies as were used in assessment evaluation are also used for input evaluation.) Once input evaluation has been completed the management organizational decisions process begins.

6.4 Management Organizational Decision Process. This
structures the evaluation system by identifying the work that needs to be done and where it needs to be done to solve the problem declarations. It serves to provide those decisions on change strategies, personnel, and other necessary equipment and materials to accomplish mission objectives of input evaluation.

Step I in management organization decision process is **Awareness**. The evaluation team determines with the assistance of the decision makers the identification of relevant questions to be answered to meet the selected problem declaration objectives.

The evaluation team was requested to structure questions which could provide the methods and means to solve problem declarations.

The evaluation team identified specific questions about alternative strategies for meeting objectives in order that each strategy could be ranked and rated equally. This was in accordance with the decision situations and levels to be served.

A few examples of the questions are:

A. What specific values or criteria are paramount in selecting decision change strategies?

B. What school agency will be responsible for the selection or development of a strategy to meet objectives?

C. What decision process will be used in developing the program?
D. Where should the decision strategy be developed and tested; that is, in the local school district or in some other educational agency?

E. Upon what basis will the eventual innovation be tested and the solution be implemented into the local school industrial arts program?

**Step II of the management organizational decision process is Design.** Select the methods and means decision schema, set the specifications and standards, and devise alternative solution strategies.

Members of the curriculum department, the director of instruction, industrial arts supervisor, and the evaluation team were given the responsibility of generating alternative solutions to problem declarations. These included decision change strategies and the criteria for assessing alternative solutions and decision regulations. Their decisions were:

A. The selection of a decision change strategy depended upon the availability of useful information.

B. Alternative solutions were selected on the basis of providing the best possible means of meeting stated objectives.

C. Values and criteria for assessing alternative solutions for the objectives are:

1. Internal validity - meets the requirements of the stated objectives.

2. External validity - solutions are applicable to all high school grades and ability levels.

3. Scope - solutions be broad enough to adequately depict the conceptualizations of modern industry.

5. Pervasiveness - solution information must be made available to all educational consumers in the district.

6. Generally accepted - solutions must be generally accepted by the educational consumers in the school district and state department of education.

D. The decision regulation was that the eventual solution must adequately meet the above values and criteria.

Step III in the management organizational decision is Choice. Determine which alternative solution strategy is best to meet stated objectives.

To determine which alternative solution strategy was best, the evaluation team created instruments to sample various population groups such as teachers, administrators, supervisors of industrial arts, parents, university professors, and others found in the two levels (See Figure 17, page 169). The alternatives were ranked in the following order:

A. Build a completely new solution to the problem in cooperation with an outside agency such as an university. Use all steps in the change model.

B. Seek available information from research and development centers, regional laboratories, universities, and from other sources. This information fits into the change model at the proper place to adapt it in solving the problems.

C. Completely adopt an available program.

D. Initiate an in-service program to update industrial arts teachers' knowledge about modern industry.

E. With the help of a consultant, develop new programs within the industrial arts programs.
The decision making team selected A as the long-term goal for September, 1967, and D as an immediate stop-gap measure. The team suggested that in A a new program could be developed at a university and be field tested in Upland City in one or two schools of different ability and socio-economic levels and instructional situations. This would provide dissatisfied groups with positive evidence that long-term planned change was taking place.

The decision makers requested that the evaluation team, with the aid of the curriculum department, create questions for determining whether the selected planned change strategy identified was best for Upland City's situation.

Step IV in the management organizational decision process is Action. Determine and program methods and means strategies required to implement selected planned change strategy for meeting problem declaration objectives.

The evaluation team and the curriculum department identified and generated appropriate questions to program planned change strategy. The questions follow:

A. Since an industrial arts program designed to teach the concepts of modern industry does not exist, what educational agency can and will work with the local school district in developing the new program?

B. What specifications and standards will be applied, that is, limits and constraints?

C. What curriculum materials and evaluation techniques will be used and what industrial arts personnel will be working with the selected outside agency to generate and test new programs?
D. How can the planned change operation be organized?

1. Will all teachers be subjected to short-term in-service training or only those who are willing to change?

2. At what ability levels and what socio-economic groupings will the field testing of the new program be incorporated?

3. How will specific teachers be selected to attend a summer workshop and be involved in continuous in-service training for teaching the new program?

4. What amount of time will be required to adequately implement and teach the new program?

5. Will the new program require a team teaching approach?

6. What amount of time will the short- and long-term change plans require?

7. Upon what basis are objectives to be evaluated as they pertain to the above organizational questions. (Also questions from Appendix H.)

   a. What levels in the cognitive domain (Bloom's taxonomy) and what methods and means strategies and instruments will be needed? (See Figure 25.)

   b. What levels in the affective domain (Krathwohl's taxonomy) and what methods and means strategies and instruments will be needed?

   c. What levels in the psychomotor domain (Simpson's taxonomy) and what methods and means strategies and instruments will be needed?

E. What content is to be covered in the program?

1. How will the content be created anew from lacking available knowledge?

2. What will be the relationship between the outside developmental agency and individuals and groups from the local district in developing
new content?

3. Who will be responsible for identifying, selecting, and developing textbook content as well as related laboratory experiences?

4. Upon what criteria will textbook content and related laboratory experiences be evaluated? What specific objectives will be required of each lesson topic to describe adequately the procedures and instruments for evaluating content?

5. Specific questions in all three domains are found in Appendix H. Questions which are relevant to content from Project Talent and decision maker questions also need to be identified.

F. What instructional methods will be used in the classroom and the laboratory?

1. What type of external reinforcement will be used?

2. What will be the different ways used to activate students and sequence content?

3. What will be the mode of presenting instruction?

4. What ways will be used to structure the body of knowledge so that it can be most readily grasped by the learner?

5. What theories of learning will be used?

6. What is the interaction of teacher to student, student to student, and teacher to other teacher?

7. What methods and means will be used to evaluate the objectives coming from the above questions?

8. What levels of performance from the cognitive, affective, and the psychomotor domains must be considered (from Bloom, Krathwohl, and Simpson respectively) and what mechanisms and instruments will be needed? (See Appendix J and Figure 28.)
G. What types of facilities will be required for the new program?

1. What laboratory structural changes will be needed to properly implement the new program?

2. What change in equipment requirements will be needed to properly implement the new program?

3. Can the new program be taught with the usual tools found in a high school laboratory?

4. What expendable materials will be required to teach the new program?

5. What type of evaluation mechanism will be required to adequately determine if objectives relating to facilities are being met in the cognitive, affective, and psychomotor domains as based on prescribed levels of performance?

H. Cost-benefit of the new program?

1. What is the cost of the new program per pupil in relation to existing program cost?

2. Will the cost of facilities, that is, equipment, tools, and materials, place an undue restriction in implementing the new program into the local school districts?

3. Who will determine where and how much the content and methods will be cut to save on cost expenditures?

4. What are the reactions from various population groups concerning the cost of the new program? (See Appendix H.)

5. What evaluative methods and means will be used to adequately determine whether cost benefit objectives are being met successfully?

After an array of questions was identified by the evaluative team, the administration identified three universities which could provide the expertise required to adequately perform the selected planned change strategies.
This expertise would be based on the ability of the university to: (1) seek financial help from public and private agencies, (2) provide intellectual skills and abilities to generate the planned change strategy, (3) foster and build the type of philosophical convictions that a new program direction should take in industrial arts, and (4) provide the personnel and leadership potential to research, develop, test, implement, and systematically evaluate the process of creating and revising new program materials.

The evaluation team generated the necessary information by using the above criterion measures and then ranked the three universities according to the decision makers' request. State University was selected as the outside agency to provide the expertise.

A meeting was held between the personnel of Upland City School District and the personnel from the industrial arts department from State University. The purpose of the meeting was to outline procedures for writing a proposal for obtaining funds required to provide the expertise for initiating a planned change process. The proposal was written and funded for a period of three years with renewals if progress was worthy. It was to generate a completely new high school industrial arts instructional program. A PERT network was established, and the planned change process was initiated. Each step in the planned change process is based on the PERT network.
Planned Change Process

Step I. Research. Literature was reviewed by examining and analyzing current innovative programs, analyzing scholarly research and information from representatives of industry, labor, management, education, and many other disciplines. The review had to meet the time limits of the PERT network.

Step II. Invention. Information from research was used and a solution was formulated to meet the objectives of the change strategy and problem declaration by the stated time in the PERT network.

Step III. Design. The plan for constructing the innovative program was evaluated. It was based on feasibility and tractability according to PERT time specifications.

Step IV. Construction. Having designed the software and hardware, they were built and evaluated according to specifications of time and performance within the PERT time network.

Step V. Assembly. The various components from individual instructional software and hardware developers were integrated into a complete package to produce a coordinated operating industrial arts program. It was evaluated according to design specifications and efficiency. This was completed according to PERT time charts.

Step VI. Disseminating. School districts were informed about
the invention and evaluation responses.

Step VII. Demonstrating. With various audiences, conviction for instructional materials was built by initiating, examining, and critiqueing.

Step VIII. Training. Teachers were selected and a summer in-service workshop conducted. Responses to materials and teachers' performances with the materials were evaluated. Staff was selected and field evaluation machinery set up.

Step IX. Trial. Prototype test to remove major operating bugs. This was field tested by incorporating the new program which was to be initiated by September, 1967 in three school districts including Upland City. Evaluation was made on whether stated objectives were met as to quality and utility.

Step X. Installation. Identification and development of university teacher training center to prepare teachers to teach the new program was done. Evaluation of output of development process on specified criteria was made.

Step XI. Institutionalization. With an open sequence feedback mechanism, objectives of problem declaration met with the new program. Information from development was stored in the information storage and retrieval center at State University. The open sequence feedback mechanism allowed for the
revision of the program as it was assessed in the industrial arts macro system.

The change process is based upon "A Classification Schema of Processes Related to and Necessary for Change" by Clark and Guba (1965). (See Figure 31.) It must be also noted that the terms used in the IASIS' change process do not exactly correspond to the terms used in the total program evaluation schema.

6.5 Process Evaluation. It is designed to provide information to improve the program in the planned change process from steps four through nine while the development is still flexible. Useful information must be continuously and systematically fed back from these steps to make modifications according to specifications and standards.

6.6 Management Control Decisions. This is to check on the process evaluation by directing, monitoring, reporting, and correcting discrepancies between intents of the program being tested and its performance standards.

   Step I in the management controlling decision process is Awareness. Direct and monitor the process evaluation strategy and select possible solutions for removing roadblocks in the path of meeting stated objectives. In this case, the roadblock was that the reading level of instructional materials was too high for most students.

   Step II in the management controlling decision process is Design. Determine what specific problems are involved
### Figure 31

A Chart to Illustrate the Role of Evaluation in the Planned Change Process

<table>
<thead>
<tr>
<th>AGENCY</th>
<th>OBJECTIVE</th>
<th>PROCESS</th>
<th>CRITERIA</th>
<th>RELATION TO CHANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research and Development Institutions, Regional Laboratories, and Industries</td>
<td>To advance knowledge, i.e., to depict, correlate, conceptualize, and test.</td>
<td>Research</td>
<td>Validity (internal and external).</td>
<td>Provides basis for invention.</td>
</tr>
<tr>
<td>To formulate a new solution to an operating problem or to a class of operating problems, i.e., to innovate.</td>
<td>Invention</td>
<td>Face validity appropriateness; estimated viability; impact (relative contribution).</td>
<td>Produces the invention</td>
<td></td>
</tr>
<tr>
<td>To draft a plan for constructing the invention, i.e., to construct the blueprint.</td>
<td>Design</td>
<td>Feasibility (production and utilization); tractability (ease of managing, controlling, and instructing in the use of).</td>
<td>Engineers the invention to fit the characteristics of the terminal situation.</td>
<td></td>
</tr>
<tr>
<td>To build the components, i.e., to construct.</td>
<td>Construction</td>
<td>Design specifications; individual performance.</td>
<td>Produces the components necessary for implementing the design.</td>
<td></td>
</tr>
<tr>
<td>To integrate the components into an operating system, i.e., to finalize for marketing.</td>
<td>Assembly</td>
<td>Design specifications; total performance, viability; efficiency.</td>
<td>Produces the coordinated operating system.</td>
<td></td>
</tr>
<tr>
<td>Government, Universities, and Regional Laboratories.</td>
<td>To create widespread awareness of the invention among practitioners, i.e., to inform.</td>
<td>Dissemination</td>
<td>Intelligibility; fidelity; pervasiveness; impact (extent to which it affects key targets).</td>
<td>informs about the invention.</td>
</tr>
<tr>
<td>To afford an opportunity to examine and assess operating qualities of the invention, i.e., to build conviction.</td>
<td>Demonstration</td>
<td>Credibility; convenience; evidential assessment.</td>
<td>Builds conviction about the invention.</td>
<td></td>
</tr>
<tr>
<td>To train local personnel to manage, operate, service, and utilize the invention, i.e., to staff.</td>
<td>Training</td>
<td>Quantity, continuity, aptitude, motivation, and proficiency of trained personnel.</td>
<td>Establishes and maintains viability for operating the innovation.</td>
<td></td>
</tr>
<tr>
<td>To build familiarity with the invention and provide a basis for assessing the quality, value, fit, and utility of the invention in a particular institution, i.e., to test.</td>
<td>Trial</td>
<td>Adaptability; feasibility; action.</td>
<td>Trials out the invention in the context of a particular situation.</td>
<td></td>
</tr>
<tr>
<td>To fit the characteristics of the invention to the characteristics of the adopting institution, i.e., to operationalize.</td>
<td>Installation</td>
<td>Effectiveness; efficiency.</td>
<td>Operationalizes the invention for use in a specific institution.</td>
<td></td>
</tr>
<tr>
<td>To assimilate the invention as an integral and accepted component of the system, i.e., to establish.</td>
<td>Institutionalization</td>
<td>Continuity; validation; support.</td>
<td>Establishes the invention as a part of an ongoing program; converts it to a &quot;noninnovation.&quot;</td>
<td></td>
</tr>
</tbody>
</table>

*From Phi Delta Kappa Evaluation Monogram—Based on Clark & Guba Change Model*
with the reading difficulty and design a procedure for reducing or alleviating the problem.

A meeting was called by the Upland City administration, curriculum department, industrial arts supervisor, evaluation team, and the university project staff to determine what was causing the reading problem. The following alternatives were suggested for next semester:

A. Provide more illustrations in the written materials.

B. Set up a three-day workshop between the development staff and the teachers in the field trial centers for identifying problems and solutions.

C. Hire reading specialists to edit manuscript.

Step III in the management controlling decision process is Choice. Assess the alternative changes and determine whether to incorporate.

The evaluation team at State University and Upland City initiated an evaluation study of their respective areas of concern and selected alternative A and B as the most likely solutions to the problem.

Step IV in the management controlling decision process is Action. Alter the evaluation plan and initiate program change.

The writers and the field staff met for three days and decided to reduce the reading level of the materials from grade level 10.5 to 9. This required revision of process evaluation and increased the time to write and revise the
materials. The cost to complete this task was estimated at $20,000.

6.7 Output Evaluation. Its purpose is to evaluate the new program at the end of the development period. It also is used as an evaluative check on the program during its development stages.

6.8 Management Communication Decision. Its purpose is to relate information between the planned change development staff and the local school district's personnel.

**Step I of the management communication decision process is Awareness.** Determine the discrepancies between the intents and the outputs from the research development and testing change system. Also determine the problems in diffusing and implementing the program output into the local school district. It monitors the linking of change with the local school district.

A meeting was held with the administration and evaluation team from Upland City, and the field evaluation directors from the other five test centers along with the total development staff from State University. The meeting was held to promote ways for acceptance of the new program by those teachers who were not directly involved in its development and field testing. This acceptance problem became more apparent when Upland City school system decided to implement the new program in all its senior high schools in 1970. It must be noted that Upland City had planned to con-
duct an in-service training program to instruct their industrial arts teachers about the rationale and content of the innovative instructional program; however, it was dropped primarily because of resistance to change by the industrial arts teachers.

The group requested that the evaluation team of Upland City work with the project evaluation staff at State University to develop a survey instrument. The instrument was designed to measure the affective behavior of the industrial arts teachers from Upland City.

The following results from this instrument are ranked in order of prominence:

A. Teachers do not have the time after school to spend learning the new program nor should they be required to do so without some compensation.

B. The teachers who helped develop and field test the new program received incentive pay. Others will not.

C. There is too much classroom activity and not enough laboratory work.

D. The individual take-home skill development project is still better than teaching concepts through group activities.

Step II in the management communication decision process is Design. Identify and determine the possible causes of the problem and build alternative solutions.

A three-day meeting was called with the administration and evaluation team from Upland City, the five field evaluation directors, and the development staff at State University.
The group selected alternative A as the problem to work on as a means to reduce resistance to the new program.

The other five evaluation centers were included because they anticipated that the next year they might have similar problems. The State University staff was concerned because they were ready to begin wide-spread implementation of the first part of the total program the next year into all regions of the country. This could be accomplished since the first part of the two-part program had completed its development according to the developmental proposal and would be ready for dissemination by a commercial publisher.

State University's program developmental staff invited various experts to speak to the group about changes, in-service education, and communication. Small discussion groups were formed to brainstorm for ideas in solving the problem. The list from each discussion group was then synthesized into the following:

A. Release teachers during the school day to attend in-service training programs taught by those Upland City teachers who were involved in developing and field testing the new program in the school district.

B. Pay teachers a stipend to attend a summer workshop and also for Saturday in-service training programs during the year.

C. Provide released time and compensation for those teachers who have taught the new program to conduct in-service teacher preparation.

D. Have the regional State University offer graduate credit for evening and summer workshops.
Step III in the management communication decision process is Choice. Determine which alternative solution appears best to solve problems.

The Upland City administration and evaluation team selected A and C as their solution. A few reasons for these decisions follow:

1. It was felt by the Upland City administration that if the teachers who are presently working with the new program taught their colleagues that less friction and distrust would result from the in-service training.

2. Those industrial arts teachers in the Upland City school district who originally started to teach the new program possibly had the same apprehension as their colleagues are presently having; therefore, these teachers could have more empathy for underlying causes of resistance to change.

3. Outsiders who are pushing innovation are more suspect and distrusted than insiders.

4. Release time during the day would mean that all teachers would meet for the in-service training. If the training periods were held on their free time, they would not feel obligated to attend even if compensated.

5. The criteria for evaluation of the in-service training program are
   a. Change in attitude as determined by observation check list.
   b. Get fifteen of twenty questions right on an achievement test covering program content.

Extra pay would be given for any time required beyond the normal day. Provision would be made to employ substitute teachers during the time the teachers were released
from their classes. A summer workshop would be conducted for all the school district and taught by the local staff in cooperation with a professor from State University before district-wide adoption. This was accomplished.

Step IV in the management communication decision process is Action. Initiate change as prescribed by choice selected above.

The evaluation team, through the assessment evaluation mechanism monitored the in-service training program and the teachers' reactions. Videotape and other feedback media were used to improve teacher awareness of his improvement.

6.9 Information Storage and Retrieval Center.
6.10 Implementation of Total or Part of the Program.
6.11 Output to Macro System.
6.12 Assessment of Communication Decisions.

As a result of the above steps the students, parents, community, and school board became enthusiastic about the new industrial arts program in Upland City. What is even more rewarding is that the Upland City school system helped in initiating a major change in the nation's industrial arts programs.

Summary

It was determined that the application of IASIS to an actual instructional program in a school system would require more resources than are available within the limitations of this investigation. Therefore, it was decided that
the best means of testing the applicability of IASIS was through simulation.

Simulation portrays a hypothetical circumstance which supposedly is representative of a real-life situation. It aids in testing newly developed models before they are actually applied for the purpose of checking the model's capability to perform its stated objectives. This technique has been previously utilized with success by Dr. Robert Hammond, Associate Director of The Ohio State University Center for Evaluation (Hammond, 1970).

The emphasis of the simulation is to provide a means of generating understanding about IASIS. To accomplish this task, the chapter is divided into five parts.

The first part, IASIS Conceptualized, defines the procedures in developing IASIS. It also identified its rationale as a means of providing useful information for decision making.

The second part, Operationalizing IASIS, explains how a systems theory concept functions with evaluation rationale. This was accomplished by illustrating how a systems numbering logic can be used to structure and integrate the parts of the evaluation schema into a workable whole. A set of sixty-one generalizable steps common to the four types of evaluation was explained in relationship to the logic of the numerals and levels used with systems concepts.

The next item, A Brief Overview of IASIS, provided a
step-by-step explanation of the major events as found in the Mission Profile. This gave a gestalt of IASIS operational workings from assessment evaluation (6.1). In essence, each major event or milestone in the Mission Profile diagram was given an explanation in regards to its function to deal with various types of information requirements needed to solve instructional program problems.

The purpose of the fourth section, A Summation of Assessment Evaluation, is to explain the steps in performing a total assessment evaluation. Included in this process are sixty-one generalizable strategies used in designing evaluation activities for meeting information requirements that come from questions posed by decision makers. Assessment evaluation was chosen since it is always performed first in IASIS to determine unmet needs and unused opportunities for improving industrial arts education.

The fifth section, The Application of Simulation to IASIS, has the purpose of applying the evaluation schema to realistic industrial arts instructional problems at Upland City and illustrating how IASIS can function to solve these problems. The simulation entered IASIS at management planning decisions where the decision was to terminate the present program and initiate a planned change mechanism. This forced the situation to run through the ad hoc section of IASIS to research, develop, test, and implement a new industrial arts program into Upland City high schools. In
essence, this fifth section realistically has shown how IASIS can function in solving problems in the industrial arts instructional program.
CHAPTER VII

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

The purpose of the summary section of this chapter is to briefly identify what has been done in the study and provide a succinct review of the findings. Next is a restatement of the objectives of the study as they are found in Chapter I, with conclusions drawn as to whether they have been adequately met. Implications will be derived from the conclusions which, if properly implemented, should provide for the advancement of the industrial arts profession through an increased awareness of its program strengths and weaknesses. This will allow for the consumer of industrial arts products to make informed decisions and keep attuned to our advancing society.

SUMMARY

Restatement of the Problem

The study of industrial arts has been included as a vital part of the total school program. However, the necessity of the inclusion is consistently being challenged by educationalists as well as the general public on grounds of obsolescence, irrelevance, and accountability.

As a consequence, the educational consumer of industrial arts programs finds himself desperately seeking useful infor-
mation on instructional programs to maintain, revise, or completely terminate his current program. Accordingly, if industrial arts is to remain a vital part of the total school program, the consumer must have useful information to make informed decisions on which direction to follow.

The problem of major concern to this study is how to gain useful information about the effectiveness of industrial arts curricula and other instructional items so that the educational consumer can make informed decisions.

Presently there is a complete lack of applicable total program evaluation roles, procedures, and mechanisms for industrial arts education which can provide information for decision making. A total program evaluation schema delineates, obtains, and provides useful information to decision makers about an instructional program and its interlocking factors prior, during, and after program development is complete.

Review of Literature

A review of the past and present concerns and future hopes of industrial arts curricula development has depicted industrial arts instructional programs as diverse, fragmented, and confused. Generally, there exists a large gap between what educators think industrial arts ought to be teaching in the public schools and what is actually being taught about the content and methods of industry. This gap has stirred complaints of irrelevance and the lack
of accountability. Recent curriculum reforms have helped close this gap but still greater efforts are needed to implement these innovations. Furthermore, even with recent curriculum reforms the evaluation procedures have not been adequately conceptualized to provide totally useful information. Agreed, the consumer of industrial arts products can find descriptive information about most programs. However, there is very limited behavioral accounting of the programs as to how it works with different types of students under various learning situations.

According to a national survey, it follows that most curriculum innovators in industrial arts have done very little to evaluate their program, nor have they adequately stated objectives which can be evaluated. Prior evidence was given in the ACIATE yearbook that there is a lack of behaviorally stated objectives and methods and means of properly measuring them.

The present problems found in evaluation are common to industrial arts as well as to all of education. There are many studies that deal with program evaluation but only in a narrow and limited way. These studies are not conceived as a means of obtaining useful information from the total environment but only from the introspective confines of the local school. This limited aspect of evaluation fails to consider external factors of parents, community, state, and federal agencies, etc. which should be considered if ade-
quate descriptive and behavioral information is to be generated about a program.

The generalists in evaluation indicate that evaluation lacks instruments, procedures, trained personnel, and a clear conceptual framework. Hence, the theoretical base is considered the greatest single item needed if evaluation is to advance to meet society's demands for better education.

One authority in evaluation indicates that the solution to evaluation's problems can be obtained by developing a battery of standard operating procedures. This, he said, requires the development of criteria; criteria depends upon a rationale, and a rationale depends upon a theory. Presently no adequate industrial arts evaluation theory is available which can provide the means of guiding and directing a set of generalizable evaluation design strategies.

To gain this end, total program evaluation statements were generated from the review of selected literature. The assumption was that through a rating process of the evaluation statements by generalists in educational evaluation and industrial arts college researchers, the premises could be formulated. These premises would be used to construct a theoretical evaluation model from which an operational evaluation model would be developed.
Design of the Study

The purpose of the design chapter (Chapter III) was to plan, organize, control, and communicate the methods and means of meeting the mission objectives of the study. These objectives were to be met by using (1) systems theory, (2) management concepts, and (3) an evaluation rationale. The systems theory was used to logically structure the individual parts of the study into a workable whole. The management concepts of planning, organizing, controlling, and communicating were applied through the CPM network activities found in Figure 1, Chapter I, for defining the rationale and procedures for each major step of accomplishing the objectives of the study.

The systems concepts of Functional Analysis and Profile Analysis were used to place evaluation at the sixth level in the industrial arts organizational system systems or in this study called the "macro system." Even though the total program evaluation schema functions at the sixth level in the "macro system," it can influence all other levels through a feedback cycle.

The design chapter also outlined the procedures in developing the survey instrument for generating premises. The following steps were used:

1. Preliminary writing of program evaluation statements from the review of related literature in the area of evaluation.
2. Revision of statements, preparation of instrument and instructions, and a design data collection sheet.

3. Preliminary review by two evaluation specialists.

4. Revision of program evaluation statements and lead-in phrase to all statements, restructure of instrument description and instructions, and preparation of cover letter.

5. Editing of all materials by a third reviewer.

6. Final reading for clarity and substantive value of evaluation statements by reviewer number four, an evaluation specialist.

7. Final revision of evaluation statements, instrument, and re-designing of rating sheet to fit a Likert procedure.

Accordingly, the parts of the instrument included: cover letter, description and instructions, 208 program evaluation statements, and a Likert style rating sheet (see Appendices A, B, C, and D).

The instrument was sent to selected generalists in educational evaluation and industrial arts college researchers. The design of the instrument violated several known tenets such as length, clustering of statements, and repetition of statements of similar meaning. However, it was decided to utilize the instrument with these facts known because it was felt that the sample should have the opportunity to respond to the entire 208 statements in random order rather than only a selected few in a categorical arrangement. This procedure also reduced any biases that could have been introduced by the researcher. Thirty-one percent of the ques-
The methodology for analyzing and interpreting the data from the survey instrument was through item analysis. This was accomplished by transferring data from the Likert-type rating sheets to IBM answer sheets which then were scanned and information punched onto computer cards and run through the 360 computer. The data was organized into group 1, the generalists, group 2, the industrial arts college professors, and group 3, the combined groups of 1 and 2.

A means of evaluating all industrial arts programs on an equal basis regardless of their specific objectives is through an overarching questioning process. If enough questions are generated from different areas of concern then when they are answered any program can be given a percentage rating between 0-100 depending upon how well the questions were answered.

The overarching questioning process included three areas of concern with the first receiving the greatest emphasis. They were (1) the questions from the questioning matrix, (2) the questions from Project Talent, and (3) decision makers' questions or other questions.

The development of the total program evaluation model involved three stages: (1) generating questions from the questioning matrix, (2) using premises for developing a theoretical evaluation model, and (3) developing the evaluation operational model from the theoretical model. The
total program evaluation schema provided both a systematic flow of information through the "macro system" plus provisions for an ad hoc or planned change mechanism. This took on the general nature of an informational decision system which served the "macro system" and provided information to that part of the "macro system" at the correct time so that informed decisions could be made.

Simulation was adopted as a means of testing the total program evaluation schema. Simulation provided an adequate means of testing the total program evaluation schema before it was actually implemented. This process consisted of (1) operationally analyzing the evaluation schema, (2) testing the logic of the evaluation schema, and (3) determining whether it was readily understood by experts in the field of evaluation, systems theory, and industrial arts research.

The Analysis of Data

The main purpose of this chapter (Chapter IV) was to determine the top twenty evaluation statements receiving the most points from the responses of the survey instrument. The top twenty statements are in essence the premises used in developing the theoretical evaluation model. The responses from the instrument were considered adequate for the study.

Other information from the analysis of responses which were not a part of the study revealed that: (1) there is a marked difference between the top and lowest twenty statements selected by both groups, (2) the top and lowest twenty
statements for groups one and two were not the same except for nine statements on which both agreed.

Even though it was not a part of the study, a statistical comparison was made between the generalists in educational evaluation and the industrial arts professors on the top twenty program evaluation statements each selected. A difference was found between each group at the .05 level of significance. No judgment was made to determine which group was correct or incorrect in their selection of evaluation statements.

Development of The Total Program Evaluation Schema IASIS

This chapter's function was to synthesize all previous information into developing the theoretical and operational models which are referred to as IASIS or Industrial Arts Systems Information Service. The definition of this concept was spelled out as the total program evaluation schema as it relates to evaluation in industrial arts education.

The three elements of systems theory, management concepts, and evaluation rationale were combined into developing and operationalizing IASIS. The first major item considered in the chapter was the overarching questioning process. The questioning matrix was given major emphasis because it provided the best structure for generating a set of questions which systematically covered both the descriptive and behavioral aspects of evaluation at local and other levels.
By combining the three dimensions of the matrix, that is, the population dimension, the program dimension, and the behavioral dimension, one can develop an overarching question or a factor to be considered when evaluating instructional programs. These questions are changed to specific behavioral objectives and provide a means of designing instruments to answer questions. In this way the discrepancies between the objectives and the outputs can be determined. One hundred sixty-five questions were written. They are found in Appendix K.

The second questioning technique comes from Project Talent which has 394 questions that are designed to determine aptitudes and abilities. The third set of questions comes from the decision makers or the administration, specialists and others who are requesting the information. The prior two questioning techniques can help the decision maker identify relevant questions which when answered can provide him with useful information. The process of answering these questions is the domain of evaluation.

The preliminary selection of the theoretical model was accomplished by using the twenty premises generated by evaluation specialists and eight other pertinent criterion measures. Six theoretical models were selected for preliminary consideration. This investigator critically reviewed the literature related to the six models and rated them on a 0-3 scale. The top two models from this process were sub-
jected to a second set of criteria which resulted in selecting the CIPP (content, input, process, and product) theoretical evaluation model.

Subsequently, the operational model was developed following the design initiated in Chapter III. The operational model consisted of two diagrams. The first is the Mission Profile which depicts in a flow block diagram the major events of the IASIS. The second is a partial Functional Analysis flow block diagram which shows how the levels or subsystems of the system's major events are logically structured to provide information to the next higher level until the Top Mission Profile or the total program evaluation objective has been met.

Within this concept IASIS can provide useful information for the consumer of industrial arts products so that he can make a choice among alternative selections.

Testing IASIS Through Simulation

A conclusion was made that a realistic application of IASIS to an actual instructional program would be impossible due to limits and constraints of this study. The best means of testing the applicability of IASIS was through simulation.

Simulation portrays a hypothetical situation which can and should be used to test newly developed models. The rationale behind this process centers around two items. The first is to operationally check the logic of the parts by running through an evaluation problem. This determines if
the model actually can function to meet its stated objectives. The second is to build conviction for the evaluation schema or IASIS by determining whether the reader understands the model.

The simulation chapter is so presented that a reader may enter at various parts depending on whether he has read the previous chapters. To accomplish this programmed effect, the chapter is divided into five sections. If the reader enters the chapter without prior information from the other previous chapters, then he would start at the beginning of the simulation chapter. If he has read the previous chapters he may want to start with Part IV, "A Summation of Assessment Evaluation" or with Part V, "The Application of Simulation to IASIS." The reader may also want to start with "The Application of Simulation to IASIS," then review the previous part of the chapter if problems in understanding have developed. The chapter was so structured that it provides the reader an option depending upon his particular interest or his reading of the previous chapters.

Briefly, the five sections follow:

1. **IASIS Conceptualized** provides the developmental definitions of roles and purposes of the evaluation schema.

2. Operationalizing IASIS explains how a system theory functions within an evaluation rationale to integrate various parts of the schema into a working whole to meet specific objectives.

3. **A Brief Overview of IASIS** provides a step-by-step explanation of the major events found in the Mis-
4. A Summation of Assessment Evaluation explains the 61 generalizable steps used for designing evaluation activities. These 61 steps are used to meet informational needs required by decision makers.

5. The Application of Simulation to IASIS provides the means of studying a realistic problems in which the various parts of the evaluation schema are applied to show how solutions are generated.

CONCLUSIONS

The study was an attempt to develop and test an innovative total program evaluation schema for industrial arts education. The specific reason for the task was to provide the methods and means strategies of improving the industrial arts instructional program. This was to be accomplished through an evaluation schema which has a primary function of providing useful information to the consumer of industrial arts products so they could make informed decisions.

The development and testing of the total program evaluation schema IASIS are dependent upon:

1. Logical soundness of the premises
2. The adequacy of the overarching questioning process
3. Efficacy of the theoretical evaluation model
4. The effectiveness of the operational evaluation model.

The latter was determined by simulation and the opinions of experts in the field of evaluation, systems theory, and industrial arts research.
The previous four conditions or criteria were accomplished by meeting the following objectives of the study:

1. To generate program evaluation statements from a review of selected literature.

2. To produce logically sound program evaluation premises from the program evaluation statements.

3. To develop (adapt or adopt) a theoretical program evaluation model which is based on the developed set of logically sound program evaluation premises.

4. To develop a schema for generating pertinent questions to gain useful information about alternative industrial arts programs.

5. To develop a program evaluation operational model from the theoretical model that provides a schema for delineating, obtaining, and providing useful information to decision makers for judging alternatives.

6. To test the total program evaluation schema by simulation and its acceptance by the known experts in evaluation, systems, and industrial arts research.

Having fulfilled the above six major objectives it would seem possible to state within the limits of this study several major conclusions:

1. The generation of program evaluation statements from selected literature required more time of the study than was beneficial. Time, for example, would have been saved if related evaluation literature had not been reviewed. Time was required to search the related literature and write statements for which the respondents did not react favorably due possibly to their unfamiliarity with the context of
the material or the rhetoric of the statements. Those statements coming from evaluation literature which were simple, short, and to the point received more critical assessment. However, as was reported by one of the respondents, the statements presented a learning situation to the determined and critical reader. This respondent further stated that his belief of what evaluation should be and how it should be accomplished was modified as he read and studied the 208 statements.

The general consensus from respondents about the statements and instruments coincided with the faults of any survey instrument as depicted in most research text books. Even though many respondents were apprehensive about the instrument and the statements, thirty-one percent responded which was sufficient to accomplish the objective of the survey.

What this research was really after was results without generating undue disdain. It appears that disdain was generated by the instrument which may be a normal result with a detailed survey instrument. Possibly other means could have been used to obtain the same results with considerably less effort and frustration. This might have been accomplished by using the Q-sort technique, clustering similar statements, using factor analysis, reducing the total number of statements to fifty or seventy, or shortening and simplifying the statements. In all, the experience with the
survey was educational but frustrating.

2. The premises were generated from the survey instrument responses. Their soundness was displayed when they were used as criterion measures for selecting the two preliminary theoretical evaluation models from a group of six. The generated premises from the survey were congruent with the major objectives of the total program evaluation schema as was suggested by the consensus of information found in Chapter II, The Review of Literature.

The eventual theoretical evaluation model was selected after applying the second set of criteria. This substantiated the worth of the premises to pick the best model based on those presently available. Therefore, the CIPP theoretical evaluation model represents the best possible theoretical evaluation model for this study as was determined by the premises. These premises were a result of responses from known generalists in evaluation and known industrial arts college researchers who rated them according to what they felt evaluation should be. In turn, these 208 statements were analyzed by item analysis into the top twenty (see Appendix E) which represented the generated premises.

3. The theoretical evaluation model provided the logically sound theory through its four types of evaluation. The theoretical structure of these four types of evaluation, i.e., content, input, process, and product evaluation (CIPP),
allowed for the development of the operational evaluation model. The efficacy of the CIPP model left no doubts as to how the total program evaluation schema should function. In essence, the CIPP model provided the explicit guidance and direction needed to adequately conceptualize the operational model for industrial arts. In addition, the CIPP model has received widespread acceptance at various levels of decision making which adds empirical validity and reliability to its theoretical soundness.

4. The schema designed to generate pertinent overarching questions was a three-order matrix. Questions were developed by combining dimensions of population, program, and behavior. The matrix's logic is shown when the interrelationship of the items involved in the three-dimension is consistently and orderly identified. The actual items in the matrix for the most part come from the Epic evaluation model which was specifically designed to determine those interrelationships for systematically gaining information.

The 165 questions found in Appendix H have been written but have not actually been empirically tested. Nevertheless, they represent overarching concerns from which subelements of an instructional program can be identified and instruments designed. This will help obtain useful information to answer many questions deemed important. As new questions arise, the matrix will be able to absorb this concern. The questions through the matrix can help with the coding, stor-
ing, and retrieving of data. The questions at least are systematic, logical, and rational which will help the decision maker identify areas of concern. The conclusion can be drawn that the questioning matrix can help identify the right question to be answered which is in and of itself a major accomplishment.

5. The operational model is complex but functional. It has been specifically applied to industrial arts education in this study. However, it appears that it could be applied to other instructional programs with little modification. The operational model follows the elements of: (a) suggested criteria for evaluation, (b) systems theory as applied to the flow of events and levels, and (c) the four management decision processes with its individual four steps in decision making. The combining of these three elements has given the operational model more clarity than if obscure terms or concepts were used.

The two items that were emphasized in the development of the operational evaluation model were first, its ability to perform total program evaluation, and second, to be readily understood by the industrial arts profession. To accomplish the latter, various changes were made in terminology. The changing of CIPP to AIPO (assessment, input, process, and output) was due to assessment being better understood than context, that output rather than product follows the natural manufacturing cycle of input-process-
output. Management concepts of planning, organizing, controlling, and communicating are better understood in the industrial arts profession than are planning, structuring, implementing, and recycling. The logic of a systems theory numbering process also helps industrial arts educators to understand the evaluation schema through the identification of events by numbers.

As a result of adopting the Phi Delta Kappa Study Committee's definition of evaluation, it was possible to develop an adequate set of generalizable strategies for designing evaluation activities applicable to all four types of evaluation. In essence, each word in the definition has a functional meaning to IASIS.

The operational evaluation model is not only able to provide systematic and continuous evaluation to monitor a program but also provides a means of solving ad hoc problems which may require a schema of planned change. This is accomplished through the input-process-output evaluation stages. It appears from the surface that the operational evaluation model is able to function adequately since it has the capability to handle ad hoc as well as continuous and systematic evaluation problems. This model also possesses the capacity to deal with the macrocosmos as well with the microcosmos. This is accomplished by applying: (a) its four evaluation types with a set of generalizable strategies of evaluation activities, (b) its four management decision
processes with its four subelements, and (c) a systems theory to logically structure major events and their subelements into a hierarchical order.

6. The success of the simulation technique to adequately test IASIS is dependent upon whether the schema can be properly understood by the reader. If IASIS can be understood by educational practitioners, then it may be implemented as a tool for improving industrial arts instructional programs. Simulation in this study has augmented this conclusion.

If an individual is confused by reading the simulation, it is possible that there are flaws either in the writing of the simulation or in the operational structure of IASIS. Therefore, having experts in the fields of evaluation, systems theory, and industrial arts research critically review the simulation and then modifying it based on their recommendations should result in an understandable, logical, and realistic total program evaluation schema. Simulation is by far the best means of testing IASIS' understandability and logic before it is implemented into a macro system.

IMPLICATIONS

The study has shown that less frustrating methods are needed for developing premises. The Delphi technique has possibilities of increasing the quality of the premises, but by the same token it may also increase the frustration of
the respondents. The implications here are that premises are needed and can be obtained through a survey of experts, but other means should be developed for increasing the validity and reliability of premises without also increasing a respondent's frustration.

As was reported in Chapter V, the developed premises were the major influence in the development of the operational evaluation model. It appears that premises can be gained from a consensus of experts, applied to selecting an adequate theoretical model, and then used in developing a logically sound and rationally accurate operational model. This procedure of developing and using premises for generating the solution to the problem in this study has possibilities of working in other areas of major concern to improve industrial arts instructional programs.

The results of the information collected and organized in this study have indicated that by using a three-order matrix, relevant questions can be identified in a systematic and logical manner. It can provide the means for industrial arts to develop instruments systematically to answer each question derived from the matrix cubes. The data derived could either be descriptive or behavioral in nature and cover all levels of decision making.

The information derived from the use of this systematic application of instruments in the matrix eventually could be placed in an industrial arts information center.
This center would have a fast and economical means of storing and retrieving data for providing useful information to decision makers, researchers, and others. Information output and feedback from its use and new research and development input would be used to refine and improve information for continuous and systematic improvement of industrial arts education.

The possibility of developing a significant total program evaluation operational model was augmented by using the knowledge derived from systems theory, management decision processes, and evaluation. If systems theory and management decision processes are applicable to this study, then they hold promises for combining to solve other problems found in industrial arts education.

The systems approach has possibility for aiding in the development of instructional programs. This is because it can provide a logical and systematic means of determining major and minor components and structuring them into an integrated whole. Management can provide the overarching means of planning and controlling the research and development process to coordinate systems efforts required to accomplish a top mission objective. In essence, the implications for using systems theory and management concepts to aid in educational improvement should continue, because they can provide the methods and means to deal effectively with a complex and confusing state of affairs found in education today.

The results from this study indicate that industrial
arts education must begin to determine the weaknesses and strengths of its instructional program. This objective can only be met through a total program evaluation schema. It was shown in Chapter VI that if IASIS can be adequately implemented into the industrial arts educational process, then this evaluative schema could make the difference between industrial arts becoming dynamic in nature rather than apathetic to change. Industrial arts must remain dynamic if it is to continue as a vital part of the educational system in America.

As was shown in Chapter II, the general public and many educators see industrial arts content as no different than it was originally conceptualized in the manual training era. If industrial arts is to move away from this anachromism toward sound improvement it must use a total program evaluation schema to increase global awareness of problems and how to go about solving them. Better solutions to problems are made by decision makers who have pertinent information from which the best possible alternative can be chosen. If the decision maker has no choice of logically derived alternatives, he can only follow the path of least resistance. This is apparently what has happened to industrial arts and will continue to occur if a total program evaluation schema is not applied. Blind decision making will not suffice in the future for the educational consumer will cease to use the product if it con-
continues to be obsolete.

Evidence was given in the study that the concern for better schools, better programs, and better instructional practices is requiring the decision maker to make better judgments. If he follows the route of "business as usual" his lack of information may seriously jeopardize a student's capacity to cope effectively with his environment. Industrial arts education is serious business which requires more relevance than the type of program which is generally found in our schools.

To change from the present apathy for total program evaluation in industrial arts and to remove the many unacceptable features that have resulted may require drastic measures. A place to start is in the teacher training institution. For example, in undergraduate method classes simulated instructional problems could be solved through the application of a total program evaluation schema. Not only would the student be actually involved in a realistic instructional problem but also be shown how to solve a problem by working through the total program evaluation schema. The results would be very beneficial if the simulation process could be adequately developed which allows for instructional problems and evaluation procedures to be realistically simulated.

This process could also apply to the graduate program which may or may not include a course in total program e-
valuation. If the graduate degree represents leadership training in industrial arts, then how can leadership ability be used without useful information to help make adequate decision? The answer to this question can only come through a schema of total program evaluation. Possibly this can be adequately taught through a simulation experience.

If the results from the review of literature are correct, evaluation and research must be more closely related for both are needed in an effective improvement process. First, the pure experimental researcher and the evaluator must consider how they can help each other in the improvement process. Presently some individuals who stress pure experimental research realize that most research studies end in no significant difference and therefore make little impact upon the daily operation of the industrial arts instructional programs. The implications for improving industrial arts' relevancy to its students requires planned change, of which total program evaluation and pure research must join forces to accomplish the job.

At all levels of decision making such as elementary, junior high, senior high, and college, industrial arts education should function within a total program evaluation schema. This would provide the information required to make informed judgments about the responsibilities for initiating and providing dynamic leadership for the improvement of the industrial arts instructional program.
As was illustrated through the review of literature and the results of this study, IASIS or other total program evaluation schemas are capable of moving industrial arts out of the manual training confines into a program process that intellectualizes the study of industry for all students. This could be accomplished by identifying instructional program problems and initiating the means of solving these problems through providing useful information. This process is not only on an ad hoc basis but also on a continuous and systematic foundation.

The future can be unlimited for industrial arts if it becomes dynamic. But first it needs more information to guide and direct this dynamism. This study has shown this information can come through a total program evaluation schema. The question is, will it be implemented? The answer to this question possibly lies in the use of simulation.

**Suggestions for Future Research**

1. Research is needed on empirically testing of total program evaluation schemas which could best fit industrial arts instructional program needs. This study should only be a start in this development process.

2. There is a need to develop instruments which can gather data from identified questions in the overarching questioning matrix. This would include instruments to gather descriptive and behavioral data in the cognitive,
affective, and especially the psychomotor domain.

3. Future research and development needs to be performed to determine how best to teach the understanding and use of evaluation techniques, procedures, and mechanisms for all levels of decision makers. Until this is accomplished change in the present apathy for evaluation is unlikely.

4. A specific system of coding, storing, and retrieving of data should be developed for industrial arts which would provide ready access of information to decision makers. This system would be able to use data processing and computer services for providing a package of data to a possible consumer.

5. Investigation needs to be conducted on the best methods and means of implementing new industrial arts evaluation programs into the public schools.

6. Investigations are needed in areas of using simulation as a means of improving intellectual abilities and skills in the use of evaluation procedures, instruments, and mechanisms.

7. Research and development needs to be conducted on how to best train industrial arts evaluators. This would require developing a program rationale, writing a course of study, and then testing the program to make changes. The results could have widespread impact.

8. Research should be conducted on the effects of
survey instruments on respondents. This process may be a means of changing attitudes as the respondent proceeds through the instrument. This process could be used as an instructional technique which indirectly changes the respondent's interest or potential aptitude for a particular subject.
APPENDIX A

208 PROGRAM EVALUATION STATEMENTS AND REFERENCES
Evaluation should:

1. be a process of making judgments that are to be used as a basis for planning.

2. be a procedure for improving the product, the process, and even the goals of instructional programs.

3. establish goals, collect evidence concerning growth or lack of growth toward goals, make judgment about the evidence, and revise procedures and goals in light of the judgment.

4. be an adequate way for society to define and communicate its expectations to the educational institution.

5. equate with processes and procedures for aiding decision making.

6. equate with a logical and rational thought process for arriving at a course of action.

7. use a strategy that includes the functions of feedback, diagnosis, and steering in providing wise judgment and descriptive information to the decision maker.

8. help make decisions on what to evaluate, how to evaluate, and when to evaluate.

9. be concerned with the concepts of trouble shooting that depend upon the actions of diagnosis, remediation, and demonstration.

10. guide and direct the selection of content and learning experiences plus providing criteria on what to teach and how.

11. be a functional process using specific objectives at various levels.

12. be a method of clearly formulating objectives which prevent discrepancy between what is expected and what actually does result in an instructional program.

13. incorporate new concepts and new knowledge into the school programs.

14. be a continuous interplay of ideas among individuals and groups of individuals who concern themselves with the future of society.
Evaluation should:

15. improve school programs through the contribution of insights, values, and commitments.

16. include various roles, functions, and responsibilities of all persons in the process of program improvement.

17. be a means to achieve goals, purposes, and objectives which have been interpreted from various groups by the decision makers.

18. be a program change process which occurs in different ways with different foci and different levels of sophistication, according to the interest, needs, and degrees of readiness and involvement of various groups of decision makers.

19. provide various stances in decision-making, based on the best judgment evidenced by data, opinion, and values available at the time of assessment.

20. generate information on alternatives so that the decision maker can adequately make a logically sound and rationally accurate choice.

21. provide for the clarification of goals and the congruence of the objective-outcome process during, and at the end of the program development.

22. seek and recognize the kind of desired behavioral pattern to be gained through the development of procedures and instruments based on an evaluative conceptual framework.

23. recognize the kind of desired student behavior that considers the influences of both instructional and student background.

24. help in designing and redesigning of instructional processes and materials.

25. be a continuous empirical verification of the instructional schema in relation to stated intents and observed results.

26. function through a feedback mechanism to provide a continuous competence level check on expected criterion behavior that gives constant guidance and direction to instructional programs.

27. use criterion referenced information to assess learning based on the instructional program goals.
Evaluation should:

28. use a comprehensive and logical schema which is simple enough to be understood by the practitioner.

29. provide feedback information for the innovator during program development process and to the educator for adopting new programs.

30. vary with population, program, and behavior.

31. be concerned with alternative evaluative strategies, their application to various target populations, and a comparison of their consequences.

32. include time and sensitivity constraints before determining what information is to be sought.

33. establish the criteria by which alternative instructional programs will be judged before the search and collection of information on alternatives begin.

34. include chosen strategies for a given education setting that reflect an appropriateness for a particular situation.

35. be based upon the best evidence that can be made available to the educational consumer.

36. augment the development of emergent and dynamic program ideas that work and need to be pursued further, and those that fail and need to be modified or terminated.

37. provide for the development of different evaluation designs to reflect the interest and circumstances of various clienteles for whom a program may be patterned.

38. assess programs during the tryout period as well as at the completion of the development period.

39. make a differentiation of priority information on instructional programs to be supplied to the decision maker.

40. generate data on a program's ability to function adequately with the use of its materials and on the kinds of situations where these materials have been successful.
Evaluation should:

41. continuously supply information to the decision maker on how and when the program materials work and what their weaknesses and strengths are.

42. be both macro and micro in nature to provide either general or specific information on programs for the decision maker.

43. seek differential outcomes of the program as it develops that will provide appropriate information as to its strengths and weaknesses under various situations.

44. assess the process of producing, trying out, and disseminating information on programs.

45. include activities which produce appropriate questions needed in providing adequate information for the decision makers.

46. evaluate individual program items and their relationship to the total program package.

47. generate evaluative information on the need for change, on the process of seeking change, and on the result of change as it relates to program development and diffusion.

48. consider various program variables in different settings using distinct designs in the most effective and efficient manner.

49. provide a variety of sources of evaluative feedback information that should be treated simulatively rather than by compartmentalization.

50. gather an adequate background of information to interpret any statistical data correctly.

51. focus on pertinent information based on a definite purpose.

52. consider the assessment of an organization as a total system that requires the interactive ties between all parts which permit its complete functioning.

53. promote an understanding and acceptance of instructional improvement through the generation of adequate information.
Evaluation should:

54. use systematic management approaches to provide a capability for continuous assessment of present and future program actions in light of overall objectives and needs of the educational consumer.

55. consider the different value positions as they relate to alternative strategies, designs, and decisions in providing useful information.

56. use practices in collecting information for the decision maker that are generally appropriate to the circumstances in which policies have to be chosen.

57. be a planned procedure which is followed in the management process of giving guidance and direction to program change.

58. play a critical role in providing corrective feedback to the various parts of the program so the entire program development operation can be improved.

59. center upon the attempt to provide answers to a question or questions on programs in a situation with which the educational consumer is concerned.

60. gather pertinent environment information both within and outside of the school setting.

61. identify information on alternatives in terms of exactly what the decision maker wants and provide any other pertinent data which may have a bearing on aiding his choice of a decision.

62. be a meaningful and objective description of the content and typical effects of a program in terms of the needs of those who must select from among competing programs.

63. use strategies that adequately provide a schema for supplying information to the educational consumer.

64. be able to function in an idiosyncratic environment that depicts the interrelationship of the teacher, student, and other problematic forces.

65. function as a device to provide quality control of a program's development and use.

66. be used to improve a program while it is still fluid in the developmental process rather than used to appraise a product which has already been placed on the
Evaluation should:

educational market.

67. provide an understanding of how a program produces its effects and what parameters influence its effectiveness.

68. help improve a program's refinement and future development.

69. be concerned with the effects of the program under study rather than with comparisons of programs.

70. measure all types of educational proficiency which might be desired in an area and not just a selected few.

71. collect evidence on all the goals toward which a program might reasonably aim.

72. generate a description of outcomes in the broadest possible scale.

73. ascertain what changes a program produces and identify those aspects of the program that need revising.

74. observe the general outcomes ranging far beyond the content of the program itself—namely, attitudes, career choices, general understandings, and intellectual powers and aptitude for further learning in the field.

75. ask the right questions about educational outcomes which can do much to improve educational effectiveness.

76. be a fundamental part of program development, not an appendage.

77. collect information that the program developer can and will use to do his job better and information from which a deeper understanding of the educational process will emerge to generate better decision making on the part of the educational consumer.

78. employ a systematic approach to gain information from various levels of instructional decision making for program development.
Evaluation should:

79. function through a model that explains how to organize an evaluator's thinking in comparing educational programs systematically, to control a program's development operation, and to accomplish other tasks which are pertinent in providing critical information to the educational consumer.

80. be aware of the types of decisions that are demanded by the decision maker so that strategies needed to produce knowledge can be implemented.

81. be an analytic study designed to help a decision maker identify possible program choices through a systematic and rational approach with assumptions made explicit, objectives and criteria clearly defined, and different courses of action compared in light of their evidenced consequences.

82. provide answers to the decision maker's questions by processes which are accessible to critical examination, capable of duplication by others, and more or less readily modified as the need for new information becomes known.

83. employ those processes appropriate to a decision maker's demands through the scientific method and other information collecting and analyzing techniques.

84. provide an overall decision-making process which is common to all evaluative strategies varying in intensity with differing roles of assessment.

85. involve the concepts of decision-making, rationality, description, and judgment with emphasis upon program personnel and organization rather than just the individual student.

86. generate a careful description of phenomena and judgment used in moving decision-making away from the non-rational toward the rational approach.

87. use distinctive strategies and roles for different levels and situations that are required to collect, organize, and analyze data pertinent for various decision-makers.

88. include various evaluative decision and information requirements needed at different levels which tend to support each other in a total program evaluation.
Evaluation should:

89. be an appropriate data collection and analysis scheme which includes an extensive use of procedures from other disciplines such as psychology, biology, philosophy, sociology, anthropology, economics, technology, and other disciplines.

90. be a process that is essentially inclusive so it can adequately accomplish its task of providing information for decision making and yet be functional.

91. include cost benefit analysis which is the most appropriate method for making decisions on the allocation of resources among competing curriculum programs.

92. serve as a basis for the management of change, the mechanism of change, and the mechanism by which some approaches, techniques, and programs are abandoned, modified, or new programs evolve.

93. be a mediator of change which evolves from a competition among alternative offerings.

94. provide information on different instructional programs so the parent, who is in reality the customer of education, can make a choice directly from what his children accomplish within a given program; therefore, deciding which program will be adopted and which will be dropped.

95. study the comprehensive environment of an educational program in its broadest context rather than examine it solely in terms of psychometric theory.

96. in most situations focus on the extent to which the objectives are achieved and their substantive value to the instructional program.

97. provide weighted recommendations on the merits of a program as it is operating and on possible ways to increase the success of the program in operation.

98. be particularly concerned with describing principles on which to make decisions about instructive programs.

99. include the task of gathering information about the nature and worth of educational programs for the purpose of improving decisions about the management of these programs.
Evaluation should:

100. fit together the separate information pieces, tease out the illogical inconsistencies, and determine the emerging trends of instructional programs.

101. use something similar to the experimental factorial design and the analysis of variances which enable the development of a device for accounting for a multiplicity of variations, for drawing inferences, and for registering informational competence.

102. guide and direct the selection of content and learning experiences appropriate to various learning situations and provide criteria on what to teach and how.

103. study prototypes of various situations using different materials that will provide a rational description of the interaction of these situations and materials with sufficiently large enough subsamples of different strata that examination of the individual factors generates information either statistically or non-statistically productive.

104. be inseparable from a general schema of decision-making.

105. operate from the assumption that intelligent decisions cannot be made until adequate information is available about different programs.

106. deal adequately with various settings and incorporate different strategies capable of delineating, obtaining, and supplying answers to questions proposed by decision makers.

107. point out the strengths and weaknesses of a program and not monitor the institution in which the program occurs.

108. inform the decision maker about what transpires during the developmental period as well as about the dimensions of the final outcome.

109. be oriented toward planning, assisting, and recommending information about various programs rather than toward making decisions and presenting judgments to the educational consumer.
Evaluation should:

110. draw from the methods and findings of research in many different disciplines.

111. be an integral part of any new program from the planning stage on.

112. be involved with both information and formal data collection and analysis procedures.

113. ascend to the level of systematic program assessment which is seen as being central rather than peripheral to the educative process and to the management of educative systems.

114. be an integral part of an overall educational system.

115. include the social mission of education through a pragmatic approach that centers on three tasks:
   (1) to clarify the mission of education in terms of what it is and perhaps ought to be;
   (2) to collect and analyze the best information obtainable on how well educational institutions and programs are fulfilling that mission;
   (3) to identify ways by which the institution and programs might be improved both in general and in particular.

116. look at both the initial inputs to the educational consumer and the inputs that were actually received by them to determine the discrepancy.

117. work cooperatively with research to gain precision and adaptability in generating information for decision-making.

118. be totally committed to designing accurate procedures to gain credible data rather than a vehicle for placating an outside sponsor.

119. gain credible information by conceptualizing first an ideal research and evaluation model, then proceed to the constraints and limitations which are found in the real world, and finally, attempt some practical compromise or reconciliation which would take into account these limitations without seriously jeopardizing the necessary research and evaluation functions.
Evaluation should:

120. focus on those criteria on which the educational customer wishes to base his choice.

121. seek the criteria deemed important by the decision maker then focus the evaluation process on gathering information in light of that criteria.

122. be imaginative and creative so that it provides the educational customer with information most helpful to him.

123. include the total environmental factors that interact to influence a program's performance.

124. create as well as analyze new instructional ideas for programs.

125. function within a basic framework generalizable to various environments.

126. evaluate specific programs and generate various alternatives which add more informative data to the decision maker's choice.

127. can add validity to a program's efficacy by involving principals, teachers, parents, and others in planning, investigating, and challenging the truth of a claim by a very thorough pre-planning so that non-threatening questions are avoided through cross validation strategies.

128. be more than the mere placing of a meter on the output of an educational pump in our society.

129. attempt to collect and use quantitative data in the management of the educational enterprise.

130. provide guidance and direction for the design and management of instructional programs.

131. be an information system that discloses its program's results to the public and gives a true measure of a school's accountability.

132. function within the principles of a scientific methodology to gain administrative consequences rather than to explain variables.
Evaluation should:

133. study the effectiveness of planned social change and how it can play an important part in the development of an on-going process related to all stages of program planning, development, and operation.

134. be a service function rather than a production industry to education.

135. play a major role in policy formation and change.

136. be a planned program of deliberate interaction in seeking information on goal orientation and the congruence between objectives and outcomes.

137. analyze the program being evaluated in terms of its objectives, the assumptions underlying these objectives, the specific program activities designed to achieve these objectives, the rationale for believing that these activities are capable of attaining the objectives, the separation of the idea of the programs from how it is being carried out, and the determination of criteria for observing the extent to which the objectives are being attained.

138. be fundamentally a research activity with specialized programs of its own since highly quantified information is not as critical.

139. deal with performance rather than pure researchable objectives which delimit the courses of action open to generating solutions to educational problems.

140. determine where children are going in regards to learning and if their directions make sense.

141. encompass both the primary and secondary effects of the programs and their interactions.

142. use different evaluation strategies suitable for specific evaluation purposes.

143. be existential in character to differentiate what it is, how it gets to be the way it is, and how it affects the people who partake of it.

144. systematically diagnose the causes of poor results and suggest a procedure for solving the dilemma through interaction with decision makers.
Evaluation should:

145. perform its greatest service when it identifies aspects of a program where revision is desirable.

146. be a technology for collecting, analyzing, and interpreting data to writers, textbook specialists, and subject matter experts for decisions.

147. clarify the importance of objectives and specifications, detailed records, elaborate management systems, and time controls to carefully monitor product development and revision activities.

148. include objective field trials of innovative programs which do not require hypotheses, controls, and pretest since these devices may hinder a true assessment of a program's worth.

149. concern itself with the quality of innovative programs, its relation to conceptions of knowledge, and its impact on the value system of various learners.

150. be involved in the design of a program before it actually has been used with students and the subsequent trail and revision process of improvement.

151. possess a common goal in all evaluative activities but employ different roles according to specific instruction situations.

152. distinguish between the outcomes or products of instruction and the conditions of instruction.

153. distinguish between procedures and accomplishments, processes and outcomes, conditions and behaviors, means and ends, and transactions and outcomes.

154. generate questions and seek their solutions through differing strategies that are feasible and acceptable to the decision maker.

155. provide the educational practitioner with the ability to discriminate between the statistically significant and the practically significant result.

156. establish an empirical basis for the revision and refinement of facilities, materials, and methods of an instructional program.
Evaluation should:

157. be as concerned with the characteristics of the environment which produces the change in programs as it is with the appraisal of the change itself.

158. make various evaluative designs similar to the Stanley and Campbell quasi-experimental design which could be applicable to different educational settings.

159. be such that it will not be counter to general educational philosophies which can cause inhibitive resistance to data identification, collection, and analysis.

160. secure data from the program, the community, the school, etc. and not the pupil.

161. review the responsibility, the desirability, and the feasibility of providing better programs to the educational consumer.

162. be seeking various levels of decision-making in terms of remoteness from learner, substantive curriculum decisions, type of decisions to be affected at each level and between levels, identification of appropriate data sources to be consulted, and a clarification of authority and responsibility for decision on the program.

163. be viewed more appropriately within the context of decision-making than within a framework provided by purposes and conventions of research.

164. ultimately depend upon a management theory that utilizes pertinent reliable information as the basis for administrative decisions.

165. provide data to help in determining whether to improve, maintain, or terminate a program.

166. use standards based on the criteria of clarity, internal consistency, comprehensiveness, and compatibility.

167. provide a schema for implementing program change as well as evaluating each stage of the process of change.
Evaluation should:

168. be sensitive to the changing society and the characteristics surrounding that change through provision for identifying and generating information on competitive instructional programs.

169. use an information theory that is applicable to generating critical data.

170. encompass the principle of cybernation that includes the transmission and interpretation of information to maintain the element of equilibrium.

171. be a hierarchy of systems enabling the evaluator to fill both the theoretical and empirical informational gaps through an appropriate strategy.

172. be concerned with the importance of data specifications to assure precision and accuracy of designed solutions of instructional programs.

173. be a system where the sum total of all parts are working independently and in interaction to meet previously specified objectives.

174. be a simplified model that abstracts the cause and effect relationships essential to the evaluative questions to be studied.

175. generate information on the effectiveness of obvious instructional solutions as well as make provisions for the invention of new innovative solutions for the decision-makers.

176. be judged on the same basis as research studies are conventionally judged.

177. contribute to a rational decision-making process in situations in which it is necessary to estimate the probability of a desirable but uncertain outcome of an action that was chosen from a number of alternative actions.

178. create ways to monitor and eventually judge the effectiveness of instructional programs.

179. be concerned with the utility of a school's innovative programs including an assessment of its readiness for change.
Evaluation should:

180. be responsible for creating a better frame of reference for understanding the effects of an educational program in our changing technological society.

181. try to enlighten the educational consumer in a new way and lead him to try a remedy that otherwise may not have seemed reasonable.

182. be a scheme with three functioning objectives which are understanding, prediction, and control of educational programs.

183. be able to interrelate a set of variables on the basis of the rules of logic.

184. be an understanding of the variables involved in supplying information to the decision maker.

185. bring order into concepts and objectives and perhaps should rationalize what procedures are most effective and efficient.

186. be a theoretical model which proceeds in a logical fashion from established facts and relationships or premises, to the derivation of a new hypothetical model which can be empirically tested.

187. be a theoretical framework used to sharpen objectives, suggest what variables should be eliminated as non-meaningful, and hence, wasteful, increase the likelihood of significant findings, simplify the complex task of interpreting results, aid in interpreting meaningful events from nonsignificant results, and make evaluation cumulative from one study to the next.

188. be logically and heuristically structured so as to account for the contingencies evolving from the interrelationships of instructional variables.

189. be a scheme for deriving useful information that is generally applicable to all specific instructional events or processes.

190. choose a model based upon a set of crucial decisions concerning the kinds of variables and relationships between variables that will be investigated.
Evaluation should:

191. choose a model based upon a set of crucial decisions concerning the kinds of variables and relationships between variables that will be investigated.

192. be a paradigm that is represented by an interlocking relationship in some graphic or outline form.

193. be a model-paradigm that depicts events that have differing temporal, spatial, causal, or logical relationships by portraying these relationships by boxes, connecting lines, and positions on vertical and horizontal dimensions.

194. be a model that is either explicit or implicit with the former being a highly elaborate paradigm with connecting lines and the latter being merely what the evaluator has done or is planning to do.

195. be used as an intellectual tool for examining crucial aspects of evaluating educational programs.

196. choose a model whether deliberately or unthinkingly which determines much about the evaluating that will be done, that is, the styles, designs, and approaches of the assessment being undertaken.

197. use a theoretical model to gain a systematic ordering of ideas about a field of inquiry which is an antithesis to ad hoc, disorderly planning or interpreting of instructional programs.

198. function in a middle-management position where it must consider the audiences of the various decision makers, the various educational programs, and those personnel involved in those programs.

199. be concerned with improving educational opportunities for students as well as providing information to decision makers so that they might have an awareness and understanding of those educational opportunities.

200. be continual process that is needed in making decisions by the educational community to keep pace with the changing technological society.

201. be based upon the assumption that decision making is not usually an integral part of assessment, but a subsequent activity engaged in by parties not involved in the evaluative process.
Evaluation should:

202. be based upon the assumption that once the local institution decides the ends-means configuration is not ideal, the evaluative schema would provide the change strategies and decision making designs which will formulate new ends by choosing new content, or by inventing new materials and instructional procedures, or by providing for the adoption of new solutions generated elsewhere.

203. be a process of delineating, obtaining, and providing useful information for judging decision alternatives.

204. be concerned with judging the worth of individual programs for the decision maker against a prede­termined criteria.

205. function within a battery of standard operating procedures.

206. tell a full story about an instructional program that is supported by both statistics and profiles.

207. answer certain types of questions about certain entities.

208. be mainly concerned with the performance of individual students rather than the total instructional program.

PLEASE NOTE: Add on the rating sheet any evaluation statement you feel is left out of the above.

AGAIN THANK YOU FOR YOUR TIME.
SELECTED BIBLIOGRAPHY


Fish, Lawrence D. "Curricular Change Involves People," Educational Leadership, XXIII (October, 1965), 49-51.


Leader, Joseph (ed.). "Evaluating Educational Programs: A Symposium," The Urban Review, III (February, 1969), 4-23.


Maccia, George S. "An Educational Theory Model: General Systems Theory," Columbus, Ohio: The Ohio State University, December, 1962. (Mimeographed.)


APPENDIX B

SURVEY INSTRUMENT DESCRIPTION AND INSTRUCTIONS
DESCRIPTION AND INSTRUCTIONS for THE SELECTION OF PROGRAM EVALUATION STATEMENTS

According to your personal judgment of what evaluation should be, please rank the following program evaluation statements. It is presumed that these statements, through a ranking process, may formulate selected premises. These premises are to be used as guidelines in a dissertation to develop, adapt, or adopt a theoretical program evaluation model. From this theoretical model, an operational program evaluation model for industrial arts education is to be developed and applied to the Industrial Arts Curriculum Project. It is planned that a set of approximately 15-20 premises will result from this selection process.

The word premise, like other words, has several definitions. The selected definition of a premise comes from the following two sources:

(1) Funk and Wagnell's Standard Dictionary, International Edition, Volume 2 (1966), which states "...a premise is a proposition laid down, proved, supposed or assumed, that serves as a ground for a conclusion...a judgment leading to another judgment as a conclusion."

(2) Webster's New World Dictionary of The American Language, College Edition (1968), which lists as the first definition of a premise as "...a previous statement or assertion that serves as the basis for an argument."

Other definitions which may help to expedite the ranking process are:

Educational consumer: a group which includes all school personnel, students, parents, community, educationalists, and other interested publics.
Decision making: a process whereby a choice among alternatives is provided.

Program (as referred to in this study): educational instruction and its interlocking factors within the total curriculum.

The program evaluation statements were derived from a number of selected publications. The evaluation statements are either paraphrased or direct quotations. One may find some of these statements repetitive in nature. However, when they are repetitive, it may be assumed that other educators have recognized the credence of the statements and have come to the same conclusion.

A listing of the authors of the statements follows:

Baker, Robert
Brickell, Henry M.
Cronback, Lee
"Evaluating Educational Programs: A Symposium"
 authored by:
 Coleman, James S.
 Dyer, Henry S.
 Hawridge, David C. and Albert B. Chalupsky
 Mann, John
 Mayer, Martin
 Scriven, Michael
 Suckman, Edward A.
 Wrightstone, Wayne J.
 Wynne, Edward

Fish, Lawrence
Frymier, Jack R.
Gage, N. L.
Gagne, Robert
Glaser, Robert
Goodlad, John I. and Maurice N. Richter, Jr.
Grobman, Hulda
Hammond, Robert
Hastings, J. Thomas
Heath, Robert W.
Hemphill, John K.
Ianni, Francis A. J. and Barbara D. McNeill
Kaufman, Roger A., Robert E. Corrigan, et al
Lindvall, C. M.
Lovell, John T.
Maccia, George S.
No attempt was made to list the author's name with the evaluation statements because this might influence the ratings.

The Procedure

(1) At the top of each page of the Program Evaluation Statements is a lead-in phrase, "Evaluation should."
The phrases to complete the statement follow.

(2) Once you have read the evaluation statement, please rank from 1 through 5 according to what you personally feel evaluation should accomplish. (See Rating Sheet.) One indicates you strongly disagree; two, you disagree; 3, neutral or undecided; four, you agree; and five, you strongly agree. Please circle your choice.

(3) Please write comments, if you like, about the statements. A place is provided for your use.

(4) Please put your name on the rating sheet.

(5) Please complete at your earliest convenience. A stamped self-addressed envelope is enclosed for returning only the rating sheet.
You are one of a number of persons who have been selected to assist with this task. Your cooperation will be sincerely appreciated. You may keep the evaluation statements if you wish. Also, a summary of the results will be available to those assisting with the analysis.

Thank you for interrupting your busy schedule to help this researcher in a very difficult task.

Dissertation Committee

Members of the dissertation committee are:

Chairman--Dr. James J. Buffer, Associate Professor of Education, Assistant Director of The Industrial Arts Curriculum Project in Charge of Evaluation.

Members of the reading committee are:

Dr. Paul R. Klohr, Professor of Education in Curriculum and Foundation

Dr. Robert L. Hammond, Associate Professor of Education and Co-Director of the Ohio State University Evaluation Center

Dr. Frank C. Pratzner, Industrial Arts Research Specialist, Center for Research and Leadership Development in Vocational and Technical Education.
APPENDIX C

THE LIKERT TYPE RESPONSE SHEET
### RATING SHEET
for
THE SELECTION OF PROGRAM EVALUATION STATEMENTS

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APPENDIX D

THE COVER LETTER OF THE SURVEY INSTRUMENT
Dear Sir:

Your professional experience can be very helpful to a research study now in progress. Although there are numerous demands on your time, will you take a few moments to read the enclosed brief description and the instructions on the rating of program evaluation statements?

It is apparent that the need for evaluation of instructional programs has become one of education's most pressing problems. Presently evaluation is in a confused state of flux. This is due possibly to the lack of consensus as what role evaluation is to play in the educational setting. One can also find enormous confusion as to the role of evaluation in the field of industrial arts education.

Ratings of program evaluation statements from selected evaluators in the general field of education and in industrial arts education should provide a valuable guide for improving industrial arts education.

If you can cooperate in this investigation just complete the rating sheets and return them. If you cannot take part, please check your reasons below and immediately return the enclosed materials.

Please check your reason.

Professional duties__Other reasons________________

Thank you for your time.

Sincerely yours,

Robert E. Wenig
Research Associate

P.S. Due to the time restraints being placed upon this investigation, no returns will be considered after February 10, 1970.
APPENDIX E

MATRIX CODING AND A LIST OF SUBTOPICS
CODING SYSTEM LIST FROM THE EPIC CUBE CODE

The cube number is formed by using three four digit numbers in the form XXXX, YYYY, and ZZZZ. The X axis is the Population dimension; the Y axis is the Program dimension; and the Z axis is Behavior.

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APPENDIX F

THE OPERATIONAL EVALUATION ASSUMPTIONS
ASSUMPTIONS FOR THE OPERATIONAL SYSTEMS
TOTAL PROGRAM EVALUATION SCHEME

Industrial Arts Operational Program Evaluation Should:

1. Provide for a planned change process which occurs in different ways with various foci and different levels of complexity according to the interest, needs, and stages of readiness and involvement of different groups of educational consumers.

2. Provide for both the why and the how of information to be fed into the revision of programs.

3. Provide for evaluation's purpose and procedures to vary with population, program, and behavior.

4. Be inclusive of:
   a. More careful detailed specification of objectives
   b. Plan for the development of new instruments and evaluative devices
   c. Strategy for the administration of instruments
   d. The analysis of results
   e. Plan to make use of the information in yielding better instructional programs.

5. Seek adequate objectives of the program as it develops which will provide appropriate information as to its strengths and weaknesses under various situations.

6. Allow for the assessment of the process of producing, trying out, and disseminating information on programs.

7. Consider various variables in different settings using distinct designs in the most effective and efficient manner.

8. Provide strategies chosen for a given purpose which reflect a consideration for the variety of possible approaches and their appropriateness for the particular situation.

9. Focus upon what is exactly to be assessed and under what circumstances to gain desired information on alternative programs.

10. Obtain, select, and justify its criterion datum deemed necessary by the decision maker which will serve as the basis for directing evaluative procedures.
11. Serve to center attention on the exact questions being asked which should be useful in guiding the thinking of persons responsible for any of a number of types of evaluation efforts.

12. Generate evaluative procedures which can be applied to a credible system of designing programs through a continuous and systematic feedback of critical information to the developer.

13. Provide knowledge about the nature of the abilities that constitute the educational goals of the decision maker.

14. Provide for differences in apparent effectiveness of various parts of the program and differences from item to item which suggests places where the program could be strengthened.

15. Collect facts that the program developer can and will use to do a better job and facts from which a deeper understanding of the educational process will emerge in generating better decision making.

16. Use a systems analysis process which is interwoven with a strategy of decision making.

17. Use cost benefit analysis to force the evaluator and the decision maker to analyze objectives in terms of possible cost and then concentrate on providing alternatives for selection of other and even better solutions of instructional programs.

18. Have an underlying philosophy which is credible and exists to be professionally ethical in providing accurate and objective information regardless of the circumstance--the decision maker can take it from this point to judge alternatives.

19. Only operate on adequate funds and expertise if any worth is to come from the efforts.

20. Include a school evaluative information system that discloses its program's results to the public which gives a true measure of a school's accountability.

21. Be analytical for examining processes and procedures for formulating information to enable the program director to gain corrective knowledge as the program is operating which brings theoretical and operational approaches together.
22. Uncover and formulate a testable set of criteria for a program.

23. Provide value judgment of alternatives in order to classify the consequence of alternatives.

24. Include both the evaluation of performance against goals plus the procedures for the evaluation of the goals.

25. Be so designed that precise specifications and requirements for the systematic study of environmental and instructional conditions as they relate to and interact with student performance are gained.

26. Include value priorities of the decision maker so information can be provided to give descriptive values consequences of alternatives.

27. Include a decision making design which allows a problem solving approach to answering pertinent questions about alternative choices.

28. Include:
   a. The definition of all of the outcomes of the system both planned and unplanned effects
   b. The systematic analysis and study of various possible procedures for achieving the objectives defined
   c. A plan and decision based on this analysis and an overall evaluation of the final program.

29. Not only entail procedural data but also a commitment to full and accurate reporting.

30. Provide a variety of sources of evaluative feedback, information which should be treated cumulatively rather than by compartmentalization.
APPENDIX G

RESPONDENT RATINGS OF THE PROGRAM EVALUATION STATEMENTS
### RATINGS OF THE PROGRAM EVALUATION STATEMENTS

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APPENDIX H

OVERARCHING QUESTIONS FROM QUESTIONING MATRIX

368
The Overarching Questioning Matrix

Axis X
Population

Axis Y
Program

Axis Z
Behavior = Affective Domain

Student:

1. Does the student feel that scope and sequence of time devoted to industrial arts instruction are adequate? Does the student feel that the vertical and horizontal organizational patterns of industrial arts programs are adequate?

2. What feeling does the student have for the type and amount of content information found in the industrial arts instructional program?

3. Is the student gaining a positive external organismic benefit from the instructional methods used in industrial arts programs?

4. What feelings do students have toward the type of industrial arts instructional program facilities?

5. What feelings do industrial arts students have about instructional cost of materials, tools, machinery, and equipment?

Teacher:

1. What feelings do teachers have about the organizational patterns used in the industrial arts instructional programs?

2. What attitude do teachers exhibit toward the content found in the industrial arts program which would assure a desired attempt to devote adequate energies to instructional activities?

3. Do teachers value the designed instructional activities promoted in the industrial arts program?

4. Are teachers satisfied with the instructional materials, tools, machines, and equipment found in the industrial arts educational program?

5. Do teachers feel adequate funds are made available to develop and promote an adequate industrial arts instructional program?
Administrator:

1. Does the administrator show confidence in the organizational patterns found in the industrial arts program?

2. Is the administrator committed to the type of content which is offered in the industrial arts program?

3. Are administrators aware of and satisfied with the instructional methods used in the industrial arts instructional program?

4. Are administrators aware of and willing to provide adequate facilities for industrial arts instruction?

5. Do administrators feel that adequate funds are available for the industrial arts instructional program?

Specialist:

1. Are the specialists sensitive to the strengths and weaknesses of various organizational patterns used in the industrial arts program?

2. Are the specialists committed to the content presently found in the industrial arts program?

3. Are the specialists committed to the type of instructional methods which promote rather than resist innovativeness in the industrial arts program?

4. How do specialists feel about the desire and the needs for facilities required to conduct an adequate industrial arts instructional program?

5. Do the specialists believe the support for the industrial arts instructional programs to be adequate?

Family:

1. Are parents aware of the organizational patterns available for industrial arts program? Are they committed to the type found within local school situations?

2. What is the expressed belief that the parents have for the content taught in the industrial arts program?

3. Are parents tolerant of the instructional procedures used in the industrial arts program? Do homework and testing methods meet with their approval?
4. Do parents believe the facilities used for the industrial arts program are adequate?

5. Are parents aware of the cost and willing to support the required instruction for an adequate industrial arts program?

Community:

1. What community feeling exists about the organizational patterns established for the industrial arts program?

2. What opinion does the community portray in regards to the industrial arts content?

3. Is the community sensitive to the methods used to teach industrial arts? Does the community have confidence in the instructional procedures used in industrial arts?

4. Is the community sensitive to the facilities required to adequately teach an industrial arts program?

5. Is the community aware of and willing to adequately support the industrial arts program?

School Board:

1. What feelings does the school board have about the organizational patterns found in the industrial arts instructional program?

2. Is the school board sensitive to the content taught in the industrial arts instructional program?

3. What does the school board value as being appropriate methods for industrial arts instructional programs?

4. How does the school board feel about the industrial arts instructional program facilities?

5. Is the school board sensitive to the cost of improving and operating an industrial arts program?

State:

1. What impressions are held by the state agencies about the organizational patterns found in the industrial arts instructional program?

2. Do the state agencies feel that industrial arts present content is adequate to meet the needs of a
changing technological society?

3. Are the state agencies in agreement as to the best methods of teaching industrial arts?

4. What feelings do state agencies express toward facilities required to develop an adequate industrial arts instructional program?

5. What opinions do state agencies express toward giving financial support to industrial arts instructional programs?

Federal:

1. Are the federal agencies sensitive about the organizational structure of various industrial arts instructional programs?

2. Do federal agencies have any feelings about the content taught in the industrial arts instructional program?

3. Are federal agencies tolerant of the instructional methods used in the industrial arts programs?

4. Are federal agencies satisfied with the facilities found in the industrial arts instructional program?

5. What opinions do the federal agencies have about the cost of industrial arts instructional programs?

University:

1. What impression does the university have regarding the organizational scope and sequence of industrial arts programs?

2. What is the university's opinion of the content presently found in the industrial arts program?

3. Is the university aware of and willing to promote relevant methods in the industrial arts program?

4. Are universities aware of the facilities required to adequately teach industrial arts programs?

5. What is the university's feeling concerning the cost of various industrial arts instructional programs?
Project Level:

a = information for the project development
b = information for the local industrial arts project development

1. (a) Is the project aware of and willing to support an organizational structure adequate to develop, test, and diffuse industrial arts instructional programs? (b) What feeling does the project have about the organizational patterns found in the industrial arts program?

2. (a) Is the project sensitive to the type of content required to develop, test, and diffuse industrial arts instructional programs? (b) Is the project aware of and willing to promote content that is meaningful to industrial arts programs?

3. (a) Is the project aware and willing to incorporate methods which can provide successful industrial arts programs? (b) Is the project satisfied with the methods used in the industrial arts instructional program?

4. (a) Does the project feel the facilities are adequate for developing, testing, and diffusing industrial arts programs? (b) Are projects sensitive to the facilities required to adequately teach industrial arts programs?

5. (a) Does the project believe that it has adequate funds to operate the process of generating industrial arts programs? (b) Does the project feel the cost of improving and operating an industrial arts program is adequate?
The Overarching Questioning Matrix

Axis X  Axis Y  Axis Z
Population  Program  Behavior = Cognitive Domain

Student:

1. In what type of organizational structure can the student achieve at the highest level in the industrial arts instructional program?

2. Does the student learn the type of content in the industrial arts program which is relevant to his needs, interests, and desires and which will enable him to be flexible and adaptable in a changing technological society?

3. Are the instructional methods found in the industrial arts program adequate for developing the student's intellectual abilities and skills for solving problems throughout his life?

4. Does the student have the type of educational facilities in the industrial arts program which can intellectualize the activities needed to develop his critical thinking?

5. What funds are required to develop and operate the type of industrial arts program which provides the student with the intellectual abilities and skills needed in a changing technological society?

Teacher:

1. Does the teacher possess the intellectual abilities and skills to adequately organize an industrial arts instructional program required to promote the most effective and efficient learning?

2. Is the teacher able to evaluate and select the content for industrial arts programs which transcends mere facts and promotes concepts relevant to a changing society?

3. Does the teacher comprehend the type of instructional methods in the industrial arts program which promotes new learning?
4. What knowledge does the teacher possess about industrial arts program facilities which develops critical thinking?

5. Is the teacher able to synthesize information about the cost of an industrial arts program which promotes experiences that intellectualize industrial concepts?

Administrator:

1. Is the administrator able to observe and evaluate the industrial arts program and then initiate the best organization of time and order required to promote the greatest achievement?

2. Does the administrator know which industrial arts program provides the content required to meet the needs, desires, and interests of the learner?

3. Is the administrator knowledgeable about an industrial arts program which promotes the type of methods required to adequately convey learning experiences needed to help the learner solve critical problems?

4. Is the administrator knowledgeable about the facilities which can adequately promote an industrial arts instructional program that incorporates meaningful experiences?

5. Does the administrator comprehend the cost required to effectively provide an adequate industrial arts instructional program in a changing technological society?

Specialist:

1. Are specialists knowledgeable about the type of organization which promotes the best industrial arts instructional programs?

2. What knowledge does the specialist have about content found in different industrial arts programs which develop intellectual abilities and skills?

3. Does the specialist possess evaluative information about industrial arts program methods which develop rational thinking?

4. What knowledge does the specialist possess about industrial arts program facilities which achieve greatest student learning?
5. What information does the specialist have about the cost-benefits found in various industrial arts programs?

**Family:**

1. What knowledge do parents possess which can be applied to better organize the industrial arts program for increasing student achievement?

2. Do parents comprehend the worth of industrial arts program content?

3. Do parents have knowledge about which industrial arts program method works best for developing intellectual abilities and skills?

4. Are parents able to evaluate the facilities used in industrial arts programs and the needs for resources in order to keep pace with a changing industrial scheme?

5. Do parents comprehend the cost of operating and developing an adequate industrial arts instructional program which promotes rational thinking?

**Community:**

1. Does the community possess knowledge of how to organize the industrial arts program?

2. Does the community have knowledge about the content found in the industrial arts program which adds relevance to learning?

3. Is the community knowledgeable about the methods used in the industrial arts program and does it comprehend why it is adequate or inadequate?

4. Is the community able to evaluate the facilities of industrial practices?

5. What knowledge does the community have about the cost of an effective industrial arts program?
School Board:

1. Does the school board have knowledge about organizational structure deemed necessary for improving industrial arts programs?

2. Does the school board comprehend the content found in various industrial arts programs?

3. What intellectual abilities and skills does the school board possess about various industrial arts instructional methods?

4. Does the school board have knowledge about adequate industrial arts program facilities?

5. Does the school board comprehend the cost required to adequately support an industrial arts program?

State:

1. Are state agencies knowledgeable about how to organize industrial arts programs for gaining the highest student achievement?

2. What information do state agencies have about various industrial arts content which transcends time?

3. Do the state agencies have comprehensive knowledge about methods used in industrial arts programs which can be applied to various instructional settings?

4. Are the state agencies knowledgeable about the type of industrial arts program facilities required to promote the most effective and efficient learning experiences?

5. Are the state agencies knowledgeable about the cost-benefits of various types of industrial arts instructional programs?

Federal:

1. What knowledge do the federal agencies have about the organizational pattern of industrial arts programs?

2. Are the federal agencies knowledgeable about the content found in various industrial arts programs?

3. Are the federal agencies able to evaluate and comprehend various industrial arts instructional program methods?
4. Do the federal agencies comprehend the type of industrial arts program facilities which can provide adequate instruction?

5. Are the federal agencies knowledgeable about the cost of implementing and operating various industrial arts instructional programs?

University:

1. Is the university knowledgeable about various organizational patterns of industrial arts programs?

2. What knowledge does the university have about the content of various industrial arts instructional programs?

3. Is the university able to provide evaluative information about various industrial arts program methods?

4. What knowledge does the university possess about industrial arts program facilities?

5. What knowledge does the university have on the cost of incorporating and operating various industrial arts instructional programs?

Project Level:

a = information for the project development
b = information for the local industrial arts project development

1. (a) Does the project possess the intellectual abilities and skills of organizational patterns to research, develop, and diffuse industrial arts instructional programs? (b) Does the project have knowledge about organizational patterns found in the industrial arts program?

2. (a) Does the project possess the intellectual abilities and skills about content required to develop, test, and diffuse industrial arts programs? (b) What information does the project have about the content needed in the industrial arts program which teaches the understanding and insights of modern industry?

3. (a) Does the project possess the intellectual abilities and skills about industrial arts program methods to research, develop, and diffuse useful information? (b) Is the project knowledgeable about various industrial arts instructional program methods?
4. (a) Is the project knowledgeable about industrial arts program development facilities which are intellectually adequate? (b) Does the project comprehend various types of industrial arts instructional facilities for different types of learning environments?

5. (a) Is the curriculum project able to evaluate the cost of developing and operating industrial arts programs? (b) What knowledge does the project possess about the cost of improving and operating an industrial arts program?
The Overarching Questioning Matrix

Axis X
Population

Axis Y
Program

Axis Z
Behavior = Psychomotor Domain

Student:

1. Can the student perform at his best within the organizational structure of the industrial arts program?

2. Is the student able to acquire the proper physical set within the content of the industrial arts program?

3. Does the student involved in the industrial arts program experience instructional methods which incorporate guided responses?

4. Is the student provided the type of facilities in the industrial arts program which promote rather than retard manipulative performance?

5. Are the student's overt responses to industrial arts activities directly dependent upon the cost of instructional resources?

Teacher:

1. Is the teacher able to perceive an adequate organizational structure of the industrial arts program?

2. Can the teacher select content for the industrial arts program which leads to skilled development?

3. Does the teacher perceive the industrial arts program in such a way that greater student performance results?

4. What teaching facilities to promote student performance are required in the industrial arts program?

5. Is the teacher able to perceive the cost necessary to promote adequate skill experience in the industrial arts program?

Administrator:

1. Is the administrator's mental, physical, and emotional set conducive to organizing the time and order of industrial arts programs?

2. Does the administrator perceive the content in the industrial arts program which increases student sensorimotor performance?
3. Is the administrator's performance adequate in promoting instructional methods within the industrial arts program?

4. Is the administrator able to provide the type of industrial arts program facilities deemed necessary to imitate industrial skills?

5. Can the administrator's performance provide the needed resources for the industrial arts program?

Specialist:

1. Is the specialist able to organize the scope and sequence necessary to promote highest performance in the industrial arts program?

2. Does the specialist express clearly the ideals about appropriate manipulative content required in the industrial arts program?

3. What skill to increase student output does the specialist possess in promoting industrial arts program methods?

4. Does the specialist perceive the industrial arts program facilities as adequate in developing the students' best performances?

5. Is the specialist able to manage the task in providing adequate financial resources for the industrial arts instructional program?

Family:

1. What factors do the parents perceive as an organizational means to improve the manipulative experiences found in the industrial arts program?

2. Can the parents give a clue as to what manipulative content in the industrial arts program is most appropriate for developing student performance?

3. What perception do the parents have toward methods of motor action in the industrial arts program?

4. What parent performance is required to generate adequate industrial arts program facilities?
5. Are the parents able to generate more funds for financing better industrial arts program?

Community:

1. Can the community organize an industrial arts program which generates greater student involvement?

2. Can the community provide information on the type and level of skill requirement which should be included in the content covered in the industrial arts program?

3. Is the community able to promote an industrial arts program methodology which increases the chances of student performance?

4. Can the community generate industrial arts program facilities which are relevant to its local industrial needs?

5. Is the community able to promote the means to promote and support industrial arts programs which increase student performance?

School Board:

1. Is the school board organized so that it can effectively operationalize an industrial arts instructional program?

2. What perception does the school board have about the sensori-motor content which is found in the industrial arts program?

3. Can the school board provide information about the type of methods relevant for industrial arts programs?

4. Does the school board provide the facilities needed for the industrial arts program?

5. Is the school board able to provide the funds for improving and operating industrial arts programs?

State:

1. What are the state agencies' perception of the correct organizational relationships between overt and covert activities needed for the industrial arts program?
2. Are the state agencies aware of the desirable content which promotes action patterns?

3. Can the state agencies translate the successful industrial arts program methodology from one region to another?

4. Are the state agencies able to promote the proper mental, physical, and emotional set required to increase better industrial arts program facilities?

5. Are the state agencies skilled in translating industrial arts instructional program needs into cost benefits which will develop better student performance?

Federal:

1. Can the federal agencies provide organizational information about manipulative experiences which are found in the industrial arts program?

2. Do the federal agencies' performances allow them to identify and provide content about industrial arts programs?

3. Can the federal agencies provide adequate methods for industrial arts instructional programs?

4. Are the federal agencies' performances in developing adequate industrial arts laboratory facilities in line with needs, interest, and desires for teaching relevant manipulative experiences?

5. Are the federal agencies' performances in supporting and identifying adequate cost in light of present and future needs of industrial arts instructional programs?

University:

1. Can the university provide relevant information about organizational patterns required to improve industrial arts instructional programs?

2. Does the university possess the performance capabilities of identifying and developing relevant industrial arts program content?

3. Does the university's performance enable it to develop and test manipulative industrial arts instructional program methods?
4. Is the university able to identify and develop relevant facilities for industrial arts programs?

5. Is the university able to provide information about the cost of industrial arts instructional programs?

Project Level:

a = information for the project development  
b = information for the local industrial arts project development  

1. (a) Is the project able to organize an operation capable of developing testing and diffusing relevant industrial arts programs? (b) Is the project able to provide organizational information relevant to industrial arts programs?

2. (a) Does the project performance allow it to develop, test, and diffuse relevant industrial arts program content? (b) Is the project able to provide relevant industrial arts program content?

3. (a) Are the project methods of operation adequate to build relevant industrial arts instructional programs? (b) Can the project provide the type of methods relevant to planning, organizing, and controlling an industrial arts instructional program?

4. (a) Does the project's perception of industrial arts facilities enable it to perform adequately in generating instructional improvement? (b) Is the project able to perform the task of developing adequate industrial arts program facilities?

5. (a) Can the project perform its responsibilities of developing, testing, and diffusing industrial arts program information within a reasonable budget? (b) Is the project able to provide cost information about industrial arts instructional programs?
APPENDIX I

CRITERION MEASURES AND RATINGS OF THE SIX THEORETICAL EVALUATION MODELS
CRITERION MEASURES AND RATINGS OF THE SIX THEORETICAL EVALUATION MODELS

Developed Premises
(a rating of 0 to 3 points each)

Evaluation should:

1. be an integral part of overall educational system.
2. be an integral part of any new program from the planning stage on.
3. be a continuous empirical verification of the instructional schema (total school) in relation to stated intents and observed results.
4. provide feedback information for the innovator during program development process and to the educator for adopting new programs.
5. continuously supply information to the decision-maker on how and when the program materials work and what their weaknesses and strengths are.
6. be a fundamental part of program development, not an appendage.
7. function through a feedback mechanism to provide a continuous competence level check on expected criterion behavior that gives constant guidance and direction to (total school) instructional programs.

The Models

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Developed Premises

Evaluation should:

8. help in designing and redesigning of instructional processes and materials.

9. use different evaluation strategies suitable for specific evaluation purposes.

10. be involved with both information and formal data collection and analysis procedures.

11. help improve a program's refinement and future development.

12. evaluate individual program items and their relationship to the total program package.

13. establish goals, collect evidence concerning growth or lack of growth toward goals, make judgment about the evidence, and revise procedures and goals in light of the judgment.

14. be both macro and micro in nature to provide either general or specific information on programs for the decision-maker.

15. use a strategy that includes the functions of feedback, diagnosis, and steering in providing wise judgment and descriptive information to the decision-maker.
Developed Premises

Evaluation should:

16. provide data to help in determining whether to improve, maintain, or terminate an existing program.

17. assess programs during the tryout period as well as at the completion of the development period.

18. seek differential outcomes of the program as it develops that will provide appropriate information as to its strengths and weaknesses under various situations.

19. provide for the clarification of goals and the congruence of the objective-outcome process during and at the end of the program development.

20. be concerned with alternative evaluative strategies, their application to various target populations, and a comparison of their consequences.

Adequately meets the requirements of a logical structure (a rating of 0 to 3 points each)

21. the relationships between major evaluation elements are mutually exclusive.

22. the sum of all evaluation elements are totally inclusive.

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Logical Structure Requirements

23. The evaluation elements fit into a logically identified pattern.

24. The content of the evaluation model must be easily understood and yet fulfill the purpose for which it was developed.

25. Model is graphically represented with boxes, circles, connecting lines, and positions on vertical and horizontal dimensions (a rating of 0 to 3 points).

26. Adequately efficient and economically sound (a rating of 0 to 3 points).

27. Acceptable to the philosophical thoughts of industrial arts instructional programs (a rating of 0 to 3 points). (Can it be communicated?)

28. Effectively able to develop an operational model from the theoretical model (a rating of 0 to 3 points).

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MULTIPLE CRITERION MEASURES FOR EVALUATION
OF SCHOOL PROGRAMS
(BY METFESSEL AND MICHAEL)

I. Indicators of Status or Change in Cognitive and Affective Behaviors of Students in Terms of Standardized Measures and Scales

Standardized achievement and ability tests, the scores on which allow inferences to be made regarding the extent to which cognitive objectives concerned with knowledge, comprehension, understanding, skills, and applications have been attained.

Standardized self inventories designed to yield measures of adjustment, appreciations, attitudes, interests, and temperament from which inferences can be formulated concerning the possession of psychological traits (such as defensiveness, rigidity, aggressiveness, cooperativeness, hostility, and anxiety).

Standardized rating scales and check lists for judging the quality of products in visual arts, crafts, shop activities, penmanship, creative writing, exhibits for competitive events, cooking, typing, letter writing, fashion design, and other activities.

Standardized tests of psychomotor skills and physical fitness.

II. Indicators of Status or Change in Cognitive and Affective Behaviors of Students by Informal or Semiformal Teacher-
made Instruments or Devices

Incomplete sentence technique: categorization of types of responses, enumeration of their frequencies, or rating of their psychological appropriateness relative to specific criteria.

Interviews: frequencies and measurable levels of responses to formal and informal questions raised in a face-to-face interrogation.

Peer nominations: frequencies of selection or of assignment to leadership roles for which the sociogram technique may be particularly suitable.

Questionnaires: frequencies of responses to items in an objective format and numbers of responses to categorized dimensions developed from the content analysis of responses to open-ended questions.

Self-concept perceptions: measures of current status and indices of congruence between real self and ideal self - often determined from use of the semantic differential or Q-sort techniques.

Self-evaluation measures: student's own reports on his perceived or desired level of achievement, on his perceptions of his personal and social adjustment, and on his future academic and vocational plans.

Teacher-devised projective devices such as casting characters in the class play, role playing, and picture interpretation based on an informal scoring model that
usually embodies the determination of frequencies of the occurrence of specific behaviors, or ratings of their intensity or quality.

**Teacher-made achievement tests** (objective and essay), the scores on which allow inferences regarding the extent to which specific instructional objectives have been attained.

**Teacher-made rating scales and check lists of observation of classroom behaviors**: performance levels of speech, music, and art; manifestation of creative endeavors, personal and social adjustment, physical well being. Teacher-modified forms (preferably with consultant aid) of the semantic differential scale.

### III. Indicators of Status or Change in Student Behavior Other than Those Measured by Tests, Inventories, and Observation Scales in Relation to the Task of Evaluating Objectives of School Programs

**Absences**: full-day, half-day, and other selective indices pertaining to frequency and duration of lack of attendance.

**Anecdotal records**: critical incidents noted including frequencies of behaviors judged to be highly undesirable or highly deserving of commendation.

**Appointments**: frequencies with which they are kept or broken.

**Articles and stories**: numbers and types published in
school newspapers, magazines, journals, or proceedings of student organizations.

Assignments: numbers and types completed with some sort of quality rating or mark attached.

Attendance: frequency and duration when attendance is required or considered optional (as in club meetings, special events, or off-campus activities).

Autobiographical data: behaviors reported that could be classified and subsequently assigned judgmental values concerning their appropriateness relative to specific objectives concerned with human development.

Awards, citations, honors, and related indicators of distinctive or creative performance: frequency of occurrence or judgments of merit in terms of scaled values.

Books: numbers checked out of library, numbers renewed, numbers reported read when reading is required or when voluntary.

Case histories: critical incidents and other passages reflecting quantifiable categories of behavior.

Changes in program or in teacher as requested by student: frequency of occurrence.

Choices expressed or carried out: vocational, avocational, and educational (especially in relation to their judged appropriateness to know physical, intellectual, emotional,
social, aesthetic, interest, and other factors).

Citations: commendatory in both formal and informal media of communication such as in the newspaper, television, school assembly, classroom, bulletin board, or elsewhere (see Awards).

Contact: frequency or duration of direct or indirect communications between persons observed and one or more significant others with specific reference to increase or decrease in frequency or to duration relative to selected time intervals.

Disciplinary actions taken: frequency and type.

Dropouts: numbers of students leaving school before completion of program of studies.

Elected positions: numbers and types held in class, student body, or out-of-school social groups.

Extracurricular activities: frequency or duration of participation in observable behaviors amenable to classification such as taking part in athletic events, charity drives, cultural activities, and numerous service-related avocational endeavors.

Grade placement: the success or lack of success in being promoted or retained; number of times accelerated or skipped.

Grade point average: including numbers of recommended units of course work in academic as well as in non-college preparatory programs.
Grouping: frequency and/or duration of moves from one instructional group to another within a given class grade.

Homework assignments: punctuality of completion, quantifiable judgments of quality such as class marks.

Leisure activities: numbers and types of; times spent in; awards and prizes received in participation.

Library card: possessed or not possessed; renewed or not renewed.

Load: numbers of units or courses carried by students.

Peer group participation: frequency and duration of activity in what are judged to be socially acceptable and socially undesirable behaviors.

Performance: awards, citations received; extra credit assignments and associated points earned; numbers of books or other learning materials taken out of the library; products exhibited at competitive events.

Recommendations: numbers of and judged levels of favorableness.

Recidivism by students: Incidents (presence or absence or frequency of occurrence) of a given student's returning to a probationary status, to a detention facility, or to observable behavior patterns judged to be socially undesirable (intoxicated state, dope addition, hostile acts including arrests, sexual deviation).

Referrals: by teacher to counselor, psychologist, or
administrator for disciplinary action, for special aid in overcoming learning difficulties, for behavior disorders, for health defects or for part-time employment activities.

Referrals: by student himself (presence, absence, or frequency).

Service points: numbers earned.

Skills: demonstration of new or increased competencies such as those found in physical education, crafts, homemaking, and the arts that are not measured in highly valid fashion by available tests and scales.

Social mobility: numbers of times student has moved from one neighborhood to another and/or frequency with which parents have changed jobs.

Tape recordings: critical incidents contained and other analyzable events amenable to classification and enumeration.

Tardiness: frequency of.

Transiency: Incidents of

Transfers: numbers of students entering school from another school (horizontal move).

Withdrawal: numbers of students withdrawing from school or from a special program (see Dropouts).

IV. Indicators of Status or Change in Cognitive and Affective Behaviors of Teachers and Other School Personnel in Relation to the Evaluation of School Programs
Articles: frequency and types of articles and written documents prepared by teachers for publication or distribution.

Attendance: frequency of, at professional meetings or at inservice training programs, institutes, summer schools, colleges and universities (for advanced training) from which inferences can be drawn regarding the professional person's desire to improve his competence.

Elective offices: numbers and types of appointments held in professional and social organizations.

Grade point average: earned in postgraduate courses.

Load carried by teacher: teacher-pupil or counselor-pupil ratio.

Mail: frequency of positive and negative statements in written correspondence about teachers, counselors, administrators, and other personnel.

Memberships including elective positions held in professional and community organization: frequency and duration of association.

Model congruence index: determination of how well the actions of professional personnel in a program approximate certain operationally-stated judgmental criteria concerning the qualities of a meritorious program.

Moonlighting: frequency of outside jobs and time spent in these activities by teachers or other school personnel.
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Attendance: frequency of, at professional meetings or at inservice training programs, institutes, summer schools, colleges and universities (for advanced training) from which inferences can be drawn regarding the professional person's desire to improve his competence.

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Memberships including elective positions held in professional and community organization: frequency and duration of association.

Model congruence index: determination of how well the actions of professional personnel in a program approximate certain operationally-stated judgmental criteria concerning the qualities of a meritorious program.

Moonlighting: frequency of outside jobs and time spent in these activities by teachers or other school personnel.
Nominations by peers, students, administrators or parents for outstanding service and/or professional competencies: frequency of.

Rating scales and check lists (e.g., graphic rating scales or the semantic differential) of operationally-stated dimensions to teachers' behaviors in the classroom or of administrators' behaviors in the school setting from which observers may formulate inferences regarding changes of behavior that reflect what are judged to be desirable gains in professional competence, skills, attitudes, adjustment, interests and work efficiency; the perceptions of various members of the total school community (parents, teachers, administrators, counselors, students, and classified employees) of the behaviors of other members may also be obtained and compared.

Records and reporting procedures practiced by administrators, counselors and teachers: judgments of adequacy by outside consultants.

Termination: frequency of voluntary or involuntary resignation or dismissals of school personnel.

Transfers: frequency of requests of teachers to move from one school to another.

V. Indicators of Community Behaviors Relation to the Evaluation of School Programs

Alumni participation: numbers of visitations, extent of
involvement in PTA activities, amount of support of a tangible (financial) or a service nature to a continuing school program or activity.

Attendance at special school events, at meetings of the board of education, or at other group activities by parents: frequency of.

Conferences of parent-teacher, parent-counselor, parent-administrator sought by parents: frequency of request.

Conferences of the same type sought and initiated by school personnel: frequency of requests and record of appointments kept by parents.

Interview responses amenable to classification and quantification.

Letters (mail): frequency of requests for information, materials, and servicing.

Letters: frequency of praiseworthy or critical comments about school programs and services and about personnel participating in them.

Participant analysis of alumni: determination of locale of graduates, occupation, affiliation with particular institutions, or outside agencies.

Parental response to letters and report cards upon written or oral request by school personnel: frequency of compliance by parents.

Telephone calls from parents, alumni, and from personnel in communications media (e.g., newspaper reporters):
frequency, duration, and quantifiable judgments about statements monitored from telephone conversations.

**Transportation requests:** frequency of.
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