1986

A systems model for developing undergraduate industrial teacher education programs in Nigeria

Godfrey Ifeanyi Nwoke

Iowa State University

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A SYSTEMS MODEL FOR DEVELOPING UNDERGRADUATE INDUSTRIAL TEACHER EDUCATION PROGRAMS IN NIGERIA

Iowa State University

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Ph.D. 1986
A systems model for developing undergraduate industrial teacher education programs in Nigeria

by

Godfrey Ifeanyi Nwoke

A Dissertation Submitted to the Graduate Faculty in Partial Fulfillment of the Requirements for the Degree of DOCTOR OF PHILOSOPHY

Department: Industrial Education and Technology
Major: Industrial Education and Technology (Industrial Education)

Approved:

Signature was redacted for privacy.

In Charge of Major Work

Signature was redacted for privacy.

For the Major Department

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For the Graduate College

Iowa State University
Ames, Iowa
1986
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Statement of the Problem</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Purpose of the Study</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Need for the Study</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Questions of the Study</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Hypotheses to be Tested</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Assumptions of the Study</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Delimitation of the Study</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Outline of Procedure</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>Definition of Terms</td>
<td>14</td>
</tr>
<tr>
<td>II</td>
<td>Literature Review</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Curriculum Development Theory</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Curriculum Development Models</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>Pre-service Teacher Education Programs</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td>Industrial Teacher Education</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>Industrial and Technical Teacher Education in Nigeria</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>Relationship of the Literature to the Present Study</td>
<td>83</td>
</tr>
<tr>
<td>III</td>
<td>Methodology</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>The Proposed Systems Model</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>Definition of the Population and Selection of Sample</td>
<td>94</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td>Development of the instrument</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>Validation and Pilot-testing of Instrument</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>Data Collection</td>
<td>97</td>
<td></td>
</tr>
<tr>
<td>Data Analysis</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>CHAPTER IV. FINDINGS</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td>General Characteristics of the Sample</td>
<td>106</td>
<td></td>
</tr>
<tr>
<td>Perceptions on the Importance of Degree Programs in Industrial and Technical Teacher Education</td>
<td>109</td>
<td></td>
</tr>
<tr>
<td>Research Hypotheses</td>
<td>113</td>
<td></td>
</tr>
<tr>
<td>CHAPTER V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS</td>
<td>142</td>
<td></td>
</tr>
<tr>
<td>Summary</td>
<td>142</td>
<td></td>
</tr>
<tr>
<td>Conclusions</td>
<td>144</td>
<td></td>
</tr>
<tr>
<td>Conclusions Relating to Research Hypotheses/Questions</td>
<td>144</td>
<td></td>
</tr>
<tr>
<td>Conclusions Relating to Program Organization and Administration</td>
<td>159</td>
<td></td>
</tr>
<tr>
<td>Recommendations</td>
<td>165</td>
<td></td>
</tr>
<tr>
<td>REFERENCES</td>
<td>167</td>
<td></td>
</tr>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>178</td>
<td></td>
</tr>
<tr>
<td>APPENDIX A. LETTERS OF CORRESPONDENCE</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>APPENDIX B. LETTERS OF TRANSMITTAL AND QUESTIONNAIRE</td>
<td>186</td>
<td></td>
</tr>
<tr>
<td>APPENDIX C. MAP OF NIGERIA SHOWING THE 19 STATES</td>
<td>196</td>
<td></td>
</tr>
<tr>
<td>APPENDIX D. SUMMARY OF ANALYSIS OF VARIANCE (PROC GLM) RELATED TO QUESTION 1 OF THE STUDY</td>
<td>198</td>
<td></td>
</tr>
<tr>
<td>APPENDIX E. SUMMARY OF ANALYSIS OF VARIANCE (PROC GLM) RELATED TO QUESTION 2 OF THE STUDY</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Appendix</td>
<td>Description</td>
<td>Page</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>F</td>
<td>SUMMARY OF ANALYSIS OF VARIANCE (PROC GLM) Related to Question 3 of the Study</td>
<td>203</td>
</tr>
<tr>
<td>G</td>
<td>SUMMARY OF ANALYSIS OF VARIANCE (PROC GLM) Related to Question 4 of the Study</td>
<td>205</td>
</tr>
<tr>
<td>H</td>
<td>SUMMARY OF ANALYSIS OF VARIANCE (PROC GLM) Related to Question 5 of the Study</td>
<td>207</td>
</tr>
<tr>
<td>I</td>
<td>SUMMARY OF ANALYSIS OF VARIANCE (PROC GLM) Related to Other Aspects of Program Development in Industrial and Technical Teacher Education in Nigeria</td>
<td>210</td>
</tr>
</tbody>
</table>
LIST OF TABLES

Table 1. Number of graduate teachers produced in industrial education within Nigeria 1980-1984 6
Table 2. Number of questionnaire returns by group 99
Table 3. Distribution of the respondents by group 106
Table 4. Distribution of respondents by location 107
Table 5. Highest educational qualifications of respondents 108
Table 6. Means, standard deviations, and analysis of variance relating to program administration 110
Table 7. Means, standard deviations, and analyses of variance of perceived importance of areas of specialization 112
Table 8. Mean ratings, standard deviations, and analyses of variance relating to the importance of objectives 114
Table 9. Mean item ratings, standard deviations and analyses of variance relating to the importance of components to be emphasized in programs 116
Table 10. Mean item ratings, standard deviations, and analyses of variance relating to content determination 127
Table 11. Mean item ratings, standard deviations and analyses of variance relating to content organization 128
Table 12. Mean item ratings, standard deviations, and analyses of variance relating to the importance of competencies to be emphasized in programs 130
Table 13. Mean proportions, standard deviations and analyses of variance relating to responsibility for curriculum planning 136
Table 14. Mean proportions, standard deviations, and analyses of variance relating to participants at the institutional level 137

Table 15. Means, standard deviations and analyses of variance relating to program duration 139

Table 16. Means, standard deviations, and analyses of variance by group relating to required years of industrial experience 139

Table 17. Frequencies and percentages of respondents indicating choice of method of acquiring experience 140

Table 18. Analysis of variance relating to the importance of objectives to be pursued in the programs 199

Table 19. Analysis of variance relating to the program components to be emphasized 201

Table 20. Analysis of variance relating to the determination of content in industrial teacher education 204

Table 21. Analysis of variance relating to organization of content of prevocational teacher education programs 204

Table 22. Analysis of variance relating to the importance of identified competencies 206

Table 23. Analysis of variance relating to the distribution of responsibility for curriculum planning 208

Table 24. Analysis of variance relating to the proportion of involvement of participants at the institutional level 208

Table 25. Analysis of variance relating to the importance of degree programs 211

Table 26. Analysis of variance relating to the importance of identified areas of specialization 211

Table 27. Analysis of variance relating to extent of agreement with statements on program administration 212
Table 28. Analysis of variance relating to required period of industrial experience 212
Table 29. Analysis of variance relating to method of acquiring industrial work experience 213
Table 30. Analysis of variance relating to duration of degree programs 213
# List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tyler's Conceptual Framework (Adapted)</td>
<td>32</td>
</tr>
<tr>
<td>2</td>
<td>Preparation Phase of Mager and Beach's Model (1967)</td>
<td>54</td>
</tr>
<tr>
<td>3</td>
<td>General systems model (Hacker and Barden, 1983, adapted)</td>
<td>65</td>
</tr>
<tr>
<td>4</td>
<td>Model of an Instructional Systems Design (Banathy, 1977, p. 401, adapted)</td>
<td>67</td>
</tr>
<tr>
<td>5</td>
<td>A proposed general systems model for undergraduate industrial teacher education curriculum development in Nigeria</td>
<td>89</td>
</tr>
<tr>
<td>6</td>
<td>Model for undergraduate industrial and technical teacher education programs in Nigeria</td>
<td>90</td>
</tr>
<tr>
<td>7</td>
<td>Scatterplot of the mean item responses (on the transformed scale) of groups 1 (DEOs) and 2 (teacher educators) regarding the program components to be emphasized</td>
<td>119</td>
</tr>
<tr>
<td>8</td>
<td>Scatterplot of the mean item responses (on the transformed scale) of groups 1 (DEOs) and 3 (graduate students) regarding the program components to be emphasized</td>
<td>120</td>
</tr>
<tr>
<td>9</td>
<td>Scatterplot of the mean item responses (on the transformed scale) of groups 1 (DEOs) and 4 (technical teachers) regarding the program components to be emphasized</td>
<td>121</td>
</tr>
<tr>
<td>10</td>
<td>Scatterplot of the mean item responses (on the transformed scale) of groups 2 (teacher educators) and 3 (graduate students) regarding the program components to be emphasized</td>
<td>122</td>
</tr>
<tr>
<td>11</td>
<td>Scatterplot of the mean item responses (on the transformed scale) of groups 2 (teacher educators) and 4 (technical teachers) regarding the program components to be emphasized</td>
<td>123</td>
</tr>
</tbody>
</table>
Figure 12. Scatterplot of the mean item responses (on the transformed scale) of groups 3 (graduate students) and 4 (technical teachers) regarding the program components to be emphasized 124

Figure 13. Scatterplot of the mean item responses (on the transformed scale) of groups 1 (DEOs) and 3 (graduate students) regarding the broad competencies to be emphasized 131

Figure 14. Scatterplot of the mean item responses (on the transformed scale) of groups 1 (DEOs) and 4 (technical teachers) regarding the broad competencies to be emphasized 132

Figure 15. Scatterplot of the mean item responses (on the transformed scale) of groups 2 (teacher educators) and 3 (graduate students) regarding the broad competencies to be emphasized 133

Figure 16. Scatterplot of the mean item responses (on the transformed scale) of groups 2 (teacher educators) and 4 (technical teachers) regarding the broad competencies to be emphasized 134

Figure 17. Revised proposed model for undergraduate industrial and technical teacher education programs in Nigeria 164
Nigeria emerged from the British rule in October 1960. Shortly after independence, the relevance of the educational system which the country inherited from Britain began to be questioned in relation to national, social and economic needs. The secondary schools, for example, produced graduates who could not be employed because they did not possess employable skills. The result was that secondary school graduates roamed the big cities whereas the nation's industries suffered from shortages of skilled labor.

In response to growing public disenchantment with the educational system, a national curriculum conference was held in 1969. Subsequent to the 1969 conference, a National Policy on Education was formulated by the Federal Government in 1977. A prominent feature of the new policy was a six-year secondary education system consisting of three years of junior secondary and three years of senior secondary education. Hitherto, secondary education in Nigeria was of five-year duration and was essentially of the grammar-school type.

In order to achieve the objectives of the new educational policy, one of which was to "... equip students to live effectively in our modern age of science and technology. . ." (Federal Republic of Nigeria, 1981a, p. 16), the government proposed among other things that:

(a) The junior secondary school will be both
prevocational and academic.

(b) Students who leave school at the junior high school stage may then go on to an apprenticeship system or some other scheme of out-of-school vocational training.

(c) The senior secondary school will be for those able and willing to have a complete six-year secondary education. It will be comprehensive but will have a core curriculum designed to broaden pupils' knowledge and outlook.

(d) The implementation of the three-year senior secondary school will mean "... the inclusion of technical, commercial and other vocational courses in order to make senior secondary school leavers immediately employable" (Federal Republic of Nigeria, 1981a, p. 18).

The implementation of the National Policy on Education at the secondary level became operational in 1982. But because of previous lack of emphasis on vocational and technical education in Nigeria, the scheme is facing serious problems. In particular, the country lacks qualified technical teachers for the vocational courses. In recognition of this problem, the policy document stated: "Crash and emergency programmes will be mounted to produce a large number of science, commercial, technical and craft teachers" (Federal Republic of Nigeria, 1981a, p. 20).
One of the emergency measures embarked upon by the government to meet the high demand for technical teachers was to send Nigerian teachers to overseas institutions for in-service education. This measure, like previous and similar ad hoc educational programs undertaken in the country, has its limitations. First, the number of teachers that could be trained by this method is limited by availability of funds. Not all qualified applicants can benefit from the program because of scarce foreign reserves. A second, and probably more serious, problem is that the training acquired overseas by these teachers may find little local application—a major problem that beset the technical crash programs undertaken by the Federal Government in the 1970s.

There are currently about 20 three-year institutions that offer non-degree programs in industrial and technical teacher education in Nigeria. There is also a department in one of the nation's sixteen universities that offers a degree program in industrial and technical teacher education. Perhaps it may prove more economical and technically expedient to expand and strengthen local institutions and their curricula so that adequate numbers of qualified teachers could be trained locally.

The problems of vocational and technical education in Nigeria have been discussed by several writers (e.g., Fafunwa, 1974; Aghenta, 1982; and Aina and Beecroft, 1982). Okoro (1979) noted that students of vocational and technical institutions in Nigeria were still required to memorize British
Building Codes which had no useful application under Nigerian climatic conditions.

Based upon the premise that the teacher is the key element in any educational program, Aina and Beecroft (1982) blamed the poor performance of Nigerian vocational school graduates on the quantity and quality of the nation's technical teachers. These writers expressed concern over the quality of instruction in our technical teacher education institutions. According to Aina and Beecroft (1982),

The course structure and content in most of these institutions are not the most ideal for our circumstances. Most of them rely on a model based on foreign environments where the trainees grow up surrounded by various marvels of technology (p. 355).

If it is accepted that the teacher occupies a key position in the educational enterprise, and if teaching is to be improved, it is important to investigate and question the teacher preparation programs from which teachers emerge. This is particularly necessary if there is any doubt regarding the effectiveness and adequacy of such programs.

**Statement of the Problem**

The success of any educational system depends on its ability to satisfy the changing needs and purposes for which it was established (Banathy, 1973). Industrial and technical teacher education programs in Nigeria should be made responsive to the growing need for qualified and competent technical teachers. It is important, however, that any effort toward
the establishment of new programs or the revision of existing ones must be based upon some framework or model designed in line with the country's needs.

The problem of this study is to investigate the variety of current models available for the preparation of industrial and technical teacher education programs and to develop a proposed model for implementation in Nigerian teacher preparation programs.

Purpose of the Study

The purpose of this study is to obtain comprehensive information from administrators, teacher educators, technical teachers and graduate students of industrial education programs that could be used to formulate a model for developing undergraduate industrial and technical teacher education programs in Nigeria.

Need for the Study

The problem of supply and demand of qualified industrial and technical teachers in Nigeria has both qualitative and quantitative dimensions. Quantitatively, Aina and Beecroft (1982) noted that six colleges offering technical teacher education programs in Nigeria, as of 1978, combined to produce a total of 226 teachers in that year. Furthermore, the only degree program at the university level graduated an average of 13 industrial and technical teachers annually between 1980
and 1984.

Table 1. Number of graduate teachers produced in industrial education within Nigeria 1980-1984

<table>
<thead>
<tr>
<th>Year</th>
<th>No. of graduates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979/80</td>
<td>9</td>
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<tr>
<td>1980/81</td>
<td>9</td>
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<tr>
<td>1981/82</td>
<td>12</td>
</tr>
<tr>
<td>1982/83</td>
<td>20</td>
</tr>
<tr>
<td>1983/84</td>
<td>15</td>
</tr>
</tbody>
</table>

Source: Department of Vocational Teacher Education
University of Nigeria, Nsukka

It has been observed that a common consequence of shortages in the field of education is the lowering of certification standards. Adamsky and Cotrell (1979) pointed out that this has been the practice in trade and industrial education for many years. It is proposed in Nigeria's new educational policy that "Where necessary, local craftsmen will be used to teach pupils" (Federal Republic of Nigeria, 1981a, p. 20). This is a further illustration of the challenge facing industrial and technical teacher education in Nigeria today.

According to Adamsky and Cotrell (1979), "When people who have little or no previous formal teacher preparation are recruited as teachers, the question of quality attracts attention" (p. 13).

In qualitative terms, Okoro (1979) observed that the present curricula of vocational teacher education in Nigeria were designed by American educators based upon a system that has been found to be effective in the United States. "There is
no proof that the present programs are effective in meeting the needs of Nigeria" (Okoro, 1979, p. 12). In a study of the vocational teacher education program at the University of Nigeria, Nsukka, Oranu (1977) found that the graduates of the program were of the opinion that the technical courses did not give them adequate preparation.

It was envisaged that once the six-year secondary education system became operational, the Nigerian Certificate of Education (NCE) would ultimately become the minimum basic qualification for entry into the teaching profession in the country. That is, the bulk of secondary school teachers will be university graduates and holders of the NCE. The feasibility of attaining this goal was questioned by the Bagauda Seminar on the implementation of the educational policy (Nigeria Education Research Council (NERC), 1980). The Seminar noted that:

The graduate teachers for the senior secondary school hypothesized in the national policy are largely non-existent. The technological streams in particular cannot take off until the (Bachelor of Technology) B. Tech. (Education) emerge from the colleges of education. The crop of B.Sc (Engineering) we have cannot give the technological training we want, because they do not have it. Overseas recruitment may help a little but no modern nation can spare these classes of teachers (NERC, 1980, p. 78).

The need for more industrial and technical teacher education programs at the undergraduate level in Nigeria is a national problem and to meet that need should be considered a national priority. A single university department cannot
supply all the teachers required for the implementation of the vocational and prevocational programs stipulated by the educational policy. New undergraduate programs for industrial and technical teacher preparation should be established and the existing one expanded and revised.

Apparently, many Nigerian universities are reluctant to establish departments of vocational and technical education. Okoro (1979) blamed this reluctance on the conservatism of Nigerians educated in British universities who think that vocational education has no place in the university. Another likely explanation for this attitude might be that there is no successful local program or model from which the other universities can learn or adopt. The establishment of vocational and technical programs at any level can be quite costly and so, few institutions may be willing to "risk" a new program without proper guidelines based upon successful models. The existing programs in Nigeria have been operating, more or less, on what Adamsky and Cotrell (1979) called "... tradition, conventional wisdom and personal experience" (p. 8).

Success in program or curriculum development is usually unpredictable if based on tradition because adequate information about resources, personnel, and community needs will be lacking for decision-making. There is, therefore, need for a valid and systematic approach to planning and developing undergraduate industrial and technical teacher education programs in Nigerian universities and colleges of education. The
importance of such an approach has been emphasized by Finch and Crunkilton (1984) who stated: "Any curriculum that is not developed systematically, or that becomes irrelevant, will soon have an adverse effect on all who come in contact with it" (p. 16). By providing a framework for establishing future industrial and technical teacher education in Nigeria and for revising existing ones, this study would have contributed toward the realization of the principal goals of the national policy on education.

Questions of the Study

The present study seeks answers to the following questions:

1. What should be the general objectives of an industrial and technical teacher education program at the undergraduate level in Nigeria?
2. What program components need emphasis in Nigerian industrial and technical teacher education programs?
3. What curriculum development approaches should be emphasized in developing undergraduate industrial and technical teacher education programs in Nigeria?
4. What are the broad competencies to be emphasized in the programs?
5. Who should be involved in industrial and technical teacher education curriculum development in Nigeria?
6. Do differences exist between the perceptions of administrators, teacher educators, technical teachers, and graduate students of industrial education regarding questions 1-5 of this study?

Hypotheses to be Tested

1. There is no significant difference in perception between administrators (DEOs), teacher educators, technical teachers, and graduate students regarding the objectives to be sought in industrial and technical teacher education programs in Nigeria.
   \[ H_{01}: \alpha_j = 0 \text{ for all } j \text{ groups, where } j=1,2,3,4 (\alpha=.05) \]

2. There is no significant difference in the perceptions of DEOs, teacher educators, technical teachers, and graduate students regarding the program components to be emphasized in industrial and technical teacher education curriculum development.
   \[ H_{02}: \alpha_j = 0 \text{ for all } j \text{ groups, where } j=1,2,3,4 (\alpha=.05) \]

3. There is no significant difference in the mean ratings of DEOs, teacher educators, technical teachers, and graduate students regarding the curriculum approach to be emphasized in industrial and technical teacher education programs.
   \[ H_{03}: \alpha_j = 0 \text{ for all } j \text{ groups, where } j=1,2,3,4 (\alpha=.05) \]

4. There is no significant difference in the perceptions of DEOs, teacher educators, technical teachers, and
graduate students regarding the competencies considered to be important in industrial and technical teacher education programs.

\[ H_{0:4} : \alpha_j = 0 \text{ for all } j \text{ groups, where } j = 1, 2, 3, 4 \text{ (a=.05)}. \]

5. There is no significant difference in perception between DEOs, teacher educators, technical teachers, and graduate students regarding the participants to be involved in program development.

\[ H_{0:5} : \alpha_j = 0 \text{ for all } j \text{ groups, where } j = 1, 2, 3, 4 \text{ (a=.05)}. \]

Assumptions of the Study

The following assumptions have been made in the design of this study:

1. An adequate supply of industrial and technical teachers with at least bachelor's degrees is essential to the implementation of Nigeria's education policy.

2. The lack of a program model designed in line with Nigeria's needs accounts for the inadequate supply of qualified industrial and technical teachers in Nigeria.

3. The systems model formulated in this study will enable Nigerian educators and administrators to develop new programs and to revise existing ones.

4. Heads of departments of vocational and technical education programs and their faculty as well as secondary school teachers will be willing to participate
in this study.

5. Nigerian graduate students of industrial education in the United States will be willing to participate in this study.

6. The opinions and perceptions of the groups identified for this study would provide sufficient basis for formulating a model teacher education in Nigeria.

7. The respondents are knowledgeable about the status and problems of industrial and technical teacher education curriculum development in Nigeria.

8. The methods of data collection and analysis used in this study are appropriate for the study.

Delimitation of the Study

1. The model proposed in this study is meant for pre-service undergraduate industrial and technical teacher education program development in Nigeria.

2. The results of this study are generalizable only to the 19 states in the Federal Republic of Nigeria.

3. The program objectives, approaches, components, and teacher competencies identified in this study are provided as guidelines and do not represent everything that should go into a teacher education program. Since institutional settings differ, elements of the model would need to be modified to suit particular settings.
4. Even though the results of this study are intended to be generalized to existing and future programs, data collection would be restricted to those programs or institutions currently existing.

5. This study recognized that the input of some other groups than those identified for study might be useful in a study of this nature; these other groups, for example, students enrolled in the teacher education programs in Nigeria, employers, and school principals, could not be included in the study because of cost and time limitations.

Outline of Procedure

The following procedure was adopted in conducting this study:

1. Review the literature on curriculum theories, curriculum models, and industrial and technical teacher education.

2. Identify institutions involved in industrial and technical teacher education in Nigeria.

3. Write proposal and develop questionnaire for the study.

4. Write letters to head of departments of institutions in Nigeria, as well as secondary school teacher representatives to solicit their participation and that of their faculty.
5. Validate instrument using a panel of experts.
6. Revise instrument based upon the recommendations of the panel.
7. Present proposal to investigator's graduate committee.
8. Pilot-test the instrument with a sample of Nigerian graduate students of industrial education at Iowa State University.
9. Revise instrument based upon the results of the pilot test.
10. Mail the questionnaires to heads of departments and technical teachers in Nigeria and to Nigerian graduate students in the United States.
11. Follow-up with additional questionnaires and letters in case of inadequate returns of initial questionnaires.
12. Collect data and code them on computer cards.
13. Analyze data.
14. Write final report and make recommendations.
15. Final oral examinations.

Definition of Terms

The following terms are defined in the context they have been used in this study:

Curriculum: Used synonymously with program -- a general overall plan of the content or specific materials of
instruction that the school should offer the student by way of qualifying him or her for graduation in a professional or vocational field (Dictionary of Education, 1973, p. 157).

**General Certificate of Education (GCE O/L):** A certificate awarded by the West African Examinations Council to high school graduates or individuals who pass examinations offered by the Council in academic subjects.

**Industrial and technical teacher education:** Used interchangeably with vocational teacher education (trade and industrial) -- those activities needed to assist prospective teachers in securing the professional knowledge, abilities, and appreciation that will enable them to qualify for employment or advancement as industrial and technical teachers (Roberts, 1971, p. 176).

**Model:** A graphic representation of a phenomenon or process which is comprised of several integrated parts (Peters, 1981, p. 6).

**Nigerian Certificate of Education (NCE):** A professional teaching certificate awarded to graduates of College of Education in Nigeria after successful completion of three years of teacher training. An NCE holder requires two or more years of further education to receive a bachelor's degree in Nigeria.

**Program development:** Used synonymously with curriculum development -- it involves the development of educational goals and objectives, identification of problems from documented needs, identification of possible strategies and tools
for attaining objectives, implementation of identified strategies and evaluation of program process and product (Bowen, 1982, p. 5).

**Systems approach:** A system is the sum total of parts working independently and working together to achieve results or outcomes, based upon needs. The systems approach, as used in education, is a logical problem-solving process for identifying and resolving important educational problems (Kaufman, 1972, p. 2).

**Technical education:** In the Nigeria context, it is defined as that aspect of education which leads to the acquisition of practical and applied skills as well as basic scientific knowledge (Federal Republic of Nigeria, 1981a, p. 28).

**Technical teachers:** These comprise one group of subjects for this study. They include teachers of industrial and technical subjects in Nigerian secondary schools and technical colleges (vocational high schools).

**Technical Teachers' Certificate:** This is a certificate awarded to persons who have completed one year of teacher training aimed at preparing them for teaching the occupational skills they already have. Entrants into the training programs are usually skilled craftspersons.
CHAPTER II. LITERATURE REVIEW

In this chapter, the literature and previous research related to the present study are reviewed. Broadly, the review focused on the following:

1. Curriculum development theory;
2. Curriculum development models;
3. Pre-service teacher education;
4. Industrial and technical teacher education; and
5. Industrial and technical teacher education in Nigeria.

A discussion of how the literature reviewed related to the present study and a summary of the review are provided toward the end of the chapter.

Curriculum Development Theory

The search for ways and means of making educational programs more effective and meaningful has been an important preoccupation of renowned educators over the years. Efforts have ranged from creating curricula that are child-centered (Dewey, 1940; Kilpatrick, 1983) and humanistic (Peters, 1981) to practical considerations in curriculum building (Tyler, 1949; Taba, 1962; Schwab, 1978). Consequently, the curriculum field appears replete with prescriptions on how to translate curriculum policies into functional programs. Although this seems to be a healthy situation for the field,
Short (1983) explained that the existence of multiple forms of curriculum development is due to the fact that

... curriculum decisions, unlike those in the technologies associated with natural science, are not governed by fixed variables and regularities in their interactions but are largely matters open at every step to social and moral choice (p. 44).

Implicit in Short's statement is that curriculum development is value-based and lacks the kind of objectivity characteristic of the physical sciences. This point of view is shared by Islam (1985) who suggested that the curriculum developer's beliefs and the assumptions he or she makes about the curriculum determine the curriculum approach to be adopted.

Rather than be guided blindly by personal values and interests, most curriculum experts (e.g., McCutcheon, 1982; Beauchamp, 1982; and Vallance, 1982) seemed to be agreed that curriculum development should be grounded upon defensible theories. Unfortunately, as the writings of these experts show, there exists little or no theory upon which to base curriculum practice. But as Tanner and Tanner (1980) indicated, "Practice in the absence of theory has limited applicability to wider and novel conditions... theory is in the end the most practical of all things" (p. 96).

McCutcheon (1982) defined curriculum theory as "... an integrated cluster of sets of analyses, interpretations, and understandings of curricular phenomena" (p. 19). The author suggested that a curriculum theory should meet certain criteria:
1. It should be open to challenge, both in terms of evidence supporting the theory and in terms of the line of reasoning - how the analyses, interpretations, and understandings are assembled, juxtaposed, ordered or strung together. In other words, researchers must be able to refute or support the theory through studies; otherwise, the work is not a theory.

2. It must be based upon a strong value base, and must draw from multiple disciplines (McCutcheon, 1982, p. 19).

McCutcheon further noted that it had been difficult to develop a theory of curriculum development because no examples or models exist. It is, therefore, "... difficult to envision what one would look like, what it would take into consideration, and how it would be written" (p. 22).

Wolansky and DuVall (1975) stressed the importance of theory in curriculum development. But according to the authors,

... after a decade of concerted effort, too few people have studied theoretical aspects of curriculum as bases for understanding curriculum development. Research on the curriculum restructuring process can be conducted only on the basis of some theoretical framework (Wolansky and DuVall, 1975, p. 56).

The argument that the curriculum field lacks a firm theoretical foundation was also supported by Beauchamp (1982) whose opinion about the situation sounded even less
encouraging. Beauchamp (1982, p. 24) stated:

Theory building in the field of curriculum is in some-what of a shambles. Despite the amount of writing and talk about curriculum theory that has been put forth in the last two decades, there are no extant curriculum theories to which we can look for models.

Beauchamp, however, pointed out that further work on curriculum theory would improve communication among potential and existing scholars in the field. In addition, he believed that well-formulated curriculum theories would function as guiding forces for practitioners in school systems who are involved in planning, implementation, and evaluation of curricula in their local settings.

While the authors cited so far showed concern for the lack of theory in curriculum development, Schwab (1978) seemed to be opposed to the idea of curriculum developers meddling with theory. In Schwab's opinion, the task of curriculum building is a practical one; therefore, the curriculum field would be better off if it dissociated itself from theoretical pursuits. He blamed most grave curricular and educational problems on the "... inveterate, unexamined, and mistaken reliance on theory" (Schwab, 1978, p. 287) largely borrowed from subjects outside the field of education. Schwab further argued:

In the first place, theoretical constructions are, in the main, ill-fitted and inappropriate to problems of actual teaching and learning. Theory by its very character, does not and cannot take account of all the matters which are crucial to questions of what, who,
and how to teach; that is, theories cannot be applied as principles to the solution of problems concerning what to do with or for real individuals, small groups, or real institutions located in time and space - the subjects and clients of schooling and schools (Schwab, 1978, p. 287).

Schwab, therefore, proposed that curriculum workers approach the curriculum task through the method of the practical which is deliberation as opposed to the inductive and deductive methods of theoretical inquiry. He emphasized that the practical approach is neither inductive nor deductive.

It cannot be inductive because the target of the method is not a generalization or explanation, but a decision about action in a concrete situation.

It cannot be deductive because it deals with the concrete case and not abstractions from cases, and the concrete case cannot be settled by mere application of a principle, for almost every concrete case falls under two or more principles. . . (Schwab, 1978, p. 318).

Following Schwab's advocacy of the practical approach to curriculum development, one might be tempted to conclude that he did not see the place of theory in dealing with curricular issues. But that is not the case. In fact, Schwab proposed two other modes of curriculum operation, in addition to the practical. These he called the quasi-practical and the eclectic. Schwab's distinction between the practical and the quasi-practical modes of operation seemed somewhat blurred. But the eclectic mode which, according to him, takes care of the theoretical issues in curriculum building, explains his position on the role of theory. "(The eclectic) . . . recognizes the usefulness of theory to curriculum decision, takes
account of certain weaknesses of theory as ground for de-
cision, and provides some degree of repair of these weak-
nesses" (Schwab, 1978, p. 295). Thus, Schwab did not com-
pletely discount the importance of theory to curriculum but
seemed to suggest that curriculum workers should direct their
energies more to practical considerations.

Curriculum Development Models

Vallance (1982) suggested that if we would accept theory as "... a coherent group of general propositions, principles
or theorems which explain a class of phenomena. ..." (p. 5),
then we do not have a theory of curriculum development. This,
according to Vallance, is not to suggest that there is no
theorizing going on in the curriculum field. She explained
that theorizing does not always result in theories. "A
related outcome of the theorizing process is the generation
not of theories per se but of models" (Vallance, 1982, p. 6).
Models, noted Vallance, are different from theories in that
they lack statements of rules and principles which seek to
describe the relationships between the components of a whole
situation or system. Unlike theories, models only help us to
see what the practical reality is; they do not attempt to
explain why curriculum decisions must be made in certain ways
instead of others, nor what to expect from any particular
course of action (Vallance, 1982).
Johnson (1977) described a model as a mental picture or a conceptualization of the relationships assumed to exist among a set of phenomena. The function of a model is not only to identify the different parts of a whole but also to demonstrate how the parts interact and affect each other - as well as the total process or phenomenon (Peters, 1981). A model may be communicated schematically, graphically, or mathematically (Miller, 1985). However, Johnson (1977) pointed out that a diagram is not the model "... but only a visual representation of the model, which in turn is a mental representation of an assumed reality" (p. 8).

Root's (1977) list of examples of models included:
- verbal descriptions;
- drawings, maps and charts;
- toys, replicas, and scaled-down copies; and
- sets of mathematical equations and computer programs.

The primary purposes of models are assumed to be (a) the representation of what are thought to be critical factors (elements and relationships) which account for a significant portion of a phenomenon or process; and (b) the development of an increased understanding of how a system operates (Root, 1977). In other words, if we understand how a system works, we can change its performance in ways thought or felt desirable.

Root (1977) identified three types of models:
1. Prose models: These are descriptions and theory statements that attempt to explain the structure and dynamics of the factors affecting the problem within its setting;

2. Structural models: These use a variety of symbol systems to represent the elements and relationships affecting a system, a problem or a phenomenon; and

3. Dynamic models: These are built upon the other two but have the characteristic that they can demonstrate the critical behaviors of a system repeatedly over an extended time period. Computer simulations and human simulations are essentially dynamic models (p. 1).

Root emphasized that each of these types of models has its strengths and limitations and, therefore, requires particular skills to design, implement and analyze. However, the end-result of the application of each model in a proper manner would justify the time and effort expended on its use.

Gay (1980) discussed four models that may be used to conceptualize the curriculum development process.

1. The academic model: In this model, scholarly debate and logic are employed as the basis for curriculum decision making. The model emphasizes the utilization of the inherent structure of a discipline or disciplines to determine the content of the curriculum. The academic model can be applied to
curriculum development in any school setting.

2. The experimental model: Here, the learner and the learning experiences determine the content. The model identifies the learner as a member of a social order and, so, emphasizes objectives which seek to assist individuals to function in their society.

3. Pragmatic model: The pragmatic model sees curriculum planning as a localized process rather than something that should be imposed by an outside authority.

4. The technical model: This model perceives the learning process as a system which consists of the following characteristics:

   (i) The system can be reduced to its constituent parts;

   (ii) It occurs in certain systematic and predictable ways; and

   (iii) Its efficiency and effectiveness can be improved through good control or management principles (Gay, 1980).

Gay's (1980) model almost corresponds with Root's (1977) structural model. Both models essentially represent what is generally referred to as the systems model of curriculum development. The systems model, upon which the present study is based, will be the subject of a more detailed analysis later in this chapter.
Various aspects of curriculum development have received attention from writers of various orientations giving rise to three broad categories of curriculum emphasis: (1) subject-versus learner-centered curriculum, (2) the curriculum process, and (3) the setting for curriculum development.

**Subject-versus learner-centered models**

One major area of emphasis from which different curriculum models have emerged was the concern for what should be the focal point of learning - the subject disciplines or the learner. The traditional concept of curriculum as the body of subject matter taught by the teacher to the students represents one school of thought. The perennialists (e.g., Hutchins, 1936) proposed that learning should consist primarily of the "permanent studies", namely grammar, reading, mathematics, rhetoric and logic as well as the great classics of the Western world (Tanner and Tanner, 1980). For the perennialists, mental discipline which is achieved through the established body of knowledge should be the sole purpose of education. According to Hutchins (1936, p. 66), "Knowledge is truth." And since truth is universal, education should be the same everywhere. The truth of this assumption as well as other tenets of the perennialist school of thought have become questionable, in view of the knowledge explosion of the second half of the 20th century. In fact, Greer (1986), noted that human knowledge base now doubles every five years.
Another group of educators that proposed a subject-centered curriculum are the essentialists. The works of Bestor (1956) and Bagley (1907) represent this school of thought. According to Bestor (1956), the curriculum must "... consist of disciplined study in five great areas: (1) command of the mother tongue and the systematic study of grammar, literature, and writing; (2) mathematics; (3) sciences; (4) history; and (5) foreign language" (pp. 48-49). The essentialists view education as principally a transmission of past knowledge, or what Bagley (1907, p. 2) called "race experience", to the younger generation for their future use.

Subject-centered curriculum is not confined to past educational thinking. The push for science and mathematics in the late 1950s following the launching of the Sputnik (Tanner and Tanner, 1980) as well as the recent back to back to basics movement (Vik, 1984) reflect the faith of many educators in subject matter as the core of education and, hence, the curriculum.

In a seeming opposition to subject-centered curriculum development is the position of some educators (e.g., Dewey, 1902, 1983; Kilpatrick, 1983) that the curriculum should focus on the learner. Providing much of the impetus for the viewpoint is John Dewey (1902, 1983) who in the early part of this century directed attention to childhood experiences and learning. Dewey (1940) postulated that the child is an "active
animal" and that educational method should be derived from the child's own nature which is active rather than passive. To Dewey, the school is a form of communal life where everything should operate to enable the child to share in the inherited resources, and also to help him to use his powers for social ends. Dewey (1983) condemned the traditional, subject-centered, teacher-dominated curriculum and its emphasis on "... acquisition of the organized bodies of information and prepared forms of skills..." (p. 32). Dewey further stated:

Since the subject-matter as well as standards of proper conduct are handed down from the past, the attitude of pupils must, upon the whole, be one of docility, receptivity, and obedience. ... The traditional scheme is, in essence, one of imposition from above and from outside. It imposes adult standards, subject-matter, and methods upon those who are only growing slowly toward maturity. The gap is so great that the required subject-matter, the methods of learning and of behaving are foreign to the existing capacities of the young. Consequently, they must be imposed; even though good teachers will use devices of art to cover up the imposition so as to relieve it of obviously brutal features (Dewey, 1983, p. 32).

It should be pointed out here, that Dewey (1902) did not discount the value of subject matter in the educational process. His concern, however, was that the curriculum should not focus solely on subject-matter. In fact, he condemned the equally extreme position of basing the curriculum on the child without consideration of subject matter. Dewey advised educators who take either extreme viewpoints:

Abandon the notion of subject matter as something fixed and ready-made in itself, outside the child's experience;
Kilpatrick (1983), another strong believer in child-centered learning suggested that education and the curriculum should

... start with the child as a growing and developing person and help him live and grow best; live now as a child, live richly, live well; and thus living, to increase his effective participation in surrounding social life so as to grow steadily into an ever more adequate member of the social whole (p. 24).

Kilpatrick (1983) saw the traditional, subjected-centered curriculum as "bookish content" which was "remote from life" (p. 26). To him, learning is living and participating in life. And since living is not static but a dynamic process, learning should be a changing process too. He declared:

The world in which we live is changing at so rapid a rate that past-founded knowledge no longer suffices. Intelligent thinking and not mere habit must henceforth rule. Youth must learn better to think for themselves. They must understand the why of our institutions, of our system of legal rights, of moral right and wrong - because only then can they use these essential things adequately or change them intelligently (Kilpatrick, 1983, p. 26).

Kilpatrick's educational philosophy, probably reflects best the current thinking about education in an age of high technology.

This brief review of the subject-versus child-centered curriculum controversy, as was earlier mentioned, represents only one aspect of curriculum emphasis. The next section
reviewed the works of educators and curriculum theorists whose primary concern was the curriculum process itself.

**Process models**

Process models of curriculum development emphasize the curriculum process - the procedures or steps in developing a curriculum as well as the social-cultural factors to be considered in developing curriculum content.

In his consideration of the purpose and scope of curriculum development Goodlad (1979) stated that "The ultimate purpose of curriculum development - both practical and theoretical - presumably is to improve the knowledge, skills and attitudes of human beings" (p. 20). Goodlad thus proposed that any curriculum inquiry should address three issues: (1) substantive, (2) political-social and (3) technical-professional. The substantive, according to Goodlad, has to do with goals, subject matter, materials, and the like - the commonplaces of any curriculum. The political-social involves the study of all those human processes through which some interests come to prevail over others so that some ends and means rather than others emerge. Curriculum inquiry into the technical-professional "... examines those processes of group or individual engineering, logistics, and evaluation through which curricula are improved, installed, or replaced" (Goodlad, 1979, p. 17).

The curriculum issues addressed by Goodlad's substantive, political-social, and technical-professional phenomena reduce
to at least three of what most writers (e.g. Beauchamp, 1982; Tyler, 1949; and Taba, 1962) consider as the components of the curriculum process, namely: goals and objectives, content, and evaluation. According to Beauchamp (1982), a curriculum should, optimally contain four parts:

1. a statement of intention for use of the (curriculum) document as a guiding force for planning instructional strategies,
2. statements outlining the goals of the school(s) for which the curriculum was designed,
3. a body of culture content that has the potential for the realization of the goals, and
4. a statement of an evaluation scheme for determining the worth and effectiveness of the curriculum and the curriculum system (p. 25).

Tyler (1949), in his model, identified four fundamental questions which must be addressed in developing any curriculum and plan of instruction. These are:

1. What educational purposes should the school seek to attain?
2. What educational experiences can be provided that are likely to attain these purposes?
3. How can these educational experiences be effectively organized?
4. How can we determine whether purposes are being attained? (Tyler, 1949, p. 1).
In summary, these questions addressed the problems of curriculum objectives, content, methods, and evaluation. Tyler's model stressed the importance of deriving all educational objectives from the following sources: (1) studies of the learner, (2) studies of the society, and (3) subject-matter specialists (see Figure 1). The model further proposed that data from these sources be screened through a philosophy and the psychology of learning.

The strength of Tyler's model lies in its emphasis on the sources for deriving educational objectives. The model has, however, been criticized for its reduction of the curriculum process into steps "... as though it were a linear and almost a technological production process" (Tanner and Tanner, 1980, p. 91). Tanner and Tanner (1980) had earlier pointed out that the idea of sequencing the curriculum process was untenable in real life and suggested that, in practice, the processes involved "... must be treated in ecological relationship" (Tanner and Tanner, 1980, p. 85).

Figure 1. Tyler's Conceptual Framework (Adapted)
Stenhouse (1982) took issue with the idea of specifying behavioral objectives for purposes of determining content as suggested by Tyler's (1949) model. Stenhouse declared:

The translation of the deep structures of knowledge into behavioral objectives is one of the principal causes of the distortion of knowledge in schools. . . . The filtering of knowledge through an analysis of objectives gives the school an authority and power over its students by setting arbitrary limits to speculation and by defining arbitrary solutions to unresolved problems of knowledge (1982, p. 182).

The point made by Stenhouse was that the curriculum developer could still evolve principles for the selection of content without limiting students' scope of enquiry - which is what specification of behavioral objectives does. Stenhouse, therefore, proposed a process model of curriculum development which should shift emphasis from examinations and grades to understanding of basic structure of a subject field.

Almost identical to Tyler's (1949) model was Taba's (1962) model in which the elements of the curriculum process were ordered as follows:

Step 1: Diagnosis of needs  
Step 2: Formulation of objectives  
Step 3: Selection of content  
Step 4: Organization of content  
Step 5: Selection of learning experiences  
Step 6: Organization of learning experiences  
Step 7: Determination of what to evaluate and of ways and means of doing it
Apparently, Taba (1962) merely expanded Tyler's (1949) four-step model. In fact, she conceded that the steps in her model were comparable to those in Tyler's.

Wheeler (1967) and Nicholls and Nicholls (1972) equally and independently developed five-step models similar to Tyler's. But both attempted to correct the criticism against sequencing the curriculum process by proposing a cyclical framework.

**Contextual models**

A third category of curriculum models are those that emphasize the context or setting for curriculum planning. Peters (1981) elaborated on two models that could be applied in the development of instructional programs. These he called the explosive and implosive models respectively. The explosive model provides for a multi-directional, disorganized, and decentralized approach to curriculum development. Each school system or building level works independently of others. There is lack of consistency and coordination in matters of curriculum building either at the building, local or state level. According to Peters (1981), many of the present-day education systems are characterized by the explosive model.

Rather than providing for consistent and uniform instruction (or delivery of content and skills) from building to building at a given grade level, many systems allow for so much divergence that chaos results and inconsistency is the name of the game played at the expense of students' education and the tax payer's dollars (Peters, 1981, p. 10).
Unlike the explosive model, Peters' implosive model provides for and encourages consistency and consensus in arriving at solutions to curricular problems. Application of the model results in program coordination, consistency, and uniformity throughout a given system (building, local or state).

It might appear logical to share in Peters' concern for consistency in developing the curriculum for an educational system, and, thus espouse the implosive model. But this should be on the assumption that all the units of school systems concerned have similar goals and needs. Unfortunately, Peters himself did not make any such assumption and there probably lies the weakness of the implosive model. In other words, before accepting the logic behind the model, one would assume that Peters was not advocating uniformity in the face of diversity of student characteristics (even within the same locality), community needs, and other environmental differences. Consistency and uniformity as implied in the implosive model could stifle innovation and ignore the need to individualize instruction.

Peters (1981) did further express concern about accountability, suggesting that accountability can be assured only if all schools across the board did exactly the same things. This is probably questionable. In fact, it does seem that the more the curriculum is geared to individual and local needs, the better it serves those it is meant for.
Furthermore, accountability could still be realized by the sponsors of education, whether or not there is uniformity. After all, each educational unit is accountable only for what input it received from the public.

In two different articles, Short (1983, 1984) described three strategies or contexts in which curriculum development takes place. These include:

Type 1: Generic/Scholar-dominated/implementation as directed: This is a form of curriculum development in which the task is undertaken at a national level, usually with academic subject-matter specialists dominating the decision-making process. The intent is that the curriculum be implemented as directed by the planning authority (Short, 1983). The limitation of this model is that, often, developers may not take full account of the realities of local systems where implementation is expected to take place. Lack of adaptation could make the curriculum appear meaningless and dysfunctional.

Type 2: Limited adaptation: In this model, curriculum development is conducted by a central project staff, usually nationally or regionally sponsored. The team is often dominated in terms of expertise, by persons who possess special knowledge about particular programs for particular student groups (e.g., handicapped, potential drop-outs, etc.). Provision is made for local systems to adapt the curriculum to some limited extent (Short, 1984). But the issuing authority cannot completely control adaptations, hence there might be
considerable deviations from the intended outcomes of the curriculum.

Type 3: Site Specific/Open Adaptation Curriculum: In this strategy, the curriculum is developed with the local school district and school building by local personnel who also expect to implement the program. The strategy recognizes that potential ideas for the curriculum can be more readily accepted and translated into classroom practice if they are conceived and developed in the immediate setting (Short, 1984).

Short's (1983, 1984) models have also been discussed by Connelly and Ben-Peretz (1980) who used the terms "teacher-proof", "teachers as active implementers," and "teachers as user-developers" to describe types one through three of Short's model.

Patriarca and Buchmann (1983) elaborated on three separate but intertwined contexts of program development and innovation utilized in achieving program changes in undergraduate teacher education at a large midwestern university. These include (1) a substantive context in which the focus was on identification of the goal or problem of the program effort, (2) an interactive context - a purely democratic context which utilizes group processes to achieve substantive goals; faculty members and public school teachers interact in formally scheduled meetings to discuss program direction, and (3) an institutional context which refers to the administrative
structure, institutional bureaucracy and policy context of the curriculum development effort. Within the institutional context, any decision about curriculum change must pass through the institutional hierarchy (department chairpersons, assistant dean, dean, etc.) for approval (Patriarca and Buchmann, 1983).

Similar to the contextual model of Patriarca and Buchmann (1983) is the dialogue process model for curriculum development proposed by Hill and Bradley (1983). But whereas the former was concerned with curriculum change within one institution, the latter involved several local school districts collaborating in an effort to develop curriculum objectives, content, and resource guides for each teacher. An important feature of the model is that each professional had the opportunity to shape the curriculum, to listen, and to be heard in the process.

Some of the assumptions upon which the model was based include:

1. Teachers are the experts about what to teach and how to teach toward specific objectives and to specific ages of learners.

2. Teachers are the most credible consultants to other teachers.

3. All levels of leadership must be informed, participate and support a curriculum development effort.

4. All teachers must have the opportunity to shape and affect the curriculum product in order to make it useful to themselves (Hill and Bradley, 1983, p. 374).
A major weakness of the dialogue process model (which the authors also conceded) was its potential inefficiency. It takes time, resources and support to involve so many people. Poor communication about the purpose of the procedure and not following guidelines for effective dialogue as well as other inherent problems (Hill and Bradley, 1983) could render the model inefficient and clumsy.

So far in this section, an attempt has been made to review three broad areas of curriculum emphasis and some of the models that have been generated to support them. It should be noted that learner-centered versus subject-centered curriculum, the curriculum process, and the contexts for curriculum development are curricular issues that cut across subject fields, institutional settings and educational systems. In other words, any of the process models for curriculum development, for example, could be applied from the elementary levels up to university level programs. Similarly, a teacher education program can be as learner-centered as a kindergarten program. Since the present study focuses on industrial teacher education programs, the following sections provide a review of programs of teacher education and the curriculum development models that have been utilized in industrial education teacher preparation.

Pre-service Teacher Education Programs

Virtually everyone who understands the dynamics of the educational process would agree that the teacher occupies a
key position in the learning process. Moss (1971) observed that teacher behaviors significantly affect student behaviors and that "... the relevant teacher behaviors can themselves be appreciably molded by formal education intervention" (Moss, 1971, p. 29). Also, Simpson and Ellis (1971) believed that a teacher preparation program could have considerable influence on teacher performance. They added that traditionally-oriented programs are likely to produce traditionally-oriented teachers. Similarly, innovative programs, alert to new concepts and practices, encourage the same alertness in the prospective teacher.

In spite of the widely-held belief about the influence of teacher education programs on teacher effectiveness, there seems to be a disparity between what teacher educators believe and what they practice. Follow-up studies of graduates of teacher education programs (McBride, 1985) point to the ineffectiveness of many of the programs. Among the many criticisms against current programs is their lack of innovation and slowness in reflecting the needs of beginning teachers (Hawes, undated). According to Hawes, "Too few (programs) concern themselves with the task a beginning teacher has to face, the skills he needs to acquire, the survival priorities he requires to carry him through the first traumatic years of teaching..." (p. 55).

Considering the many elements that should be embodied in teacher education curriculums and the complexity of their interactions, Haberman (1981) found it surprising that teacher
Educators narrow down the meaning of teacher education curriculum development. According to Haberman, curriculum development in many institutions "... is merely a euphemism for requiring another course" (1981, p. 2).

It has been suggested (Roth, 1981) that whenever significant changes in teacher education occur, they are often the result of forces outside of teacher education and rarely as a result of teacher education faculty initiative. Roth (1981) further identified some issues that hinder faculty-initiated reform: These include:

1. Absence of common beliefs about teacher education leading to divisions of college faculties into rival groups;
2. Adding courses to satisfy the interests of instructors; and

The traditional model of teacher preparation

The traditional teacher education program consists primarily of the following components (Hauenstein, 1977; Loepp, 1977; Simpson and Ellis, 1971; Corrigan, 1983):

1. Professional education component including the history and philosophy of education, psychology of learning, methods, research and evaluation.
2. Teaching subject component, for example, construction technology, mathematics, graphic communications, etc.

3. Clinical experience or practice teaching component.

4. Liberal arts or general education component.

This model of teacher preparation has endured for several decades and, in spite of criticisms (Roth, 1981; Tafel, 1984; McBride, 1985), might still pervade teacher education for several years to come. In fact, it has been suggested (Smith, 1982) that the model has fared well so far, given the enormous constraints of funding, staffing and teacher preparation time under which it has operated.

Issues in the traditional model of teacher education which have been the bases for much criticism include the amount of liberal arts background required by education majors, the role of practice teaching, arrangement and sequence of coursework, and the duration of the programs (Tafel, 1984; Corrigan, Palmer and Alexander, 1982). Tafel (1984) questioned the usefulness of the clinical experience component and stated:

The role of the clinical experience must be carefully reexamined. The "practice" component of teacher education programs has been identified as being crucial to shaping the student's image of what school and teaching are. . . . However, the impact of this socialization process often has been shown to negate or alter those beliefs which the student has developed prior to the school-based experience. . . .
As an alternative, Tafel proposed a future paradigm for teacher education. One of the major limitations of the clinical model, according to Tafel (1984), is that it perpetuates the status quo. "Students who enter standardized programs are treated alike, given the same doses of coursework and field experiences. Environments in which they 'practice' are constrained. They learn what teaching was not what it could be" (Tafel, 1984, p. 5).

Smith (1980) was another proponent of a future-oriented teacher education. Smith suggested that educators keep two fundamental questions in mind when designing teacher preparation programs:

1. What should a beginning teacher know in order to function effectively in the 21st century?
2. What should a beginning teacher be able to do to function at a fully professional level at the time of entry into the profession (1980, p. 5).

Smith believed that by asking these questions, educators would end up defining the content of teacher preparation programs in a substantially different fashion than they had defined the content in the past.

A panel appointed by Governor Thomas Kean of New Jersey (Cooperman and Klagholz, 1985) to determine (1) what beginning teachers must know and (2) how effective teachers teach
came up with the following findings: (1) A beginning teacher needs to know-

. the curriculum priorities of the school;
. how to assess student progress;
. how to organize instruction;
. how to develop and use evaluation instruments;
. how students learn, both individually and in groups;
. how to motivate students;
. how to maintain a healthy classroom climate;
. how the classroom functions as a social unit; and
. how the school functions as an organization; and

(2) The teacher should be a decision maker, not just a technician who links the students, textbooks, and test developers. Teachers who assume roles as technicians are bound to be less inspired and less committed to their work (Boyer, 1984; cited in Cooperman and Klagholz, 1985, p. 694).

Vaughan (1984) identified at least three bodies of knowledge that bear directly on improving the content of preservice teacher education programs. These he called (1) teaching effectiveness knowledge, (2) teaching context knowledge and (3) change and improvement knowledge. The teaching effectiveness knowledge provides guidance on choice of instructional strategies appropriate to given situations and how these strategies could be used and enhanced by the teacher. The teaching context knowledge provides information about factors external to the classroom but which influence the effectiveness of teaching, for example, the role of parents and communities in education, influence of school district and school management and organization on instruction, to mention but a few. Change and improvement knowledge derives from what is known about innovation and change in educational
institutions. This knowledge serves as a tool for effecting desirable changes within the immediate school setting.

Several other models of teacher preparation have been proposed in the literature (McBride, 1985; Andrews, 1975; Cotrell et al., 1972). Among these, competency-based teacher education (CBTE) (Cotrell et al., 1972) appears to have made the greatest impact on teacher education of the 1970s and 1980s. Competency-based teacher education as well as other models proposed for industrial teacher education are discussed in greater detail in a later section of this chapter.

Inadequacies of teacher education models

A study by Russell (1978) revealed that most models of teacher education proposed in selected professional journals between 1965 and 1975 were inadequate. Russell conducted a content analysis of models to determine whether they were adequate in providing comprehensive pre-service professional training. Results of the analysis showed, among other things, that:

1. The teacher education models lacked or failed to emphasize a number of elements essential to the development of professional workers.
2. The models seldomly provided for exposure to the basic aims and purposes of education.
3. The liberal arts or general education component including the teaching major is seldom discussed.
4. Few models are validated by prior research or provide a means for evaluation after their implementation.
5. Few models discuss the means or anticipate any problems in effecting the changes they propose (Russell, 1978, p. 711-A).

Based upon these findings, Russell concluded inter alia, (1) deemphasis of theory, lack of training in the value, techniques and uses of research, and the limitation of the curriculum to the mastery of classroom-related skills prevent teacher education models from providing truly professional preparation, (2) without any stated philosophy of education or teacher role, models tend to be confused and incomplete, and (3) the authors of the models tend to be unaware of the political and social realities affecting education that must be considered in attempting any program for educational change. One of Russell's findings which is supported by other writers (e.g., Vallance, 1982; McCutcheon, 1982) is the lack of theoretical bases for most teacher education curriculum models.

Industrial Teacher Education

The need for sound programs of industrial teacher education was recognized right from the formative years of the industrial education movement in the United States. But as Barlow (1967) observed, dedication to the principles of sound teacher education was one thing, its practice was quite
another.

Conventionally, industrial teacher preparation has been the responsibility of colleges and universities and comprised: (1) professional education courses, (2) general education courses, and (3) courses in the technical teaching areas - drafting, auto mechanics, etc. (Loepp, 1977; Hauenstein, 1977). This pattern of industrial teacher education which mimics the traditional model of preparing general academic teachers has been with the profession for a long time. A change to something different or new does not seem foreseeable. Simpson and Ellis (1971) suggested several reasons why colleges and universities seem slow in changing the curriculum of vocational teacher education. These include, among others:

1. Getting program changes through the complicated university machinery is a slow and difficult process. This is particularly true for the preservice program.

2. In many colleges and universities, the teacher education programs for the substantive areas of vocational education are located in different departments, schools, and/or colleges. Thus it is difficult to achieve the communication and cooperative activity needed to implement program changes that seem indicated by needs and trends in vocational education.

3. There is a history of conservatism in the teaching profession. Much of teacher education has been
oriented toward the concept of "passing on the social heritage," and the traditions of the past have provided both the content and the rationale for the curriculum.

4. Change is generally threatening and change in a specific (field) may be particularly threatening to those who have a strong sense of identity with the field - especially those who have invested heavily of time, money, and emotion in becoming specialists and building careers based on an area of specialization (Simpson and Ellis, 1971, p. 88).

There is evidence (Roth, 1981) that this lack of innovation and seeming inertia is not peculiar to vocational and industrial teacher education programs but pervades the entire spectrum of teacher education regardless of specialization.

Work experience in industrial teacher education

Apparently, there has not been a consistent pattern of selection and training of industrial teachers. Resnick and Gardner (1977) observed that in some places, beginning teachers are merely selected from the rank and file of tradespeople and required to take occupational competency tests prior to being hired. Adamsky and Cotrell (1979) also indicated that in a lot of cases, trade and industrial teachers are rarely required to hold a bachelor's degree.

The foregoing raises the question whether industrial
teachers are primarily teachers or tradespersons. Based upon a 1981 study of vocational teachers in Massachusetts, the Logos Research Institute (LRI) concluded that industrial teachers are primarily teachers and secondarily tradespersons. The study revealed, however, that traditionally, vocational teachers in Massachusetts were "... selected first on the basis of trade experience and then provided with whatever training was necessary to make them teachers" (LRI, 1981, p. 3).

Occupational or work experience as a component of industrial teacher preparation has been studied by Santos and Olinzock (1977), Welch and Garner (1976) and McCallister (1973). One of the earliest studies on the subject (Impellitteri, 1965) found no relationship between occupational experience and teaching competence. This finding was supported by McAllister (1973) and Garner, Brantner, Kapes, Long, and Welch (1974). Garner et al. (1974) found that the number of years of occupational experience had little effect on the outcome of the trade competency examination and that the results of the trade competency examination could not be used to predict teaching competence or success. In a later study, Welch and Garner (1976) concluded that a significant positive correlation exists between occupational experience and competence until a point is reached after which additional occupational experience does not contribute to occupational, and hence teaching, competence.
Santos and Olinzock (1977) analyzed various approaches to detailing a work experience component of the vocational teacher education curriculum. Among the various approaches considered by the authors, the PERT network format was found to permit a more effective display of the interrelationships among competencies to be developed and was, therefore, a more efficient and effective approach.

In addition, Santos and Olinzock (1977) suggested that a work experience component must be based on a firm philosophical and educational foundation. To be successful, the component must conform to the standard characteristics of vocational education including:

1. A viable delivery system.
2. A dependence upon constituency support from students, businesses, teacher training institutions, and state agencies.
3. A carefully developed and documented plan that is based upon a set of specific goals and measurable program objectives and which will facilitate and support subsequent planning and programming efforts.
4. The existence of a comprehensive pattern for program development and expansion, supported by legislative and fiscal commitments at the state and local levels, and taking into account occupational needs, student base, and educational resources available as required.
5. A set of program standards addressed to the four factors of curriculum, facilities and equipment, instructional staff, and students.

6. A mechanism to provide for periodic formative and summative evaluation (Santos and Olinzock, 1977, p. 3-4).

Further on the issue of occupational experience and teaching competence, Matthews and Pyle (1978) questioned (1) whether a student with or without a background in vocational education can gain sufficient understanding of a trade to become an effective trade teacher without having to go through an apprenticeship program, and (2) whether the trade-prepared or the university-prepared teacher was more effective in the classroom with comparable groups of students. Although research on these questions appeared quite sparse, Matthews and Pyle (1978) noted that there was evidence that students prepared in a higher education setting coupled with "sufficient cooperative education" performed just as well as traditionally prepared tradesmen. Furthermore, the college graduate was favored because he or she was believed to possess certain characteristics superior to the person who comes directly from industry into the classroom.

Having provided a brief overview of the state of the art in industrial teacher education, the following section provides a synopsis of some of the models of curriculum development that have been applied to industrial education.
Models of curriculum development in industrial teacher education

The field of industrial education (including industrial arts, and trade and industrial education) has witnessed considerable curriculum development effort since the early part of the century. Much of the work has been in response to changing program goals and philosophy as well as to changes in the job market.

Overall, there is no single pattern or emphasis in models of curriculum development in the field. Notable among the curriculum models that have emerged over the years are the task analysis models, the cluster models, the integrated models, the systems models and the competency-based education models. Application of these models either singly or in combination has yielded such plans as the Industrial Arts Curriculum Project (Towers, Lux, and Ray, 1966) and the Jackson's Mill Industrial Arts Curriculum Theory (Snyder and Hales, 1981). Those models which have had the most significant impact on industrial and technical teacher education programs are discussed in the following section.

Task analysis models

Task analysis is a process wherein tasks performed by workers employed in a particular job are identified and verified (Finch and Crunkilton, 1984, p. 153). This curricular approach, according to Thompson (1973), follows the
analytical procedures for content selection. These involve systematic gathering of information directly from current workers and from instructors who are occupationally experienced.

A study by Mager and Beach (1967) sought to develop a model specifically for developing vocational instruction based upon task analysis. Three phases of curriculum development were identified in the model - preparation, development, and improvement. The preparation phase, for example, was designed to ensure that all the relevant information and practice required for the performance of the job are included in the course program. The steps in this phase lead to a systematic development of course objectives which itself, begins with an analysis of the job. Figure 2 shows the conceptual framework of the preparation phase of the Mager and Beach (1967) model.

Although the task analysis model of curriculum development has been in wide use since World War I (Thompson, 1973), it is not without flaws. First, task analysis, as a technique, intends to identify exactly what the master worker does so that these activities may be imitated by the trainee. By implication, the technique is not concerned with preparing the trainee for future changes in his occupation. The trainee must, therefore seek to upgrade his skill each time a change occurs or is introduced. In other words, any curriculum based upon task analysis can hardly permit transfer of
learning. This is a major limitation of the task analysis model.

Second, task analysis emphasizes the identification of psychomotor skills. But it is becoming increasingly obvious that, in the world of fast-changing technology, the affective component of worker performance cannot be simply dismissed as unimportant. Furthermore, not all work behavior lends itself to job analysis techniques (Swanson, 1981).

Cluster models

The classification of the content of industrial education into clusters was one of the major emphases of the 1970s. Ziegler (1979) traced the history of the cluster concept to the work of Bonser and Mossman (1923) at the early stages of
industrial arts. In their work *Industrial Arts for Elementary Schools*, Bonser and Mossman (1923) identified three industrial arts content clusters - food, clothing, and shelter.

Maley (1975) conducted a major study of the cluster concept for its application to vocational education. He defined the cluster concept as

(A) form of vocational education which prepares the individual to enter into gainful employment in a number of occupations which have sufficient commonalities in human requirements and kinds of work to permit a high degree of mobility within, as well as entry into, the occupation's associated with the cluster (1975, p. 6).

The application of the cluster concept has been broadened to include not only vocational education but industrial arts. The concept also extends beyond secondary-level programs to include post secondary and industrial teacher education programs. Carrel (1978) conducted a survey of 46 member institutions in the Mississippi Valley Industrial Teacher Education Conference area in October 1977. The purpose of the study was to determine those institutions that offer "cluster" programs. Thirty schools indicated that their programs were traditional in nature. Thirteen indicated that they utilized a cluster curriculum whereas three stated that they have a traditional program but offer cluster courses. Carrel observed that many of the "clusters" developed for secondary school programs, at least by title, are employed in industrial teacher education programs.

Wolansky and DuVall (1975) developed a rationale for
clustering curriculum content in industrial education.

Exponential growth of technological knowledge suggests grouping (clustering) of common concepts of content elements, a defensible route to effective management of greater quantities of knowledge. Clustering also allows for better organization of information into coherent units (Wolansky and DuVal, 1975, p. 60).

The Logos Research Institute (1981) proposed a cluster model for training vocational teachers in the state of Massachusetts. The model was based upon the selection and sequencing of 70 of the 100 original Ohio State Performance Based Teacher Education (PBTE) modules (Cotrell et al., 1972) into six curriculum clusters considered appropriate for the initial training of provisionally approved teachers. The six sequential clusters proposed by the Institute include:

1. Introduction to teaching for the vocational educator;
2. Curriculum planning and development for the vocational educator;
3. Teaching methods for the vocational educator;
4. Instructional management for the vocational educator;
5. Instructional evaluation for the vocational educator, and

These clusters were prioritized overall on the basis of an inexperienced teacher's most immediate need to know.

There is little doubt that the cluster concept has gained a fairly wide acceptance as a viable method of organizing
industrial education curriculum content (Carrel, 1978). However, there appears to be lack of consensus among industrial educators regarding the number and titles of available clusters in industrial education. Warner et al. (1958) identified power, transportation, manufacturing, construction, communication and personnel management as industrial technology clusters.

The Galaxy Plan for Career Preparation which was developed in the Detroit, Michigan, School System in the 1960s classified occupational groups into four clusters: materials and processes, visual communications, energy and propulsion, and personnel services (Carrel, 1978). The Iowa State Conceptual Cluster Approach (Wolansky and DuVall, 1975) classified industrial arts into three clusters.

1. graphic communication;
2. power, transportation and energy; and
3. materials and processes.

The Jackson's Mill Industrial Arts Curriculum Theory (Snyder and Hales, 1981) identified four clusters which describe the "sub-systems of the human technical endeavor." These include communication, construction, manufacturing and transportation.

In the above cases, we find a situation characterized by inconsistency in the titles and content of identified clusters. Ziegler (1979) described this inconsistency as a dilemma for industrial education.

The cluster approach has one other shortcoming which derives from the model's basic assumptions. One of the basic
assumptions of the cluster concept is that the commonalities of a family of occupations is what is important, which implies that the unique aspects of a family of occupations is not quite important to the entry worker. Another assumption is that the unique aspects of an occupation are more technical than the common aspects and should, therefore, be taught at a higher level of education (Thompson, 1973).

These assumptions are logically erroneous. First, sociological analyses of occupations reveal that people identify more readily with what is unique about their occupation or profession. Second, it is known from occupational analyses that what is unique to a job may not necessarily be highly technical (Thompson, 1973).

**Conceptual models**

Conceptual models of curriculum development emphasize the importance of structure of subject matter. The idea of subject structure was developed by Bruner (1977, 1982) who argued that each subject has its peculiar structure and that the curriculum of a subject should be determined by identifying and understanding its fundamental principles. Bruner reasoned that one must understand the general and fundamental nature of an idea before one can apply the idea to novel situations.

The application of the conceptual approach to industrial education has been advocated by Thompson (1973) and Wolansky
and DuVall (1975). The latter authors outlined a number of basic assumptions which support the use of concepts in developing an industrial arts curriculum. These include:

1. It is more defensible to use a conceptually based approach in the selection of content for transfer of learning in similar contexts than it is to use a factual base. Concepts are not retired as quickly as facts. Most of technological systems operate upon a core of scientific principles and concepts.

2. Learning activities and experiences center around common concepts, real and practical learning units, and synergetic laboratory relationships which appeal to most students.

3. At each succeeding level of sophistication, students proceed according to maturity, motivation, and capacity for application of major conceptual themes (Wolansky and DuVall, 1975, p. 63).

An example of the application of the conceptual model is the American Industry Project developed at the University of Wisconsin, Stout. Fourteen concepts were identified as the reference points for American industry, namely production, management, marketing, industrial relations, procurement, research, property, finance, public interest, transportation, communication, energy, processes, and materials.

The Jackson's Mill Industrial Arts Curriculum Theory (Snyder and Hales, 1981), conceptualized the technical systems
as being made up of communication, construction, manufacturing, and transportation.

What one notices from the foregoing is that there is not quite a difference between the cluster approach previously described and the conceptual approach, at least, in the terms used to identify content. However, the underlying principles or assumptions are different for each model. In some programs, it is even difficult to describe the curriculum as either conceptual or cluster, based upon the name alone. The industrial arts program at Iowa State University as described by Wolansky and DuVall (1975) is named "Conceptual Cluster Curriculum." That the two terms "conceptual" and "cluster" were combined in the same program title further suggests that the two might be related in certain ways.

**Competency-based models**

Competency-based teacher education (CBTE) is probably one of the most sustained approaches to curriculum development in industrial education. Bell (1980) defined competency-based education (CBE) as:

> . . . education in which objectives are determined on basis of competencies perceived necessary for daily living for an occupation. The instructional process is directed toward these objectives and, then, the learning outcomes are evaluated relative to them (p. 7).

Several factors have been associated with the growth of the CBTE movement in the United States. Among these are the discontent among many educators with traditional methods of
teacher education (Meek, 1979), the increasing public demand for accountability in education (Bell, 1980), and the results of the research conducted by Cotrell and associates (1972). Providing much of the impetus was the study by Cotrell and others in which 384 vocational teacher competencies were identified. These competencies led to the development of 100 learning modules which focus on many of the key professional performance skills needed by vocational teachers. Each module includes content appropriate to the performance elements and sequenced learning experiences aimed at helping learners develop the needed standards for appropriate performance (Adamsky and Cotrell, 1979). Performance assessment instruments as well as supporting instructional materials are provided to assist learners in the use of the models.

Cotrell's research stimulated not only the conduct of numerous other studies but also generated protracted debate among educators on educational soundness of CBTE. In the opinion of Finch and Crunkilton (1984),

Competency-based education represents a meaningful alternative to conventional forms of education. Its direct focus on the development of tasks, skills, attitudes, values, and appreciations critical to success in life and/or in earning a living makes competency-based education very relevant to vocational and technical education (Finch and Crunkilton, 1984, p. 289).

Harris (1982) described CBTE as a clarifier of educational purpose. Harris further declared:

The collaborative specification of outcomes for students has made both instruction and assessment more relevant
to the professional teaching role, rather than their being dependent on the structure of disciplines or the professor's interests and whims. As a consequence, program goals have become both clearer and more public (Harris, 1982, p. 37).

Gorman and Hamilton (1975) criticized traditional teacher education programs which they considered to be subject-matter-oriented, "... emphasizing theory, philosophy, and studying about teaching rather than emphasizing development of each individual's competency of perform the teacher role" (1975, p. 20). According to Wright (1977), "The formula for performance-based instruction is deceptively simple: careful definition of performance goals in assessable terms and guidance of instruction by evaluation of learner performance" (p. 43).

The critics of CBTE, however, point to the method's emphasis on accountability through behaviorally stated performance criteria and, thus, its alignment with behavioral psychology. Tarr (as cited in Kampsnider (1977)), for example, criticized CBTE for its lack of attention to the affective domain and noted that affective competencies cannot be ignored simply because they are difficult to measure.

One of the most vocal critics of CBTE, Bell (1980) argued that, because of its roots in accountability, CBTE emphasizes outputs of the educational process and pays less attention to the process itself. Bell declared:

Educational administrators are becoming increasingly removed from the primary task of education, which is
teaching, and are becoming increasingly concerned with the managerial aspects of educational institutions. ... In the face of this, they have become desperate to find the magic mechanism which will correct the problems of education and answer public criticism. CBTE is the latest technique in the educational technocrat's portfolio. ... Its origins and impetuses are from technocrats rather than from teachers (1980, p. 9).

The reaction of Tanner and Tanner (1980) to CBTE is no less disparaging:

Competency-based teacher education is mechanical efficiency applied to teaching. The objective is to "program" the teacher to perform explicitly specified behaviors. What this means for the teacher's role in curriculum development is obvious; there is no provision for decision making by teachers. ... Competency-based education conceives the teacher as a technician who deals only with established-convergent situations. The competency movement denies the obvious: that teachers are inevitably involved in curriculum development and that this function of teaching does not lend itself to a behavioristic-competency approach (Tanner and Tanner, 1980, p. 624).

Advocates of "humanistic education (e.g., Nash, 1973; Drummond, 1974; and Kampsnider, 1977) suggest that CBTE can overcome the criticisms labeled against it if only it could incorporate effective components into the model. But some advocates of CBTE (e.g., Loepp, 1977) think that CBTE is itself a humanized approach to education, "... for instance, it is treating students 'humanely' to tell them in advance what they will be expected to do." (Loepp, 1977, p. 189). "This", Loepp contends, "provides the stimulus for the student and the instructor to discuss the objectives and to modify them as necessary" (1977, p. 189).
The end of the debate on the relevance of CBTE does not seem to be in sight. The position taken by Harris (1982) appears to be a logical one on the issue. According to Harris:

It is important to remember that (CBTE) as a name does nothing. A (CBTE) program can be rigid, flexible, mechanistic, easy, demanding, relevant or useless as any other teacher education model. It depends on the values, beliefs, and assumptions of the program leaders (1982, p. 40).

Systems models

A recent trend is to view the curriculum development process as an integrated system. Kaufman (1972) defined a system as "The sum total of parts working independently and working together to achieve required results or outcomes, based on needs" (p. 1). The systems approach, according to Kaufman, is a type of problem-solving process for identifying and resolving important educational problems. Kaufman's (1972) model of the general system approach incorporates the following components: (1) identification of a problem from needs, (2) determining solution requirements and alternatives, (3) selecting solution strategy, (4) implementing, (5) determining performance effectiveness, and (6) revising the process as required.

Most systems thinkers (e.g., Banathy, 1973, 1977; Kaufman, 1972; and Hacker and Barden, 1983) strongly believe that the systems approach could be applied to virtually every
aspect of the educational process-- program planning, administration, evaluation and so on. In the opinion of Hacker and Barden (1983), "Systems theory represents a powerful paradigm for scientific thinking. Identification and assimilation of the general principles applicable to all systems can help learners transfer knowledge from one specialty to the next" (p. 10).

Hacker and Barden further stated that the universal systems concepts - inputs, controls, processes, outputs, and feedback - are integral to all systems, be they technical, exonomic, biological or social. The general systems model proposed by these authors is shown in Figure 3.

Figure 3. General systems model (Hacker and Barden, 1983, adapted)
Banathy (1977) categorized systems concepts into three models. These are:

1. **System-environment or system-and-its-context model:** This model permits the model building to (i) define the system space or context, (ii) explain why the system exists, and (iii) display the laws that regulate the interactive behavior of the system and its environment.

2. **The structural model:** In this model, the focus is on what the system is. The model presents generalizations about goals, functions, components, and their relationship of structure.

3. **Process or behavioral model:** This model aims at explaining how education as a social system operates and behaves, and how its entities, their attributes, and relationship change over time.

Banathy's (1977) model (Figure 4) identified (i) input processing; (ii) transformation, (iii) output processing, and (iv) feedback and adjustment as the main operations of education as a system.
The seven principles which form the basis for systems analyses (Miller, 1985) include:

1. Parsimony: System descriptions must be brief, components must be separable from other parts, and the system few in total number of parts.

2. Order: Each part of the system must have some quantitative properties by which it may be classified, ordered or ranked.

3. Relatedness: Because parts of a system are integral parts of a whole, they must be related.

4. Acceptability: Those who are to use the system analysis must understand the terminology, graphics, mathematics and relationships described.

5. Validity: The analysis must accurately describe the reality of content, relationships, processes, etc. of the system.
6. Utility: Analysts must produce a system that is complete yet functional.

7. Entropy and Enthalpy: System analysis must attempt to describe the resources available to keep the system operational.

The systems paradigm has been applied in a variety of studies and proposals, and in a variety of school settings. Bowen (1982) proposed a systems model for program development comprising three components: program planning, program implementation and program evaluation. Although Bowen's model appears over-simplified, it addressed virtually all the issues and questions that go into the planning and development of an educational program.

Harrison (1980) formulated an eight-step systematic model for institutional curriculum development. The first three steps of the model were field-tested through application and evaluation in a community college. The subjects of the study (administrators and faculty members) were asked to rate on a given scale various aspects of curriculum planning in an international/intercultural program. Results of the study showed that the model would work fairly well if administrative and other impediments to its application were removed.

In another study, Henriquez-Villegas (1982) developed a model for use in the Venezuelan community college system. The study utilized computer simulation for curriculum decision making. The investigator conducted a sensitivity analysis to
determine how the model would respond to changes in certain critical variables. The results of the study encouraged Henriquez-Villegas to recommend its application in Venezuelan community colleges.

The Jackson's Mill Industrial Arts Curriculum Theory (Snyder and Hales, 1981) is, perhaps, the most elaborate application of the systems approach to curriculum development in industrial arts/technology education. Hacker and Barden (1983) suggested that the use of systems theory by industrial educators is an effective technique "... to adapt the industrial arts profession to the demands imposed on it by accelerating technical, social, and economic changes. Systems theory is a technique by which the developing discipline of technology education can provide relevant experiences" (p. 11). Hacker and Barden then proposed a systems model for technology education which takes account of student competencies, their personal and attitudinal development as well as program content.

Apart from the models described in this section, there are several other models that have been proposed for various aspects of industrial education that do not strictly fall into any of the major categories described. For example, Drake, Davies, and Terry (1980) proposed a model for establishing trade and industrial education curriculum development priorities. The model identified occupational areas to be emphasized in trade and industrial education. And at the international level, Kida (1982) developed a set of guidelines for vocational and
technical teacher preparation in Asia and the Pacific regions. The guidelines identified levels of teacher preparation, program objectives and program components.

Industrial and Technical Teacher Education in Nigeria

The development and present status of industrial and technical teacher education in Nigeria can be best understood by taking into account what Lillis (1984) called the country's "overall historic constraints of colonial dependency" (p. 176). Fafunwa (1974), Osuala (1976) and Okoro (1979) provided detailed historical perspectives on the development of vocational and technical education in Nigeria. The events and policies that shaped the course of industrial and technical teacher education are discussed in this section.

Early policies on technical education

Nigeria became a British Colony in 1861, but up to 1925 the British government had no clearly defined policy on education for the country (Fafunwa, 1974). Whatever education that was available was provided by the early missionaries. In 1920, the Phelps-Stokes Fund - an American philanthropic organization - in cooperation with the International Education Board set up a commission to study education in Africa (Lewis, 1962). The Phelps-Stokes commission report sharply criticized the British government's position on education in Africa. In
addition, the report made recommendations on how to improve African education.

The major and immediate outcome of the Phelps-Stokes report was the formulation and issuance of a Memorandum on Education in the British Colonial Territories by the British government. The policy called for government assistance in the education of the native Africans and also stressed the need for a system of technical and industrial training. Some of the pertinent points in the Memorandum include:

1. Technical and vocational training should be carried out with the help of the government departments concerned and under (the supervision of a system of supervisors to be established as laid down in the memorandum).

2. Systems should be established which, although varying with local conditions, will provide elementary education for boys and girls, secondary education of several types, technical and vocational education, institutions of higher education which might eventually develop into universities, and some form of adult education which will ensure identity of outlook between the newly educated generation and their parents (Memorandum on Educational Policy in British Tropical Africa, H.M.S.O., 1925).

The 1925 educational policy is significant in Nigerian education in many respects. First, it was the first policy
to be issued on the education of Nigerians since the introduction of Western education in the country eighty-three years earlier (Fafunwa, 1974). Second, it was the first government policy on vocational and technical education in Nigeria.

Okoro (1979) noted that the adoption of the 1925 educational policy led to the establishment of trade centers and technical institutes. But prior to this time some government departments, for example, the Nigerian Railway, the Public Works Department and the Marine, were offering vocational and technical training programs.

**Technical programs in higher education**

The first attempt to introduce technical courses in higher education came with the official establishment of Yaba Higher College in 1934 (Fafunwa, 1974). The initial students of the college were enrolled in medicine, agriculture, engineering and teacher training.

Another landmark in the development of vocational and technical education in Nigeria was the 1946 Ten-Year-Plan for development and welfare. The plan, among other things, provided for the establishment of handicraft centers for training in manual arts; trade centers for the training of skilled craftsmen; and technical institutes for the training of technicians. Consequently, three technical institutes were established at Yaba, Enugu and Kaduna between 1947 and
1952. Also seven trade centers and eighteen handicraft centers were established around the country (Okoro, 1979).

In April 1959, less than one year before Nigeria's independence, the federal government appointed a commission to study Nigeria's needs in post-secondary school certificate and higher education for the twenty-year period – 1960-1980 (Federal Ministry of Education, 1960). The commission often referred to as the Ashby Commission was chairmaened by Sir Eric Ashby. Three eminent Nigerians were among the team of experts that carried out the investigation on higher education in Nigeria. The Ashby Report, issued in 1960, had significant import for technical education which up to the time had very little place in Nigerian education. Among other things, the Commission strongly recommended the introduction of manual subjects "... as an obligatory ingredient of all primary and secondary schooling; not as a vocational training, but because such subjects have educational value which entitles them to a place in a general education" (Federal Ministry of Education, 1960, p. 18).

**Post-independence curriculum efforts**

In spite of the efforts made to create a functional education system for Nigeria, education after independence followed very much the colonial pattern. Some writers (e.g., Ward, 1974; Lillis, 1984) attempted to explain why colonial educational patterns persisted in independent African nations
regardless of attempts to gear education to national developmental needs. One explanation was that post-independence elites aspired to those jobs and positions held by the Europeans, hence they also wanted to receive the kind of education the Europeans had. Consequently, such efforts as the Phelps-Stokes Report were perceived by the elites as a "... means of perpetuating the inferior status of their race" (Lillis, 1984, p. 177) and, therefore, were unacceptable.

Ward (1974) suggested that the national elites did not want to alter the status quo because it would amount to tearing down their own nests. As for the masses, they too sought elitist education and "... would not accept any substitutes for places in the same inherited system that has given so many social and economic advantages to the national elites" (Ward, 1974, p. xvi). The explanations about the slowness in gearing Nigerian education toward national needs are, at best, speculative. The important point that should be noted is that a situation existed in which literary education and the university degree were all that counted in post-independence Nigeria. By contrast, technology, agriculture and other practical subjects, particularly at the subprofessional level, did not win much esteem (Fafunwa, 1974). It is equally important to note that Nigerians themselves were not satisfied with the educational system.

Thus, in 1969, a National Curriculum Conference was held in Lagos. Among other things the conference attempted to
define a national educational philosophy for Nigeria, delineate goals and objectives for primary and secondary education as well as make far-reaching recommendations for technical and teacher education. On the low status of vocational and technical education, the conference recommended:

Government labour code and service conditions should not only pay lip-service to the concept of dignity of labour. Nigerians with practical and technical training should be encouraged and their status in society raised through a better wage structure and a change in attitude between the so-called white-collar jobs and the blue-collar jobs (National Curriculum Conference, cited in Fafunwa, 1974, pp. 232-244.

Following the 1969 curriculum conference, a National Seminar on Educational Policy was held in 1973. The result of the seminar led to the historic National Policy on Education of 1977. One of the hallmarks of the policy was the introduction of a two-tier secondary education system - a junior secondary stage which was to be prevocational and a senior secondary level which was to be comprehensive. The National Policy included a philosophy statement and statements of objectives of education for primary, secondary, higher, technical, adult and non-formal, special and teacher education. Some implementation strategies were proposed with respect to the administration, planning and financing of Nigerian education as laid down in the policy (Federal Republic of Nigeria, 1981a).

Nigeria's five-year development plans (since the
formulation of the new policy on education) have made provisions that demonstrate government's commitment to make Nigeria a technologically and economically self-reliant nation. The importance attached to technology education became very apparent in the 4th National Development Plan (1980-85). The federal government stated in the plan document:

Technical education will continue, as in the preceding (plan) period to command the priority attention of government. More technical colleges and vocational training schools will be built in order to increase training facilities for craftsmen, artisans and technicians. The existing polytechnics and colleges of technology will be strengthened and new ones built. In this regard it is the policy of the Federal Government to ultimately provide one technical college and one Polytechnic in each State of the Federation (Federal Republic of Nigeria, 1981b, p. 257).

Technical education received a budgetary allocation of N400.20 million (about U.S. $600 million) in the 1980-85 plan period, thus having the second largest share of the total financial allocation to the education sector (after higher education) (Federal Republic of Nigeria, 1981b, p. 259).

**Industrial and technical teacher education**

Programs for the preparation of teachers at the higher educational level in Nigeria have a fairly short history; those for preparing vocational and technical teachers have even a shorter history dating only to the 1960s. The Yaba Higher College started a three-year course for teachers in 1932. But when the college was merged with the University
College, Ibadan in 1948 the Education students were transferred to the latter institution. The program which was for the award of a teaching diploma was discontinued in 1950. For about eight years thereafter there was no alternative arrangement for the training of teachers at this level (Fafunwa, 1974). A one-year diploma course was later organized at the University College, Ibadan in the 1957-58 academic year.

One of the major proposals of the Ashby Report was a scheme for university programs in teacher education. In fact, the Report recommended that 7,000 graduate teachers be trained for the secondary schools by 1970. Following its establishment in 1960, the University of Nigeria, Nsukka was the first Nigerian university to introduce full degree programs (B.A. or B. Sc.) in Education in 1961.

In the same vein, the first vocational and technical teacher education program in Nigeria was established at the University of Nigeria in 1965 with a grant from the Ford Foundation of New York (Oranu, 1977). Prior to 1965, it was assumed that no special program for the training of vocational teachers was necessary; that all a vocational teacher needed was skill in a trade (Okoro, 1979).

The establishment of more trade schools and trade centers (vocational high schools) in Nigeria in the 1960s created a great need for trained vocational and technical teachers. This need further led to the establishment of the National Technical Teachers College (NTTC), now Federal

Colleges of Education (offering industrial and technical courses) provide two kinds of programs: (1) a one-year certificate program. Graduates of the program receive the Technical Teachers Certificate, (2) a three-year certificate program for holders of the West African School Certificate (WASC) or the General Certificate of Education at the ordinary level (GCE-O/L). Those who successfully complete the three-year program receive the Nigerian Certificate in Education (NCE) and are qualified to pursue degree programs in the country's universities for two or three years depending on the level of pass they attained in the NCE. The final examinations in some of the colleges of education are moderated by the universities with which these colleges are affiliated. In recent years, some of the colleges have started awarding a bachelor's degree to outstanding students who successfully complete a newly introduced four-year program. It is hoped that many more colleges will offer four-year programs.

At the university level, the University of Nigeria provided both degree and diploma programs in industrial and technical education. The diploma (an equivalent of the NCE) was phased out in the early 1970s. Currently the department offers:
(i) a four-year bachelor's degree program for holders of the WASC or GCE-O/L;
(ii) a three-year bachelor's degree program for holders of the NCE with less than credit-level pass;
(iii) a two-year bachelor's degree program for those who possess outstanding NCE results.

Graduates of the above programs specialize in one of the areas of Building Technology, Mechanical Technology, and Electrical and Electronics Technology.

The Federal Government of Nigeria recognized the enormous demand its new policy on education would make in terms of supply of trained and competent technical teachers. The problem has been addressed in several ways. First, the 4th National Development Plan earmarked N189,050 million (about U.S. $250 million) for teacher education within the plan period (Federal Republic of Nigeria, 1981b, p. 260). In addition, the plan provided for construction and expansion of new and existing facilities for industrial and technical teacher education. Second the Federal Government, in cooperation with the U.S. Agency for International Development has been training Nigerian technical teachers in American universities. The impact of these programs on teacher supply in Nigeria is yet to be investigated.
Research on curriculum development in industrial and technical teacher education in Nigeria

Although some studies have been conducted on vocational and technical education in Nigeria, none has addressed the problem of developing a framework for industrial teacher education curriculum development. Available studies have focused on either the historical development of technical education in Nigeria (e.g., Nwagbaraocha, 1978; Osuala, 1976) or other aspects of Nigerian education. An exception, probably, is the study by Okoro (1979) who developed a model for evaluating vocational teacher education programs in Nigeria. The study identified program objectives and validated the criteria for evaluating those objectives. Vocational educators and administrators constituted the subjects of Okoro’s study.

Aghenta (1982) reviewed various studies carried out in Nigeria in the 1960s and 1970s by various organizations including the UNESCO, the Industrial Training Fund (ITF), and the National Manpower Board. The review showed that not only were graduates of public vocational schools poorly rated by employers but also the vocational schools lacked experienced specialist teachers.

The activities of the Ford Foundation in Nigeria was the subject of a study by Oranu (1977). Oranu studied the impact of the Ford Foundation on vocational teacher education in Nigeria and concluded, based upon a follow-up of
graduates, that the students of the University of Nigeria were not receiving adequate technical preparation. The undergraduate program was being hampered by insufficient instructional staff, limited instructional equipment, inadequate laboratory space, and lack of technical and professional books (Oranu, 1977).

Wolansky (1974), a consultant with the Ford Foundation, carried out an extensive study of vocational teacher education in Nigeria in the early 1970s. After reviewing the major forces that have contributed to the current emphasis on vocational teacher education in Nigeria, Wolansky developed a five-year plan for the Department of Vocational Teacher Education at the University of Nigeria, Nsukka. A model was proposed which recommended the training of three types of technical teachers at Nsukka, namely:

(i) technical teachers for upper secondary classes and two-year colleges;

(ii) vocational teachers capable of teaching trade skills at the trade centers and two-year postsecondary vocational schools and colleges; and

(iii) industrial arts teachers for the junior classes in the comprehensive secondary schools. The proposal also contained recommendations for expanding the facilities for vocational teacher education programs in Nigeria (Wolansky, 1974).
Ogbazi (1983) developed a master plan for the programs of industrial technology in Nigerian Federal Universities of Technology. Although Ogbazi's study was not focused on teacher education per se, his findings had useful implications for technical teacher education in Nigeria. For example, his subjects identified four dominant curriculum approaches and 14 occupational areas that should be emphasized in industrial technology programs.

A study by Njoku (1980) sought to develop a model program for cooperative teacher education in Nigeria. The model program was designed to include public schools, teacher training colleges, universities, and governmental agencies as well as the Nigerian Union of Teachers.

Also in 1980, Etim conducted a study aimed at determining the adequacy or inadequacy of undergraduate teacher education curriculum in Nigerian universities as perceived by first and second year secondary school teachers. Among the findings of the study were:

1. The strongest area in the preparation curriculum was the subject area specialization while the weakest area was student teaching.
2. Teachers were not satisfied with their student teaching experience.

It should be noted that Etim's (1980) study apparently did not involve vocational and technical teachers. That probably explains the disagreement between his findings and those of
Oranu (1977) over the perceived quality of student preparation in the subject area of specialization. But to some extent, the findings on dissatisfaction of graduates with their teacher preparation was not markedly different from those reported by Oranu. Regarding practice teaching, Etim recommended that college supervisors of practice teaching should try to pay more visits to the student during practice sessions.

Relationship of the Literature to the Present Study

The review of the literature led to three important developments in the design of the present study. First, the literature review revealed the absence of a model to guide curriculum development in industrial teacher education in Nigeria, and hence, the need for one. As an approach to the solution of the problem of inadequate undergraduate industrial and technical teacher education programs, this study found the models proposed by Wolansky (1974), Miller (1985) and Kida (1982) very useful.

Second, through the review of the studies by Okoro (1979) and Harrison (1980) the present researcher was able to pull together ideas that produced the design of the present study. Furthermore, Okoro's (1979) study enabled the present researcher to minimize effort on the evaluation aspect of program development in Nigeria since substantial work had already been done in that area by the author cited. Finally,
the review has given direction to the present study by defining the state of the art in curriculum development and industrial and technical education both in Nigeria and elsewhere, and has thus, provided valuable information upon which this study was built.

Summary

The review of the literature has shown that there exists little or no sound theory upon which to base any curriculum development effort. That curriculum practitioners have been operating on tradition and conventional wisdom does not imply that the importance of theories in curriculum enquiry was not recognized. At the same time, it does not mean that curriculum experts have not made efforts to generate theories for the field. But apparently, because of the nature of the educational enterprise and the curriculum process, theorizing in curriculum development has yielded models rather than theories.

The literature is replete with proposed models for curriculum development - some dealing with the curriculum process and others with the setting for curriculum planning and development. Most of the models reviewed demonstrated certain strengths and weaknesses suggesting that no single model will provide all the answers to questions of curriculum content, methods, organization, and the like.

Models have been proposed to replace the traditional clinical model of teacher preparation which some authors
consider inadequate. But in spite of criticisms, there is abundant evidence in the literature that the traditional model of teacher preparation will be seen more and more in the profession. Two probable reasons for this are that alternative models such as the competency-based models, themselves, face sharp criticisms and, in some cases, outright rejection. Secondly, tradition dies hard and this is more so in teaching as some writers suggested.

Overall, however, the review of related literature indicated that competency-based teacher education has exerted considerable influence on teacher education since its introduction in the 1970s. But as noted earlier, it is not necessarily the most popular teacher education model except, perhaps, in industrial teacher education where it has been widely employed (Frantz, 1979).

The systems model of curriculum development seems to be gaining much ground and appears not to be the subject of too much debate or rejection among educators. Its place in industrial and technology education programs suggest that it might be the dominant curriculum development model for the new field of technology education.

Finally, the recency of the introduction of industrial and technical education in Nigeria to some extent accounts for the limited number of available research in the area. It was noted, however, that the ineffectiveness of existing technical education programs resulting from lack of qualified
teachers spelt the need for systematically planned and developed industrial teacher education programs in the country. Although most of the models reviewed were developed outside Nigeria, it is believed that their basic tenets, with proper adaptation, will find application in formulating a program development model that will meet the needs of industrial and technical teacher education programs in Nigeria.
CHAPTER III. METHODOLOGY

The methods and procedures used in this study are described in this chapter and are reported in five parts:

1. A description of the systems model proposed in this study.
2. A definition of the population and sample of the study.
3. Development of the instrument.
4. Method of data collection.
5. Method of data analysis.

The Proposed Systems Model

The review of literature conducted for this study revealed that most available models of curriculum development in teacher education are inadequate. The traditional model of teacher preparation, for example, was found to be lacking in innovation and in providing beginning teachers with the competencies they need to be effective teachers (Tafel, 1984; McBride, 1985).

Competency-based models as well as models based upon task analysis are inadequate because of their failure, often, to take into account the affective competencies needed by industrial and technical teachers. Task analysis procedures are further deficient from the point of view of transfer of learning. The cluster and conceptual models have the
advantage that they encourage organization of curriculum content in a manner that promotes understanding of the underlying structures of subject fields. But a model which focuses only on content organization is likely to provide only a partial picture of what goes into the total process of curriculum development.

The increasing complexity of the educational process demands a curriculum development model that takes account of all the various facets of an educational program. Such a model should also be responsive to the changing needs of the educational system. It should borrow some of the strengths of available models and blend them into a system that encourages innovation and flexibility.

Thus, after reviewing the literature on curriculum development models, particularly those of Kaufman (1972), Banathy (1973), Henríquez-Villegas (1982) and Miller (1985), and based upon the experience of the investigator as an industrial teacher educator in Nigeria, a systems model for undergraduate industrial teacher education programs in Nigeria was proposed. Figure 5 shows the components of the proposed systems model. Also shown in Figure 6 are the major elements of a model for undergraduate industrial teacher education programs in Nigeria.

The underlying assumptions of the proposed model are that curriculum development: (a) is a continuous and responsive process, (b) occurs in an institutional context and must, therefore, require the participation of faculty and
Figure 5. A proposed general systems model for undergraduate industrial teacher education curriculum development in Nigeria

Administrators in decision-making, (c) must be based upon predetermined need, and (d) requires constant review to reflect changing needs. The eight phases of the systems model are as follows:

Phase I. Need identification: Needs which are to be met by the curriculum being developed should be determined. Information on the national need for adequate supply of qualified industrial and technical teachers are obtained from needs assessment studies, policy documents, and educational planning statistics. The institutional need should also be considered, taking into account the institutional mission, philosophy, goals and objectives. Student needs are identified based upon feedback from
Figure 6. Model for undergraduate industrial and technical teacher education programs in Nigeria
graduates as well as the career goals of present students. Once needs have been identified, they should be scrutinized for any discrepancies or conflicts among the various groups. Any differences between members of a group and among different groups should be resolved. Finally, the needs should be ranked.

Phase II. **Definition of goals.** The broad goals as well as objectives of the program are defined. Program goals and intended outcomes must be compatible with the goals of the population which the institution serves. These include:

1. National goals as indicated in the National Policy on Education, and five-year Development Plans.
2. Institutional goals as stated in its publications.
3. Goals of organizations - business, industry or other entities whose needs the institution serves.

Phase III. **Feasibility analysis.** Focus at this stage is on resources for curriculum development - planning, implementation and evaluation. Resources are identified by consultants or specialists in each curriculum or subject area. Important resources to consider include:

a) Human resources - information about the availability and expertise of instructional staff for each area of specialization is gathered. Possibilities for staff development are determined.

b) Management and funding: Means for financing and managing the program is determined.
c) Instructional resources: Information about facilities, equipment, materials and other educational resources are obtained and analyzed.

d) Support services: Library and counseling services, as well as institutional offices and committees concerned with institutional and community relationships are identified.

Also implied in this phase is the need to obtain approval and support of the official organism of the institution. The support of other relevant groups including students, teachers, faculty and administrators of other departments, local community people, and the business community is equally important.

Phase IV. Design of Content. This phase is crucial in the decision-making process and, therefore, requires the active involvement of faculty at every step. First, specialty areas (e.g., Trade and Industrial, Technology/Industrial Arts, Industrial Technology) are identified. Content for each area is determined by specialists in the area. A systematic approach to designing content would include:

a) identifying program components through occupational surveys,

b) identifying competencies through competency studies and task analysis procedures, and

c) determining the organizational approach for the content.

Data obtained from these procedures are analyzed and utilized
in developing program content for each technical specialty area. Decision as to the final form of the content design should be based upon a thorough analysis of the data collected and results of tests and revisions of the original structure and sequence of content as conducted by the specialists.

Phase V. Definition of objectives: In order for the curriculum elements to be translated into instructional activities, instructional objectives are defined. These general objectives derive from the broad goals of the program as determined in Phase II.

Phase VI. Curriculum implementation: This stage consists of two main activities: (a) designing the strategy for implementing the curriculum at the classroom level - selection of instructors, students, supplies, equipment and instructional materials, and (b) determining the teaching strategies to be used to insure optimum development of the desired attitudes, skills, knowledge and competencies required for industrial subjects. Such strategies as field trips, projects, individualized instruction and various other methods should be assessed for their effectiveness in any particular instructional situation.

Phase VII. Program evaluation: Selection of an appropriate evaluation technique is important. Curriculum elements to be evaluated include student outcomes in particular instructional units, courses, or programs. Evaluation of curriculum packages, instructional techniques or materials should also be
conducted on a continuous basis to provide information about program effectiveness.

Phase VIII. **Program modification**: Based upon evaluation results, the curriculum in each area of specialization should be updated or revised as necessary. Phases I through VIII of the model should undergo continuous revision to ensure that a dynamic and responsive curriculum is in operation.

**Definition of the Population and Selection of Sample**

The population of this study consisted of:

1. All heads of departments (DEOs) of institutions offering industrial and technical teacher education programs in Nigerian colleges and universities. Twenty-one such institutions were identified from statistics obtained from the Federal Ministry of Education, Science and Technology, Lagos, and the National Board for Technical Education in Kaduna.

2. All industrial and technical teacher educators (faculty) in Nigerian colleges and universities where industrial and technical teacher education programs are offered.

3. All teachers of industrial and technical subjects in Nigerian secondary and technical schools/colleges.

4. All Nigerian graduate students of industrial education in U.S. universities.
The above population was identified for this study because of the investigator's belief that program administrators, teacher educators, practicing teachers, and graduate students (most of whom were teachers or students in Nigeria), are in the best position to determine what should be the essential considerations in developing an undergraduate industrial teacher education program for Nigeria.

From the above population the following sample was drawn:

1. All twenty-one DEOs were included in the sample because of their small number (n=21).

2. Seventy industrial and technical teacher educators (faculty) selected from a stratified sample of institutions from the three major geographical regions of the country. Three institutions were randomly selected from the Eastern States and Western States (including Bendel State) respectively. Seven institutions were randomly selected from the Northern States. There was a total of four institutions in the Eastern States, six in the Western States, and eleven in the Northern States.

3. Forty industrial and technical teachers selected from six secondary schools and technical colleges in three geographical regions of the country.

4. Forty Nigerian graduate students of industrial education from randomly selected American universities.
Development of the Instrument

A questionnaire was developed for gathering data for this study. The questionnaire items were generated by the investigator from the literature (e.g., Kida, 1982; Wilson, 1971; and Blake, 1971). The instrument consisted of two parts. The first and major part contained 74 variables dealing with program development. Most of the items sought the respondents' perceptions about the degree of importance or extent of agreement about identified elements of an industrial and technical teacher education program for Nigeria.

Instructions for responding to the items were developed and a certainty rating scale from 1 to 99 was employed. The certainty scale allows for a wide range of responses to each item. A rating of 1 indicates that the individual is certain that he/she does not agree with a statement or does not consider an item important, whereas a rating of 99 signifies that the respondent is certain that he/she agrees with a statement or considers an item very important. Ratings near 50 are appropriate when the respondent does not know whether he/she agrees with a statement, or whether or not an item is important.

Studies conducted on the application of the 99-point response framework (e.g., Liu, 1971; Warren, Klonglan, and Sabri, 1969) indicate that it reflects more of the differences between individuals in relation to certain characteristics and, therefore, represent a more sensitive scale than, say, the five-point Likert-type scale.
The second part of the instrument sought demographic data about the respondents. Four variables were considered in this part.

Validation and Pilot-testing of Instrument

The questionnaire went through a validation process by a panel of experts comprising five members of the investigator's Graduate Committee. Based upon the recommendations of the panel, the instrument was revised several times before a final draft was produced.

The final draft of the instrument was pilot-tested with a sample of eight Nigerian graduate students of industrial education at Iowa State University. Results of the pilot test were utilized to further screen and revise the questionnaire.

It is required at Iowa State University that a research proposal involving human subjects be reviewed by a committee to ensure that the proposal conformed with stated guidelines. The proposal and instrument for this study were approved by that committee.

Data Collection

Because the mailed questionnaire was the method of data collection employed in this study, it was necessary to identify some contact persons to assist the investigator in administering and collecting the questionnaires. In May of 1985,
letters were written by the investigator to the Federal Ministry of Education, Science and Technology, Lagos, and the National Board for Technical Education, Kaduna requesting information that would assist in identifying the institutions and persons to be involved in the study (see Appendix A). Following the responses from the two agencies in Nigeria, letters were written to the DEOs of twenty-one identified institutions in Nigeria soliciting their participation in the study. Out of 21 letters sent out, 15 DEOs responded and indicated their willingness to participate in the study along with their faculty. The DEOs were also to be the contact persons in their institutions. Ten Nigerian graduate students were contacted by telephone and they accepted the responsibility to aid in data collection in their respective institutions.

It was initially proposed in the study to include only three groups, namely, DEOs, teacher educators, and graduate students. But owing to the belief that technical teachers in Nigerian secondary and technical schools might provide useful input to the study, this group was later included. Six contact persons were identified in five different states in Nigeria and requested to assist the investigator in data collection in the secondary and technical schools.

The questionnaires were mailed out on February 16, 1986 to the various contact persons. The respondents in Nigeria were asked to return the completed questionnaires to the con-
tact persons who were requested to return the instrument in a
sealed enveloped provided by the investigator. Nigerian stu-
dents in the United States were asked to return the completed
questionnaires directly to the investigator. Postage was
provided (see Appendix B for letters of transmittal).

Although the respondents were asked to return all ques-
tionnaires within a three-week period, six weeks were allowed
for questionnaires expected from Nigeria. Out of 171 ques-
tionnaires sent out, 122 were returned after eight weeks from
date of mailing. This represented 71.3% return and provided
the data used in this study. Thirteen additional question-
naires were received after the data from the first 122 ques-
tionnaires had been coded for computer processing. These
13 questionnaires were, therefore, not used in the study.

Table 2 shows the questionnaire returns from the four groups.

Table 2. Number of questionnaire returns by group

<table>
<thead>
<tr>
<th>Group</th>
<th>Number sent</th>
<th>Number returned</th>
<th>Percent return</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEOs</td>
<td>21</td>
<td>13</td>
<td>61.9</td>
</tr>
<tr>
<td>Faculty</td>
<td>70</td>
<td>47</td>
<td>67.1</td>
</tr>
<tr>
<td>Technical Teachers</td>
<td>40</td>
<td>25</td>
<td>62.5</td>
</tr>
<tr>
<td>Graduate Students</td>
<td>40</td>
<td>37</td>
<td>90.2</td>
</tr>
<tr>
<td>Total</td>
<td>171</td>
<td>122</td>
<td>71.3</td>
</tr>
</tbody>
</table>
Data Analysis

The data collected from the returned questionnaires were coded on IBM forms in preparation for keypunching and subsequent computer analysis.

The study sought to provide answers to the following questions:

1. What should be the general objectives of an industrial and technical teacher education program at the undergraduate level in Nigeria?
2. What program components need emphasis in Nigerian industrial and technical teacher education programs?
3. What curriculum development approaches should be emphasized in developing undergraduate industrial and technical teacher education programs in Nigeria?
4. What are the broad competencies to be emphasized in the programs?
5. Who should be involved in industrial and technical teacher education curriculum development in Nigeria?
6. Do differences exist between the perceptions of administrators, teacher educators, classroom teachers and graduate students of industrial education regarding questions 1-5 of this study?

The research questions resulted in the formulation of the following five hypotheses:
1. There is no significant difference in perception between administrators (DEOs), teacher educators, technical teachers, and graduate students regarding the objectives to be sought in industrial and technical teacher education programs in Nigeria.

$H_0: \alpha_j = 0$ for all $j$ groups, where $j = 1, 2, 3, 4$ (a=.05)*

2. There is no significant difference in the perceptions of DEOs, teacher educators, technical teachers, and graduate students regarding the program components to be emphasized in industrial and technical teacher education curriculum development.

$H_0: \alpha_j = 0$ for all $j$ groups, where $j = 1, 2, 3, 4$ (a=.05)

3. There is no significant difference in the perception of DEOs, teacher educators, technical teachers, and graduate students regarding the curriculum approach to be emphasized in industrial and technical teacher education programs.

$H_0: \alpha_j = 0$ for all $j$ groups, where $j = 1, 2, 3, 4$ (a=.05)

4. There is no significant difference in perception between DEOs, teacher educators, technical teachers, and graduate students regarding the competencies considered to be important in industrial and technical teacher education programs in Nigeria.

$H_0: \alpha_j = 0$ for all $j$ groups, where $j = 1, 2, 3, 4$ (a=.05)

*a = level of significance.
5. There is no significant difference in perception between DEOs, teacher educators, technical teachers, and graduate students regarding the participants to be involved in program development.

\[ H_0: \alpha_j = 0 \text{ for all } j \text{ groups, where } j = 1, 2, 3, 4 \ (a=.05) \]

The statistical model used for testing the hypotheses was:

\[ X_{ij} = u + \alpha_j + e_{ij} \]

where:

- \( X_{ij} \) = the \( i \)th score in the \( j \)th group
  - \( j = 1, 2, 3, 4 \)
- \( u \) = the grand mean of the population
- \( \alpha_j = u_j - u \) = the difference between the mean of \( j \)th population, \( u_j \), and \( u \)
- \( e_{ij} \) = individual differences within the groups which might be attributed to random error

In analyzing the questionnaire items on the 1 to 99 response framework, the original responses (numerical values from 1 to 99) were non-linearly transformed. According to Warren et al. (1969), a researcher using the 99-point scale does not assume equal intervals between values selected by the respondent. These authors suggested the use of an appropriate transformation utilizing the scale of normal deviates (Z). The use of normal deviates in analyzing certainty scale data is also supported by Wolins and Dickinson (1973).
In the present study, the item responses were divided by 100 and transformed (PROBIT) to a scale of normal deviates (Z). With this transformation, a response of 99 was coded +2.326, 75 as +0.674, 50 as 0.000, 25 as -0.674, and 1 as -2.326.

The transformations have the effect of weighting highly response differences in the ends of the scale and relatively lowly those in the center of the scale (Wolins and Dickinson, 1973). In other words, there is a "spreading out" of the tails of the scale and a "pushing together" of the scores occurring near the middle.

Using the computer program, Statistical Analysis Systems (SAS), the following were computed and used to summarize the data:

1. Mean scores: These were computed for all the four groups in the study for all items related to each research question. For items on the 99-point scale, the means were computed from the normal deviates rather than from the original 99-category responses.

2. Standard deviations: These were computed for the four groups in the study and for all items. Again, the transformed scores were used for items on the 99-point scale.

3. Frequency counts and percentages: These were used
to summarize descriptive data.

4. Analysis of variance (ANOVA): One-way ANOVA for unequal n's, using the SAS procedure (PROC GLM), was employed to test the null hypotheses stated in the study.

5. A post-hoc analysis using Scheffé's multiple range test was carried out whenever differences were found among groups for F-values significant beyond the assigned probability level of 0.05.

Resolving disagreements or differences in perceptions between groups

The purpose of this study was to obtain comprehensive information from administrators, teacher educators, technical teachers, and graduate students for use in formulating a model for developing undergraduate industrial and technical teacher education programs in Nigeria. If there was consensus in the perceptions of all four groups regarding any variable, such a variable was accepted into the proposed model as an important element of Nigerian industrial teacher education programs. Where significant differences were found between the groups, the data were further analyzed using scatterplot analysis to compare the four groups in different pairwise combinations. This would enable the reader to see the whole set of data.

Final judgement about which of the variables to be ident-
ified for emphasis, based on the ratings of the four groups, was made on the basis of the overall means of the four groups. The pre-determined cut-off point was set at the 70th percentile (0.53 on the transformed scale) for items on the scale of 1 to 99, and the simple average for items involving proportions or other forms of response. In general, any variable earning a mean response below the cut-off point was eliminated from the proposed model.

Tables and graphs were presented to clarify findings and discussions. Finally, recommendations were made based upon the results of the study.
CHAPTER IV. FINDINGS

In this chapter, the major findings of this study are presented. The presentation includes (1) results of descriptive statistical analyses of some general characteristics of the sample, (2) results of statistical tests of null hypotheses relating to the questions of the study, and (3) results of the analyses of other pertinent data concerning the development of undergraduate industrial and technical teacher education programs in Nigeria.

General Characteristics of the Sample

Composition of the sample

One hundred twenty-two (122) respondents provided the usable data for this study. The composition of this sample is shown in Table 3.

Table 3. Distribution of the respondents by group

<table>
<thead>
<tr>
<th>Group</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Administrators (DEOs)</td>
<td>13</td>
<td>10.7</td>
</tr>
<tr>
<td>2. Teacher Educators (Faculty)</td>
<td>47</td>
<td>38.5</td>
</tr>
<tr>
<td>3. Graduate Students</td>
<td>37</td>
<td>30.3</td>
</tr>
<tr>
<td>4. High School Technical Teachers</td>
<td>25</td>
<td>20.5</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 3 indicates that 13 administrators, 47 teacher educators, 25 technical teachers, and 37 graduate students participated in the study.

**Geographical location of respondents**

For purposes of this study, the 19 states of Nigeria were grouped into three geographical regions, namely, Northern States, Western States, and Eastern States. Three groups of respondents (administrators, teacher educators, and technical teachers) were residing in these regions of Nigeria. A map of Nigeria showing the states is presented in Appendix C. The graduate students who participated in the study were residing in the United States.

Table 4 shows the number of responses received from the various geographical locations.

**Table 4. Distribution of respondents by location**

<table>
<thead>
<tr>
<th>Geographical location</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern States</td>
<td>44</td>
<td>36.1</td>
</tr>
<tr>
<td>Western States</td>
<td>13</td>
<td>10.6</td>
</tr>
<tr>
<td>Eastern States</td>
<td>28</td>
<td>23.0</td>
</tr>
<tr>
<td>U.S.A. (Graduate Students)</td>
<td>37</td>
<td>30.3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>122</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 4 indicates that 85 respondents (69.7%) were resident in Nigeria. Thirty-seven (30.3%) of the respondents were resident in the United States.

Consideration was given to the highest educational qualifications attained by the respondents. This is presented in Table 5. As the table shows, nine respondents had earned doctorate degrees, 43 had earned the master's, and 54 had received the bachelor's degrees. Sixteen respondents possessed "other" non-degree qualifications including the Nigerian Certificate in Education and the Higher National Diploma (a certificate awarded by the polytechnics to those who completed three to four years of technician programs). The data revealed that the 16 non-degree holders belonged to the group of technical teachers.

Table 5. Highest educational qualifications of respondents

<table>
<thead>
<tr>
<th>Qualification</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctorate Degree</td>
<td>9</td>
<td>7.4</td>
</tr>
<tr>
<td>Master's Degree</td>
<td>43</td>
<td>35.2</td>
</tr>
<tr>
<td>Bachelor's Degree</td>
<td>54</td>
<td>44.3</td>
</tr>
<tr>
<td>Other (NCE, Higher National Diploma, etc.)</td>
<td>16</td>
<td>13.1</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Another demographic variable considered in the study was the sex of the respondents. It was found that only two females participated in the study. The sample was, therefore, predominantly male (98.4%).

Perceptions on the Importance of Degree Programs in Industrial and Technical Teacher Education

As a background for the major questions of this study, the perceptions of the respondents were sought regarding the need for colleges and universities in Nigeria to provide degree programs in industrial teacher education and how such programs should be administered.

Importance of degree programs

The respondents were asked to rate on a scale of 1 to 99 how important it was that colleges of education and universities in Nigeria offer degree programs in industrial teacher education.

It should be noted that the means and standard deviations of the responses were computed after the original 1 to 99 response categories had been transformed (PROBIT) as described in Chapter III.

The results of the analysis showed that the four groups of respondents considered it very important that the colleges and universities offer degree programs in industrial teacher education ($X = 1.36$). An analysis of variance of the group means yielded a non-significant F-value of 1.23...
Administration of degree programs

Five statements relating to administration of industrial teacher education programs in Nigeria were made in the questionnaire and the respondents were asked to rate how much they agreed with the statements. Table 6 shows the results.

Table 6. Means, standard deviations, and analysis of variance relating to program administration

<table>
<thead>
<tr>
<th>Statement</th>
<th>Overall mean</th>
<th>Std. dev.</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. A college of education offering a degree program should be affiliated with a university.</td>
<td>0.70</td>
<td>1.31</td>
<td>4.26**</td>
</tr>
<tr>
<td>2. A college of education offering a degree program should be administratively autonomous.</td>
<td>0.63</td>
<td>1.08</td>
<td>3.35*</td>
</tr>
<tr>
<td>3. Certification standards in institutions offering degree programs in industrial and technical education should be monitored by a national commission.</td>
<td>1.02</td>
<td>0.94</td>
<td>2.10</td>
</tr>
<tr>
<td>4. The commission to monitor certification standards should be an arm of the National Board for Technical education.</td>
<td>0.78</td>
<td>1.01</td>
<td>0.84</td>
</tr>
<tr>
<td>5. Final degree examination and certification should be handled by individual educational institutions.</td>
<td>0.62</td>
<td>1.16</td>
<td>3.73*</td>
</tr>
</tbody>
</table>

The means and standard deviations presented in Tables 6 through 12 are computed from transformed numerical (Z) values.

*Significant beyond the .05 level.

**Significant beyond the .01 level.
The means and standard deviations shown in Table 6 indicate that the respondents mostly agreed with statements 1, 3, and 4 concerning the administration of degree programs in industrial teacher education in Nigeria. The mean ratings of 0.63 and 0.62 recorded for items 2 and 5 respectively suggest that the agreement on those statements were not as strong as in the other three statements.

The analysis of variance of group means revealed significant differences in items 1, 2, and 5. The Scheffé's multiple range test showed that for item 1, differences existed between the ratings of technical teachers ($\bar{x} = 1.42$) and graduate students ($\bar{x} = 0.26$). For item 2, there were also differences between the ratings of technical teachers ($\bar{x} = 0.08$) and graduate students ($\bar{x} = 0.93$).

In the case of item 5, significant differences were not found between any two groups in all the pairwise comparisons, even though there was a significant F-value.

**Areas of specialization**

The respondents were further asked how important it was to provide specialization in certain areas of industrial and technical teacher education. The identified areas of specialization as well as the ratings of their perceived importance are presented in Table 7.
Table 7. Means, standard deviations, and analysis of variance of perceived importance of areas of specialization

<table>
<thead>
<tr>
<th>Area of Specialization</th>
<th>Overall mean</th>
<th>Std. dev.</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Industrial arts for teachers of prevocational programs in Nigerian secondary schools.</td>
<td>0.94</td>
<td>0.81</td>
<td>1.15</td>
</tr>
<tr>
<td>2. Trade and industrial education for teachers of vocational subjects in secondary and technical schools.</td>
<td>1.28</td>
<td>0.79</td>
<td>3.65*</td>
</tr>
<tr>
<td>3. Industrial technology for industrial trainers.</td>
<td>1.08</td>
<td>0.84</td>
<td>2.50</td>
</tr>
</tbody>
</table>

*Significant beyond the .05 level.

Table 7 shows that relatively high ratings were recorded for all the three areas of specialization indentified in the questionnaire. The analyses of variance indicated that there were significant differences among the group means for item 2. The Scheffé's multiple range test revealed that the differences existed between the ratings of teacher educators ($\bar{x} = 1.05$) and those of technical teachers ($\bar{x} = 1.67$).
Research Hypotheses

Hypothesis 1

It was hypothesized that there was no significant difference in perception between administrators (DEOs), teacher educators, technical teachers, and graduate students regarding the objectives to be sought in industrial and technical teacher education programs in Nigeria. Table 8 shows the results of the data analysis regarding the objectives to be pursued in industrial and technical teacher education programs in Nigeria.

As shown in Table 8, all the nine general objectives identified were rated above the 75th percentile indicating that they were considered very important by the respondents. Variable 4, "Producing qualified technical teachers in sufficient numbers to meet national needs", received the highest mean rating (1.62).

Analyses of variance of group means for all the nine variables revealed that there were no significant differences except for variable 8 (p=.0218). The Scheffé's test for variable 8 indicated that there were significant differences between the ratings of teacher educators ($\bar{x} = 0.88$) and the ratings by graduate students ($\bar{x} = 1.34$). Both ratings are far beyond the 70th percentile cut-off point. This indicates that both groups perceived "Creating in students an awareness of the impact of industry and technology on society" as a very important objective to be pursued in the programs.
Table 8. Mean ratings, standard deviations, and analyses of variance relating to the importance of objectives

<table>
<thead>
<tr>
<th>General objectives</th>
<th>Overall mean</th>
<th>Std. dev.</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Providing technical knowledge and vocational skills necessary for effective technical teaching.</td>
<td>1.38</td>
<td>0.71</td>
<td>1.12</td>
</tr>
<tr>
<td>2. Providing a balance of general, technical, and professional education.</td>
<td>1.01</td>
<td>0.82</td>
<td>0.89</td>
</tr>
<tr>
<td>3. Providing a balance between the theory and practice of contemporary industrial teaching.</td>
<td>1.10</td>
<td>0.78</td>
<td>1.58</td>
</tr>
<tr>
<td>4. Producing qualified technical teachers in sufficient numbers to meet national needs.</td>
<td>1.62</td>
<td>0.68</td>
<td>0.32</td>
</tr>
<tr>
<td>5. Providing educational experiences to meet the needs and interests of individual students.</td>
<td>1.07</td>
<td>0.81</td>
<td>2.55</td>
</tr>
<tr>
<td>6. Enhancing and promoting students' interest and attitude toward the profession of industrial and technical teaching.</td>
<td>1.13</td>
<td>0.71</td>
<td>1.12</td>
</tr>
<tr>
<td>7. Providing the opportunities for the development of independent thinking and problem solving skills.</td>
<td>1.12</td>
<td>0.74</td>
<td>1.22</td>
</tr>
<tr>
<td>8. Creating in students an awareness of the impact of industry and technology on society.</td>
<td>1.07</td>
<td>0.71</td>
<td>3.34*</td>
</tr>
<tr>
<td>9. Providing extra curricular activities which enhance students' potential for further professional development.</td>
<td>0.79</td>
<td>0.74</td>
<td>2.61</td>
</tr>
</tbody>
</table>

*Significant beyond the 0.05 level.
Hypothesis 2.

It was hypothesized that there was no significant difference in the perceptions of DEOs, teacher educators, technical teachers, and graduate students regarding the program components to be emphasized in industrial and technical teacher education curriculum development. The findings with respect to this hypothesis are presented in Table 9.

The analyses presented in Table 9 show that except for variables 1 and 16, which received relatively low ratings (0.62 and 0.61 respectively), all the other variables received high ratings. The Table also shows that the analyses of variance of group means for variables 2, 3, 4, 5, 9, 12 and 15 resulted in F-values significant beyond the 0.01 level. The F-values for variables 7, 11, and 16 were significant beyond the 0.05 level.

The Scheffé's multiple range test for all the significant F-values revealed that teacher educators and graduate students differed significantly in their ratings of all the variables. Graduate students and DEOs differed in variables 4, 9, and 12. For variables 5 and 9, teacher educators and technical teachers differed; and for variable 9, DEOs and technical teachers differed. All the pairwise comparisons for variable 9 revealed significant differences between the four groups.
Table 9. Mean item ratings, standard deviations and analyses of variance relating to the importance of components to be emphasized in programs

<table>
<thead>
<tr>
<th>Program Component</th>
<th>Overall mean</th>
<th>Std. dev.</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Knowledge and understanding of the historical, social and philosophical foundations of vocational and technical education.</td>
<td>0.62</td>
<td>0.68</td>
<td>0.77</td>
</tr>
<tr>
<td>2. Applying the theories and principles of teaching and learning to classroom situations.</td>
<td>0.98</td>
<td>0.78</td>
<td>5.91**</td>
</tr>
<tr>
<td>3. Planning and implementing instruction.</td>
<td>1.10</td>
<td>0.70</td>
<td>4.94**</td>
</tr>
<tr>
<td>4. Designing and utilizing appropriate teaching aids.</td>
<td>1.11</td>
<td>0.74</td>
<td>5.75**</td>
</tr>
<tr>
<td>5. Organizing group discussions, demonstrations, field trips and other instructional strategies.</td>
<td>1.06</td>
<td>0.78</td>
<td>6.59**</td>
</tr>
<tr>
<td>6. Conducting and supervising students' practice teaching experience.</td>
<td>1.03</td>
<td>0.73</td>
<td>2.44</td>
</tr>
<tr>
<td>7. Conducting and supervising students' industrial work experience in cooperation with employers.</td>
<td>1.13</td>
<td>0.74</td>
<td>3.40*</td>
</tr>
<tr>
<td>8. Measuring and evaluating student progress.</td>
<td>1.21</td>
<td>0.72</td>
<td>2.02</td>
</tr>
<tr>
<td>9. Conducting follow-up studies of program graduates.</td>
<td>0.82</td>
<td>0.83</td>
<td>7.38**</td>
</tr>
<tr>
<td>10. Applying the principles of guidance and counseling and communicating same to the students.</td>
<td>0.83</td>
<td>0.76</td>
<td>1.63</td>
</tr>
</tbody>
</table>

*Significant beyond the .05 level.

** Significant beyond the .01 level.
Table 9. (Continued)

<table>
<thead>
<tr>
<th>Program Component</th>
<th>Overall mean</th>
<th>Std. dev.</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>11. Managing classroom resources and problems.</td>
<td>0.76</td>
<td>0.73</td>
<td>3.05*</td>
</tr>
<tr>
<td>12. Managing the industrial education laboratory or shop.</td>
<td>1.06</td>
<td>0.73</td>
<td>5.42**</td>
</tr>
<tr>
<td>13. Understanding the theoretical bases</td>
<td>0.99</td>
<td>0.76</td>
<td>2.67*</td>
</tr>
<tr>
<td>of the major industrial or technical teaching specialty.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Practical application of technical skills, knowledge</td>
<td>1.49</td>
<td>0.70</td>
<td>2.80*</td>
</tr>
<tr>
<td>and attitudes to real life situations.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. Mastery of other subject areas related to technical</td>
<td>0.73</td>
<td>0.72</td>
<td>4.44**</td>
</tr>
<tr>
<td>specialty.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. Developing student interest and awareness in the</td>
<td>0.61</td>
<td>0.72</td>
<td>2.83*</td>
</tr>
<tr>
<td>contemporary social, economic, and political life of the</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>community.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Familiarity with research methods, techniques, and</td>
<td>1.04</td>
<td>0.79</td>
<td>1.66</td>
</tr>
<tr>
<td>practices, and utilizing them to improve instruction.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As a result of the observed differences, the data were subjected to further analysis using the scatterplot procedure. The mean ratings of the four groups of respondents were plotted in the following combinations:

Group 1 (DEOs) with group 2 (teacher educators)
Group 1 (DEOs) with group 3 (graduate students)
Group 1 (DEOs) with group 4 (technical teachers)
Group 2 with group 3
Group 2 with group 4
Group 3 with group 4
The scatterplots were used to indicate the extent of agreement or disagreement between two groups of respondents over an item. In each scatterplot, a 45° line is drawn through the origin. Points which fall on the line indicate items on which the two groups perfectly agreed. The further a point is from the line, the greater the extent of disagreement between the two groups.

Figure 7 depicts the mean item responses of DEOs and teacher educators regarding the program components to be emphasized in industrial and technical teacher education curriculum development. The two groups rated items 1, 9, 11, 15, and 16 as moderately important and the rest of the items as very important. Items 9 and 11 seemed to have been rated very low by both the DEOs and the teacher educators. However, the overall mean ratings (0.82 and 0.76 respectively) were large enough to qualify both items for inclusion in the proposed model.

Shown in Figure 8 is the scatterplot for the mean item responses of the DEOs and the graduate students. The figure indicates that the graduate students rated nearly all the items higher than the DEOs did. Again there seemed to be more disagreement over items 9 and 11 than with any other item.

In Figure 9, items 8 and 4 remained highly rated whereas items 9 and 11 received higher ratings from technical teachers but lower scores from the DEOs. Greater disagreement is noted in items 9 and 11 as was the case in previous comparisons.
Figure 7. Scatterplot of the mean item responses (on the transformed scale) of groups 1 (DEOs) and 2 (teacher educators) regarding the program components to be emphasized.
Figure 8. Scatterplot of the mean item responses (on the transformed scale) of groups 1 (DEOs) and 3 (graduate students) regarding the program components to be emphasized.
Figure 9. Scatterplot of the mean item responses (on the transformed scale) of groups 1 (DEOs) and 4 (technical teachers) regarding the program components to be emphasized.
Figure 10. Scatterplot of the mean item responses (on the transformed scale) of groups 2 (teacher educators) and 3 (graduate students) regarding the program components to be emphasized.
Figure 11. Scatterplot of the mean item responses (on the transformed scale) of groups 2 (teacher educators) and 4 (technical teachers) regarding the program components to be emphasized.
Figure 12. Scatterplot of the mean item responses (on the transformed scale) of groups 3 (graduate students) and 4 (technical teachers) regarding the program components to be emphasized.
In Figure 10, the relative positions of items 9 and 11 were improved. This resulted from the higher ratings both items received from faculty and graduate students.

Figure 11 shows that except for item 16, "Developing student interest and awareness in the contemporary social, economic, and political life of the community" which received a low score from group 2, all of the other items seemed to have been rated relatively high by both groups of respondents.

The picture in Figure 12 also shows higher ratings for the items by graduate students and high school teachers and a more balanced cluster of items around the 45° line.

Summary

The scatterplot analyses of the mean item responses regarding the program components to be emphasized showed that the following items consistently received high scores (above 0.53) from the respondents (the number in parentheses refers to the item number in Table 9):

1. Practical application of technical skills, knowledge and attitudes to real life situations. (14)
2. Measuring and evaluating student progress. (8)
3. Conducting and supervising students' industrial work experience in cooperation with employers. (7)
4. Planning and implementing instruction. (3)
5. Organizing group discussions, demonstrations, field trips and other instructional strategies. (5)
6. Familiarity with research methods, techniques, and practices, and utilizing them to improve instruction. (17)
7. Conducting and supervising students' practice teaching experience. (6)

8. Designing and utilizing appropriate teaching aids. (4)

9. Understanding the theoretical bases for the major industrial or technical teaching specialty. (13)

10. Applying the theories and principles of teaching and learning to classroom situations. (2)

11. Applying the principles of guidance and counseling and communicating same to the students. (10)

12. Managing the industrial education laboratory or shop. (12)

The following items received from low to moderately high ratings from some of the groups:

1. Developing student interest and awareness in the contemporary social, economic, and political life of the community. (16)

2. Managing classroom resources and problems. (11)

3. Conducting follow-up studies of program graduates. (9)

4. Mastery of other subject areas related to technical specialty. (15)

5. Knowledge and understanding of the historical, social and philosophical foundations of vocational and technical education. (1)

It was noted in Figures 7, 8, and 9 that items 9 and 11 did not fall within the clusters of items. The explanation for this could be found in the low ratings given to the two items by the DEOs. Figures 7, 8, and 9 plotted the mean ratings of DEOs against the mean ratings of each of the other three groups, one after another, hence the repeated non-clustering of the two items with the other items in the scatterplots.

Although items 1, 9, 11, 15 and 16 received relatively low
ratings from the respondents, it was not necessary to eliminate any of the items from the model because, in each case, the mean rating exceeded the predetermined cut-off point of 0.53.

Hypothesis 3

It was hypothesized that there was no significant difference in the perceptions of DEOs, teacher educators, technical teachers, and graduate students regarding the curriculum approach to be emphasized in industrial and technical teacher education programs.

Two factors were considered in defining curriculum approaches namely: content determination and content organization. Table 10 shows the ratings for the factor of content determination. Ratings for content organization in courses for teachers of prevocational courses are shown in Table 11.

Table 10. Mean item ratings, standard deviations, and analyses of variance relating to content determination

<table>
<thead>
<tr>
<th>Determining Content</th>
<th>Overall mean</th>
<th>Std. dev.</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Task analyses of what workers do in various occupations.</td>
<td>1.04</td>
<td>0.90</td>
<td>1.18</td>
</tr>
<tr>
<td>2. Asking employers about necessary competencies needed to obtain and retain a job.</td>
<td>0.94</td>
<td>0.80</td>
<td>1.65</td>
</tr>
<tr>
<td>3. A consensus of subject experts on what should be taught.</td>
<td>0.82</td>
<td>0.87</td>
<td>1.13</td>
</tr>
</tbody>
</table>
Table 11. Mean item ratings, standard deviations and analyses of variance relating to content organization

<table>
<thead>
<tr>
<th>Content Organization</th>
<th>Overall mean</th>
<th>Std. dev.</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Clustering related tasks into such broad areas as construction, manufacturing, energy and power, etc.</td>
<td>0.76</td>
<td>0.96</td>
<td>1.52</td>
</tr>
<tr>
<td>2. Presenting the content simply as a unified body of knowledge under the title 'technology'.</td>
<td>0.35</td>
<td>0.83</td>
<td>0.32</td>
</tr>
<tr>
<td>3. Teaching each occupational area as a single subject, e.g., carpentry, welding, auto mechanics, etc.</td>
<td>0.31</td>
<td>1.19</td>
<td>1.51</td>
</tr>
</tbody>
</table>

Table 10 indicates that variable 2, "Task analyses of what workers do in various occupations", received the highest mean rating of 1.04. The other two variables also received high ratings. The analysis of variance revealed no significant differences among the groups.

In Table 11, no significant differences were found among the group means regarding content organization. It is further shown that whereas variable 1, "Clustering related tasks. . ." was rated relatively high (0.76), variables 2 and 3 were rated very low (0.35 and 0.31, respectively). The items with these two low ratings were eliminated from the model.
Hypothesis 4

It was hypothesized that there was no significant difference in the perceptions of DEOs, teacher educators, technical teachers, and graduate students regarding the competencies to be considered important in industrial and technical teacher education programs. The results of the data analysis relating to the hypothesis are presented in Table 12.

Table 12 shows that the respondents considered all the nine broad competencies as very important (mean ratings = 0.92 and above). The table further shows that the F-values for variables 1, 3, and 4 were significant at the .05 level. For variables 6, 7, 8, and 9 the observed differences were significant beyond the .01 level. The Scheffé's test found no significant differences between any two groups for variables 1, 3, and 4. Groups 2 and 3 (faculty and graduate students) differed in their mean ratings for variables 6, 7, 8 and 9. There were significant differences also between the DEOs and the graduate students for variables 8 and 9; and between teacher educators and technical teachers in the case of variable 6.

In Figure 11, the mean item ratings of the DEOs on the competencies to be emphasized are plotted against the mean ratings of graduate students. Whereas graduate students (group 3) rated item 8, "Obtaining and utilizing research information", very high, the DEOs rated that item very low. The rest of the items were scored as being very important except item 9 which received a very high score from graduate
Table 12. Mean item ratings, standard deviations, and analyses of variance relating to the importance of competencies to be emphasized in programs

<table>
<thead>
<tr>
<th>Competency</th>
<th>Overall mean</th>
<th>Std. dev.</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Demonstrating practical skills in one or more occupational areas</td>
<td>1.39</td>
<td>0.71</td>
<td>2.93*</td>
</tr>
<tr>
<td>2. Designing and effectively utilizing instructional aids.</td>
<td>1.05</td>
<td>0.66</td>
<td>2.00</td>
</tr>
<tr>
<td>3. Planning and implementing instruction for a given student group.</td>
<td>1.01</td>
<td>0.73</td>
<td>2.90*</td>
</tr>
<tr>
<td>4. Promoting safety in the industrial laboratory or shop.</td>
<td>1.30</td>
<td>0.77</td>
<td>3.68*</td>
</tr>
<tr>
<td>5. Evaluating and reporting student achievement.</td>
<td>1.14</td>
<td>0.71</td>
<td>2.41</td>
</tr>
<tr>
<td>6. Working effectively with other teachers and administrators.</td>
<td>1.00</td>
<td>0.72</td>
<td>7.04**</td>
</tr>
<tr>
<td>7. Demonstrating leadership in organizing and coordinating industrial education related activities and programs.</td>
<td>0.98</td>
<td>0.68</td>
<td>4.97**</td>
</tr>
<tr>
<td>8. Obtaining and utilizing research information.</td>
<td>0.97</td>
<td>0.74</td>
<td>7.77**</td>
</tr>
<tr>
<td>9. Keeping records and inventory of materials and equipment.</td>
<td>0.92</td>
<td>0.75</td>
<td>5.30**</td>
</tr>
</tbody>
</table>

*Significant beyond the .05 level.

**Significant beyond the .01 level.

students but a moderately high score from the administrators.

An alternate view is that the graduate students were not discriminating in that they rated all items as important where-
Figure 13. Scatterplot of the mean item responses (on the transformed scale) of groups 1 (DEOs) and 3 (graduate students) regarding the broad competencies to be emphasized.
Figure 14. Scatterplot of the mean item responses (on the transformed scale) of groups 1 (DEOs) and 4 (technical teachers) regarding the broad competencies to be emphasized.
Figure 15. Scatterplot of the mean item responses (on the transformed scale) of groups 2 (teacher educators) and 3 (graduate students) regarding the broad competencies to be emphasized.
Figure 16. Scatterplot of the mean item responses (on the transformed scale) of groups 2 (teacher educators) and 4 (technical teachers) regarding the broad competencies to be emphasized.
as the DEOs felt that the "practical skills" (e.g., item 1) were more important than those skills related to evaluation (e.g., item 5) or to research (item 8).

The mean ratings of the graduate students were also plotted against those of the technical teachers (Figure 14). Item 1 was rated equally by both groups and received the highest rating. Items 8 and 9 received high ratings from the technical teachers but low ratings from the graduate students. The rest of the items -- 1, 2, 3, 4, 5, 6, and 7 were perceived as very important competencies by both groups of respondents. Item 10, "Other" was eliminated because of the varied responses received, some of which duplicated items already identified in the questionnaire.

Depicted in Figure 15 is the mean item responses of teacher educators plotted against the ratings of graduate students. Item 4 "Promoting safety in the industrial laboratory or shop," was rated equally and highly by both groups.

In Figure 16, the mean item ratings of teacher educators were plotted against those of the technical teachers. Virtually all the items received high scores from both groups.

Summary

The scatterplots of the mean item responses of the broad competencies to be emphasized in industrial teacher education programs were presented in Figures 13 through 16.
From the scatterplots, it was seen that there were some disagreements among the groups over certain items just as there were significant differences between the group means as indicated by the Scheffé's tests.

Pairs of groups for which no scatterplots were drawn are those for which the Scheffé's tests revealed no differences.

Hypothesis 5

It was hypothesized that there was no significant difference in perception between DEOs, teacher educators, technical teachers, and graduate students regarding the participants to be involved in program development. The findings are presented in Tables 13 and 14.

Table 13. Mean proportions, standard deviations and analyses of variance relating to responsibility for curriculum planning

<table>
<thead>
<tr>
<th>Participant</th>
<th>Mean Proportion of responsibility</th>
<th>Std. dev.</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Officials of the federal government.</td>
<td>27.43</td>
<td>13.15</td>
<td>1.57</td>
</tr>
<tr>
<td>2. Officials of the state government.</td>
<td>25.02</td>
<td>9.86</td>
<td>1.07</td>
</tr>
<tr>
<td>3. Administrators in each educational institution.</td>
<td>35.25</td>
<td>15.22</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Values are derived from original responses and not from transformed responses:
Table 14. Mean proportions, standard deviations, and analyses of variance relating to participants at the institutional level

<table>
<thead>
<tr>
<th>Participant</th>
<th>Mean proportion of involvement</th>
<th>Std. dev.</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Department Head</td>
<td>15.36</td>
<td>8.03</td>
<td>2.15</td>
</tr>
<tr>
<td>2. Selected curriculum committee</td>
<td>29.36</td>
<td>13.00</td>
<td>2.62</td>
</tr>
<tr>
<td>3. All members of teaching staff</td>
<td>19.55</td>
<td>11.35</td>
<td>2.31</td>
</tr>
<tr>
<td>4. Curriculum specialists from outside the department</td>
<td>17.89</td>
<td>8.55</td>
<td>1.96</td>
</tr>
<tr>
<td>5. People from industry</td>
<td>16.71</td>
<td>7.49</td>
<td>0.85</td>
</tr>
</tbody>
</table>

From Table 13, it could be seen that the respondents indicated that administrators in educational institutions should assume about 35.25% of the responsibility for industrial and technical teacher education curriculum planning in Nigeria. The federal and state governments should assume responsibility for 27.43% and 25.02% respectively. The remainder (12.3%) was to be shared between "other" parties, namely, community people, employers, teachers' unions, etc. The F-test on the group means for the three major variables - federal government, state government, and administrators of educational institutions yielded F-values that were not significant.

At the level of each educational institution, Table 14 shows the mean proportion of involvement for the various
participants. The respondents were in favor of a Selected Curriculum Committee being more involved (mean proportion of involvement = 29.36%) than any other group of participants. For variable 6, "Other", most of the respondents identified students and subject teachers and assigned a mean proportion of involvement of 10.17% to that variable. The analyses of variance of group means on each of the variables yielded no significant F-values.

Duration of programs

In order to establish some guidelines on how any proposed degree program in industrial and technical teacher education should operate, the respondents were asked to indicate how long they think the programs should last for different levels of entrants. The number of years indicated should exclude the years of industrial experience. The findings are shown in Table 15.

Table 15 shows what the respondents considered the average number of years students who enter degree program with certain educational qualifications should spend before graduation. Analyses of variance of group means indicated significant differences in variables 2 and 3.

The Scheffé's multiple range test for paired comparisons showed that differences existed between groups 2 and 3 (faculty and graduate students) for both variables 2 and 3.
Table 15. Means, standard deviations and analyses of variance relating to program duration

<table>
<thead>
<tr>
<th>Level of Entrance</th>
<th>Mean Duration (Years)</th>
<th>Std. dev.</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. GCE O/L</td>
<td>4.39</td>
<td>0.69</td>
<td>1.07</td>
</tr>
<tr>
<td>2. NCE (Technical)</td>
<td>2.35</td>
<td>0.81</td>
<td>3.17*</td>
</tr>
<tr>
<td>3. NND or HND</td>
<td>1.88</td>
<td>0.82</td>
<td>4.24**</td>
</tr>
<tr>
<td>4. Technical Teachers Certificate</td>
<td>2.51</td>
<td>1.01</td>
<td>2.32</td>
</tr>
</tbody>
</table>

*Significant beyond the .05 level.
**Significant beyond the .01 level.

Years of industrial work experience

The respondents were asked to indicate the number of years of industrial work experience that should be required before one goes into professional industrial and technical teaching. The results are presented in Table 16.

Table 16. Means, standard deviations, and analysis of variance by group relating to required years of industrial experience

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>Std. dev.</th>
<th>F-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. DEOs.</td>
<td>2.83</td>
<td>1.01</td>
<td>0.40</td>
</tr>
<tr>
<td>2. Faculty</td>
<td>2.69</td>
<td>1.52</td>
<td></td>
</tr>
<tr>
<td>3. Graduate Students</td>
<td>2.65</td>
<td>1.41</td>
<td></td>
</tr>
<tr>
<td>4. Technical Teachers</td>
<td>2.36</td>
<td>1.29</td>
<td></td>
</tr>
</tbody>
</table>
The mean number of years, as shown in Table 16, indicated by each of the groups of respondents ranged between 2.36 and 2.83. The analysis of variance of the four group means yielded an F-value of 0.40 which is not significant. The overall mean for all the four groups is 2.62 with a standard deviation of 1.42.

Method of acquiring industrial experience

The method of acquiring industrial experience by prospective industrial and technical teachers was considered. The respondents were asked to check one out of three alternative methods. The frequency and percentage of respondents opting for each method are presented in Table 17.

Table 17. Frequencies and percentages of respondents indicating choice of method of acquiring industrial experience

<table>
<thead>
<tr>
<th>Method</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Supervised industrial attachment while one is a student.</td>
<td>54</td>
<td>44.3</td>
</tr>
<tr>
<td>2. Full-time employment in industry following graduation.</td>
<td>43</td>
<td>35.2</td>
</tr>
<tr>
<td>3. Internship immediately following graduation.</td>
<td>23</td>
<td>18.9</td>
</tr>
<tr>
<td>4. Other (Cooperative education).</td>
<td>2</td>
<td>1.6</td>
</tr>
<tr>
<td>Total</td>
<td>122</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Table 17 shows that a majority (44.3%) indicated a preference for **Supervised industrial attachment while one is a student**. The second preferred method was **full-time employment in industry following graduation** (35.2%). The third variable (post-graduation internship) ranked third with 18.9%.

**Summary**

The results of the statistical analyses related to the questions of the study were presented in this chapter. The findings indicated that nine program objectives, 17 elements relating to the professional, technical, and general education components of teacher education, and nine broad competencies were considered important for emphasis by the respondents.

A general summary of the results of this study as well as the conclusions and recommendations based upon the findings are presented in Chapter V.
CHAPTER V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This study was designed to gather the perceptions of Nigerian administrators, teacher educators, technical teachers and graduate students of industrial education for use in formulating a model for developing undergraduate programs of industrial teacher education in Nigeria.

The previous chapters include:
1. An introduction describing the background of the study that led to the formulation of the research problem, hypotheses, procedures and basic assumptions of the study.
2. A review of related literature on curriculum theory and models, and on industrial teacher education programs in Nigeria and elsewhere.
3. A description of the methods and procedures used in gathering data and the analysis techniques used in treating the data.
4. A presentation of the findings describing the results obtained from analyses of the data.

In the following sections of the present chapter, the findings reported in Chapter IV are summarized so that conclusions could be drawn. Finally, certain recommendations are made based upon the conclusions of the study.
Restatement of the problem

The problem of this study was to investigate the variety of current models available for the preparation of industrial and technical teacher education programs and to develop a proposed model for implementation in Nigerian teacher preparation programs.

The study specifically set out to provide answers to the following questions:

1. What should be the general objectives of an industrial and technical teacher education program at the undergraduate level in Nigeria?
2. What program components need emphasis in Nigerian industrial and technical teacher education programs?
3. What curriculum development approaches should be emphasized in developing undergraduate industrial and technical teacher education programs in Nigeria?
4. What are the broad competencies to be emphasized in the programs?
5. Who should be involved in industrial and technical teacher education curriculum development in Nigeria?
6. Do differences exist between the perceptions of administrators, teacher educators, technical teachers, and graduate students of industrial education regarding questions 1-5 of this study?
Conclusions

The conclusions of this study are presented in two parts: (1) conclusions relating to the research hypotheses and, hence, the questions of the study, and (2) conclusions relating to other aspects of the administration and organization of industrial and technical teacher education degree programs in Nigeria, as contained in the questionnaire. Each hypothesis is restated and followed by a conclusion based on the findings presented in Chapter IV. A discussion of each conclusion is included where necessary.

Conclusions Relating to Research Hypotheses/Questions

Hypothesis 1

It was hypothesized that there was no significant difference in perception between administrators (DEOs), teacher educators, technical teachers, and graduate students regarding the objectives to be sought in industrial and technical teacher education programs in Nigeria.

Conclusion 1

The findings in Chapter IV indicate that out of nine general objectives identified by the study, there were no significant differences in the perceptions of the four groups of respondents on eight objectives. The perceptions of
faculties and graduate students differed significantly on only one objective, namely, "Creating in students an awareness of the impact of industry and technology on society." Based upon these findings, there was insufficient evidence to reject the null hypothesis. The DEOs, teacher educators, technical teachers, and graduates did not differ significantly in their perceptions of the objectives to be emphasized.

Discussion

The item means reported in Table 8 indicate that all of the nine general objectives identified for industrial and technical teacher education programs in Nigeria were rated very important by the respondents. The objective with the highest rating, namely, "Producing qualified technical teachers in sufficient numbers to meet national needs", had a mean rating of 1.62 and a standard deviation of 0.68. This implies that Nigerian administrators, teacher educators, technical teachers, and graduate students are fully aware of the need for an adequate supply of qualified technical teachers in the nation's educational system. This need and awareness are in line with the concerns and provisions of the National Policy on Education.

The objective with the least rating (item 9), received a mean score of 0.79 and a standard deviation of 0.74. The relatively low rating of this item does not detract from its
importance as indicated by its high position on the certainty rating scale. That is, it was considered a very important objective by the respondents.

The significant difference found between the perceptions of faculty (teacher educators) and graduate students on the objective, "Creating in students an awareness of the impact of industry and technology on society", was because of its high rating by graduate students ($\bar{x} = 1.34$) as against the rating by faculty ($\bar{x} = 0.88$). It is significant, however, that both groups considered the objective as a very important one.

In conclusion, therefore, and in answer to the first question of this study, the following emerged from this study as the general objectives to be pursued in an industrial and technical teacher education program at the undergraduate level in Nigeria.

1. Providing technical knowledge and vocational skills necessary for effective technical teaching.

2. Providing a balance of general, technical, and professional education.

3. Providing a balance between the theory and practice of contemporary industrial teaching.

4. Producing qualified technical teachers in sufficient numbers to meet national needs.

5. Providing educational experiences to meet the needs and interests of individual students.

6. Enhancing and promoting students' interest and
attitude toward the profession of industrial and technical teaching.

7. Providing the opportunities for the development of independent thinking and problem solving skills.

8. Creating in students an awareness of the impact of industry and technology on society.

9. Providing extra curricular activities which enhance students' potential for further professional development.

Hypothesis 2

It was hypothesized that there was no significant difference in the perceptions of DEOs, teacher educators, technical teachers, and graduate regarding the program components to be emphasized in industrial and technical teacher education curriculum development.

Conclusion 2

Based on the findings presented in Table 9 (Chapter IV), the null hypothesis was rejected at the 0.05 alpha level. The DEOs, teacher educators, technical teachers, and graduate students differed significantly in their perceptions of the program components to be emphasized in industrial and technical teacher education curriculum development.
Discussion

The literature (e.g., Corrigan, 1983; Hauenstein, 1977; Simpson and Ellis, 1971) suggests that an industrial teacher education program would consist of, at least, three broad components including (1) professional education, (2) technical teaching subject, and (3) liberal arts or general education. Practical experience, including practice teaching and industrial work experience, might be added as another important component, even though practice teaching and industrial work experience could be subsumed under the teaching and technical components respectively.

Seventeen program variables which describe the elements of the above three major program components were identified in this study. The findings reported in Chapter IV suggest that there was not general agreement among the four groups of respondents regarding the degree of emphasis that should be placed on each of these variables.

The mean item ratings of these variables in Table 9 suggest that all but two of the items were considered very important by the respondents. However, the two variables with low ratings still had mean ratings that qualified them for emphasis.

The variables are:

1. Knowledge and understanding of the historical, social and philosophical foundations of vocational and technical education (X = 0.62).
2. Developing student interest and awareness in the contemporary social, economic, and political life of the community (X = 0.61).

The findings also indicate that out of the seventeen variables, there were significant differences in the perceptions of the DEOs, teacher educators, technical teachers and graduate students about seven variables at the 0.05 level and significant differences in four variables at the 0.01 level.

The most significant differences among the four groups were found in item 9 (Table 9) -- "Conducting follow-up studies of program graduates." Even though the overall mean for that item was relatively high (X = 0.82), the Scheffé's test for all pair-wise comparisons showed that differences existed between the groups in all possible combinations, that is, between groups 1 and 2, 1 and 3, 1 and 4, 2 and 3, 2 and 4, and 3 and 4. The item was particularly rated very low by DEOs (X = 0.36) and teacher educators (X = 0.52). This finding is, perhaps, an indication that administrators and teacher educators in Nigeria do not consider program evaluation through follow-up studies of past graduates as an important aspect of program development and improvement.

In answer to the second question of this study, the following elements that describe the professional (pedagogical), the technical, and the general education components of industrial and technical teacher education programs in Nigeria should be emphasized:
1. Knowledge and understanding of the historical, social and philosophical foundations of vocational and technical education.

2. Applying the theories and principles of teaching and learning to classroom situations.

3. Planning and implementing instruction.

4. Designing and utilizing appropriate teaching aids.

5. Organizing group discussions, demonstrations, field trips and other instructional strategies.

6. Conducting and supervising students' practice teaching experience.

7. Conducting and supervising students' industrial work experience in cooperation with employers.


9. Conducting follow-up studies of program graduates.

10. Applying the principles of guidance and counseling and communicating same to the students.

11. Managing classroom resources and problems.

12. Managing the industrial education laboratory or shop.

13. Understanding the theoretical bases of the major industrial or technical teaching specialty.

14. Practical application of technical skills, knowledge and attitudes to real life situations.

15. Mastery of other subject areas related to technical specialty.

16. Developing student interest and awareness in the contemporary social, economic, and political life of the community.

17. Familiarity with research methods, techniques, and practices and utilizing them to improve instruction.
Hypothesis 3

It was hypothesized that there was no significant difference in the perceptions of DEOs, teacher educators, technical teachers, and graduate students regarding the curriculum approach to be emphasized in industrial and technical teacher education curriculum development.

Conclusion 3

Two factors were considered in defining curriculum approaches, namely, content determination and content organization. In relation to content determination, three approaches were identified. These include (1) task analysis, (2) occupational competencies, and (3) consensus of experts. In Table 10, the analyses of variance on the item mean ratings of the four groups of respondents showed that there were no significant differences among the groups. Similarly, three methods of content organization for prevocational teaching programs were identified, namely, the unified technology approach, the cluster approach, and the single subject approach. The F-values of the analyses of variance on the mean ratings for each of the approaches was found to be statistically insignificant (Table 11). Based on these findings, there was insufficient evidence to reject the null hypothesis at the 0.05 alpha level.
Discussion

With respect to the approaches for determining content, Table 11 shows that the respondents strongly agreed that each of the approaches - task analysis, occupational competencies, and consensus of experts - was viable for determining content. Although the respondents were not asked to prioritize their ratings, Table 9 indicates that task analysis had the highest overall mean rating (1.04). This can hardly be interpreted as implying that the respondents were completely in favor of task analysis over the other two approaches - occupational competencies and experts' opinion - which had mean ratings of 0.94 and 0.82 respectively. The differences between these means are so small that the integration of the three approaches into a system for content determination should be considered.

Regarding the methods of organizing content, Table 10 clearly indicates that the respondents were in favor of "Clustering related tasks into such broad areas as construction, manufacturing, energy and power, etc." The "unified technology" approach and the "single subject" approach had overall mean ratings of 0.35 and 0.31 respectively. These mean ratings were far below the cut-off point (0.53) which implies that the two approaches were not perceived as viable methods of delivering industrial teacher education content in programs for prevocational teaching.

In conclusion, and in an answer to the third question of
this study, the following curriculum approaches to be emphasized in industrial and technical teacher education programs in Nigeria were identified in regard to content determination:

1. Task analyses of what workers do in various occupations.
2. Asking employers about necessary competencies needed to obtain and retain a job.
3. A consensus of subject experts on what should be taught.

Similarly, "Clustering related tasks into such broad areas as construction, manufacturing, energy and power, etc." was identified as the method of curriculum content organization to be emphasized.

Hypothesis 4

It was hypothesized that there was no significant difference in the perceptions of DEOs, teacher educators, technical teachers, and graduate students regarding the competencies to be considered important in industrial and technical teacher education programs.

Conclusion 4

Based on the findings reported in Table 12, the null hypothesis was rejected at the 0.05 level. The findings in Chapter IV indicate that the DEOs, teacher educators, technical teachers and graduate students were not agreed on
the extent to which identified program competencies were important in industrial and technical teacher education programs in Nigeria.

Discussion

The overall mean ratings of the identified competencies were considered as very important by the respondents and should, therefore, be emphasized in the programs. The analyses of group mean item ratings, however, showed that there were significant differences among the groups regarding seven of the nine identified competencies. Only in two competencies were there not any significant differences. These are (1) "Designing and effectively utilizing instructional aids," and (2), "Evaluating and reporting student achievement."

Regarding those items in which significant differences were found, the Scheffe's multiple range test found no significant differences between any two groups on the following components whose F-values are significant at the 0.05 level:

1. Demonstrating practical skills in one or more occupational areas ($\bar{X} = 1.39$).
2. Planning and implementing instruction for a given student group ($\bar{X} = 1.01$).
3. Promoting safety in the industrial laboratory or shop ($\bar{X} = 1.30$).

For items 6, 7, 8, and 9 (Table 12) in which the F-values were significant at the 0.01 level, the differences were found mostly between teacher educators on the one hand, and graduate
students and technical teachers on the other, and between the DEOs on the one hand and the graduate students and technical teachers on the other. In general, the DEOs and teacher educators were more conservative in their ratings than the technical teachers and graduate students.

In order to provide an answer to the fourth question of this study, the following broad competencies which are supported by the literature (e.g., Hauenstein, 1977; Kida, 1982) emerged for emphasis in industrial and technical teacher education programs in Nigeria.

1. Demonstrating practical skills in one or more occupational areas.
2. Designing and effectively utilizing instructional aids.
3. Planning and implementing instruction for a given student group.
4. Promoting safety in the industrial laboratory or shop.
5. Evaluating the reporting student achievement.
6. Working effectively with other teachers and administrators.
7. Demonstrating leadership in organizing and coordinating industrial education-related activities and programs.
8. Obtaining and utilizing research information.
9. Keeping records and inventory of materials and equipment.
Hypothesis 5

It was hypothesized that there was no significant difference in perception between DEOs, teacher educators, technical teachers, and graduate students regarding the participants to be involved in program development.

Conclusion 5

Based on the findings presented in Table 13, there was insufficient evidence to reject the null hypothesis. The results in Chapter IV suggest that there were no significant differences in the perceptions of the DEOs, teacher educators, technical teachers and graduate students on who should participate and to what extent in the planning of industrial and technical teacher education program development in Nigeria.

Discussion

Two levels of participation in program development in Nigeria were considered. The levels are (1) the national level and (2) the level of the educational institution. The intent of the first question relating to Hypothesis 5 was to determine whether the respondents would consider program planning the exclusive responsibility of either the federal government, the state governments or the individual educational institutions. But as Table 13 shows, the respondents indicated that the responsibility for program planning should be shared among the following participants in the proportions
indicated:

1. Officials of the federal government ($\bar{X} = 27.43\%$).
2. Officials of the state governments ($\bar{X} = 25.02\%$).
3. Administrators in each educational institution ($\bar{X} = 35.25\%$).

"Others" including teachers' unions, employers, and students were identified for participation in varying proportions. An important point to note is that "Administrators in each educational institution" were given the largest proportion of responsibility. Because of possible bias in this finding, the data were further examined and it was found that each of the groups of respondents assigned the largest proportion of responsibility to the administrators as follows: DEOs, $\bar{X} = 35.38$; teacher educators, $\bar{X} = 38.09$; technical teachers, $\bar{X} = 33.24$; and graduate students $\bar{X} = 32.97$.

In spite of the agreement found among the groups, the element of bias still remains owing to the fact that the respondents themselves were either administrators or potential administrators and might want to have the greatest say in program planning and development.

The findings regarding the proportion of involvement in program development at the level of each educational institution (Table 14) indicated that the largest proportion of involvement in curriculum development was assigned to "Selected Curriculum Committee" ($\bar{X} = 29.36\%$). This was followed by "All members of teaching staff" which was assigned a mean
proportion of 19.55%. Interestingly, all of the four groups of respondents assigned the largest proportion to curriculum committees. This finding probably reduces the suspicion that the previous finding on responsibility for program policy-making was biased in favor of administrators.

Based on the findings in Tables 13 and 14, the answer to the fifth question of this study could be stated as follows: (a) The responsibility for curriculum policy-making should be shared among the following participants in the proportions indicated:

1. Administrators in each educational institution (35.25%).
2. Officials of the federal government (27.43%).
3. Officials of the state government (25.02%).
4. Others (employers, teachers unions, lay people, etc.) (12.3%).

(b) At the level of education institutions, the following groups should be involved in curriculum development in the proportions indicated:

1. Selected curriculum committees (29.36%).
2. All members of teaching staff (19.55%).
3. Curriculum specialists from outside the department (17.89%).
4. Department heads (15.36%).
5. People from industry (16.71%).
6. Others (students, high school teachers, etc.) (1.14%).
Conclusion 6

The sixth and final question of this study was whether there were differences among the respondents regarding the first five questions of the study. The results indicate that differences in perceptions were observed only in a few variables relating to program components and program competencies. Specifically, the questions of the study in which up to three groups of respondents disagreed and the particular variables over which there were differences included:

(i) Question 2: The program components to be emphasized especially the importance of follow-up studies of program graduates.

(ii) Question 4: The broad competencies to be emphasized were differences as to the importance of "obtaining and utilizing research information" by the industrial and technical teacher.

It was, therefore, concluded that, apart from the above two instances, there were generally not any significant differences in the perceptions of the administrators, teacher educators, technical teachers, and graduate students regarding the major questions of this study.

Conclusions Relating to Program Organization and Administration

In addition to the basic hypotheses and questions of this study, it was considered necessary to explore the perceptions of the respondents regarding some other issues of program development and particularly as regards organizing and administering of degree programs. The following conclusions were
drawn based upon the findings in Chapter IV.

**Conclusion 7: Importance of degree programs**

The results reported in Table 5 indicate that the respondents strongly perceived the offering of degree programs in industrial teacher education by colleges of education and the universities in Nigeria as a very important goal ($\bar{X} = 1.36$). It was therefore, concluded that there is a dire need for more programs so that more graduate technical teachers could be produced for the country's schools and colleges. This conclusion is supported by the literature (e.g., Aina and Beecroft, 1982; NERC, 1980).

**Conclusion 8: Administration of degree programs**

Based on the findings reported in Table 6, the following conclusions were drawn regarding the organization and administration of degree programs in industrial and technical teacher education in Nigeria:

1. A college of education offering a degree program in industrial education should be affiliated with a university.

2. A college of education offering a degree program in industrial teacher education should enjoy administration autonomy.

3. Standards and guidelines for examinations and certification in institutions offering degree programs should be established and monitored by the National Board for Technical Education.
Conclusion 9: Areas of specialization in degree programs

The findings reported in Table 7 support the conclusion that degree programs in industrial teacher education in Nigeria should provide specializations in the following areas:

1. Industrial arts/technology education for teachers of prevocational programs in Nigerian secondary schools.
2. Trade and industrial education for teachers of vocational subjects in senior secondary schools and technical colleges.
3. Industrial technology for industrial trainers.

The above conclusion is supported by an earlier proposal by Wolansky (1974) to the University of Nigeria, Nsukka.

Conclusion 10: Duration of degree programs

Based on the results presented in Table 15, it was concluded that the duration of the degree programs in industrial teacher education for the following categories of entrants (excluding years of industrial experience) should be:

1. GCE O/L -- 4 years.
2. NCE (technical) -- 2 years.
3. NND or HND -- 2 years.
4. Technical Teachers Certification (subject to any additional academic qualifications possessed) -- 3 years.

The above conclusion approximates what currently exists in the system except that the years of industrial work experience are inclusive. The effect of making the work experience
component a part of the four-year period for the GCE O/L holder, for example, is that, quite often, the period of academic work is shortened, and yet there is insufficient time for acquisition of practical experience through, say, an industrial attachment program.

Conclusion 11: Years of industrial work experience

The findings reported in Table 16 indicate that the four groups of respondents recommended that between 2.36 and 2.83 years of industrial work experience be required of potential industrial and technical teachers. The overall mean number of years suggested by the four groups was 2.62.

It was, therefore, concluded that the DEOs, teacher educators, technical teachers, and graduate students were in favor of a work experience requirement of at least two years for all pre-service industrial and technical teachers.

Conclusion 12: Method of acquiring industrial work experience

Granted that a minimum period of industrial work experience would be required of all industrial and technical teachers, the next concern was the means or method of acquiring such experience. About 44 percent of all the respondents were in favor of "Supervised industrial attachment while one is a student." Thirty-five percent of the respondents favored work experience through actual "full-time employment in industry following the individual's graduation from college."
Only about 19 percent recommended work experience through "Internship immediately following graduation."

In an era of serious unemployment, a requirement that teachers work full-time in industry for at least two years before going into the classroom will not only be wasteful of needed human resource but could lead to frustrations on the part of both the teacher and the educational system.

The literature (e.g., Matthews and Pyle, 1978), suggests that a college graduate of a teacher education program could be as occupationally competent as someone with the traditional trade preparation, if the former received sufficient cooperative education experience.

Based on the results presented in Table 17, it was concluded that the respondents in this study supported supervised industrial attachment as the preferable method of acquiring industrial work experience. This implies that there is need to strengthen the cooperation between Nigerian industrial teacher education institutions and industry.

Summary

The conclusions relating to the findings of this study have been presented in this chapter. Owing to insufficient evidence, three out of the five hypotheses stated in the study were not rejected. These hypotheses relate to program objectives, curriculum approaches, and the participants to be involved in program planning and development. Two hypo-
Figure 17. Revised proposed model for undergraduate industrial and technical teacher education programs in Nigeria
theses relating to program components and competencies to be emphasized were rejected at the 0.05 significance level.

The respondents in the study indicated a very strong need for Nigerian universities and colleges of education to provide degree programs in industrial and technical teacher education to meet national needs. Subsequently, certain conclusions were reached regarding important administrative and organizational considerations that must be made in program development and implementation. Conclusions were also drawn concerning the program objectives, components, and competencies as well as the curriculum approaches to be emphasized in Nigerian industrial teacher education at the undergraduate level.

The program development elements identified in the study led to a slight revision of the model proposed in Figure 6 (p. 90). The revised model is shown in Figure 17.

Recommendations

Based upon the findings of this study, the following recommendations were considered pertinent:

1. The Federal Government of Nigeria should take the first bold step toward establishing new programs in industrial and technical teacher education by upgrading the present Federal Colleges of Education to degree-awarding institutions, taking into
account the findings of this study. This will enable the States to have some guidelines for establishing their own programs.

2. The eight-step systems model for curriculum development proposed in this study should be implemented in Nigerian universities and colleges of education. The effectiveness of the model in particular settings should be tested and modifications made based upon the results of the tests.

3. The present study focused on preservice industrial teacher education programs. A similar study should be conducted to develop a model for in-service industrial teacher education programs in Nigeria.

4. This study should be replicated using additional and/or different groups of respondents such as secondary school and technical college principals, employers in industry, and students in teacher education programs in Nigeria.

5. It appears from the results of this study that the administrators of industrial teacher education programs in Nigeria do not consider follow-up studies as useful tools for program evaluation and improvement. A study should be conducted to determine the attitude of Nigerian administrators toward program evaluation.
REFERENCES


Memorandum on educational policy in British tropical Africa. (1925). London: His Majesty's Stationery Office.


ACKNOWLEDGEMENTS

Numerous individuals, institutions, and governmental agencies have contributed in various ways not only to this study but also toward my entire graduate education in the United States. To each and every one of them, I am very grateful.

My special thanks go to my graduate committee at Iowa State University, Dr. John Dugger, Dr. Robert Gelina, Dr. Anton Netusil, Dr. Leroy Wolins, and Dr. William Wolansky. I could not have made it without the guidance and support of this committee of dedicated professors.

I am eternally grateful to my major professor, Dr. William D. Wolansky for his patience, understanding and unrelenting support at all times. Working with such a distinguished educator was a very rewarding experience for me.

I am greatly indebted to Dr. Leroy Wolins for the sacrifice of his precious time and expertise toward the statistical analysis of the data used in this study.

It was a blessing to have had the opportunity to study under Dr. John Dugger and Dr. William G. Miller. I sincerely appreciate the generous provision of their time and expertise toward making me a better student and researcher.

My indebtedness also goes to my sponsor, the University
of Nigeria, Nsukka, its Administration, and my past and present heads of department. I appreciate their constant support and encouragement.

I wish to thank the Director and staff of the Nigerian Universities Office in Washington, D.C. for coming to my assistance when it was most needed.

My appreciation goes to Professor Madelon D. Stent of The City University of New York for her commitment to the cause of my graduate education. She was to me a mother and a tremendous source of inspiration.

To my dear parents, Columba and Anthonia Nwoke, I owe a debt of gratitude. Their foresight, love and encouragement have been my strength all along. I wish them God's abundant blessings.

A special thank you goes to my dear wife, Chibuzor, whose love, patience and support were with me throughout the program at Iowa State University.
APPENDIX A: LETTERS OF CORRESPONDENCE
May 28, 1985

Dear Sir:

I am a doctoral student in the Department of Industrial Education and Technology, Iowa State University. I am in the process of carrying out my research project which focuses on Technical Teacher Education programs in Nigeria.

To help me carry out my project, I would need some information regarding which colleges and universities in the country offer technical teacher education programs and at what levels.

I believe that your office might have a listing of technical teacher training institutions and possibly a directory of the teaching staff in these institutions.

May I respectfully request that you send to me a copy each of any list or directory which would give me an up-to-date information about the institutions and their staff.

Your cooperation will be highly appreciated.

Sincerely,

Godfrey Ifeanyi Nwoke
Graduate Student

Approved by:

Dr. William D. Wolansky, Professor
Industrial Education & Technology
(Supervisor)
May 28, 1985

The Secretary
National Board for Technical Education
Kaduna
Nigeria

Dear Sir:

I am a doctoral student in the Department of Industrial Education and Technology, Iowa State University. I am in the process of carrying out my research project which focuses on Technical Teacher Education programs in Nigeria. To enable me to undertake the project, I would need some information regarding which colleges and universities in the country offer technical teacher education programs and at what levels.

As the agency of the Federal Government in charge of Technical Education in Nigeria, I believe your office would have a directory of technical teacher training institutions and a listing of their teaching staff.

May I respectfully request that you send to me a copy of any such list to enable me to send my questionnaire to those who will participate in my study.

Your cooperation will be highly appreciated.

Sincerely,

Godfrey I. Nwoke
(Graduate student)

Approved by:

[Signature]
Dr. William D. Wolansky
Professor of Industrial Education & Technology
(Supervisor)
Mr. Godfrey I. Nwoke  
IOWA State University,  
College of Education,  
Department of Industrial Education & Tech.,  
Ames, Iowa 50011  
U.S.A.

Dear Sir,

TECHNICAL TEACHER PROGRAMS IN NIGERIA

Your request on the above subject as per your own letter dated May 28, 1985, please refer.

Find attached a directory of educational institutions and departments that run technical teacher programs in Nigeria.

For your project, you will find it more convenient to mail a set of questionnaires (20 copies on the average) to the Head of Department in each case. Request the H.O.D. to distribute and return the completed questionnaires to you en bloc.

Let me point out that the enclosed directory does not include universities as these are outside the province of the National Board for Technical Education (NBTE). You may wish to contact the National Universities Commission (NUC), Executive Secretary, for information on the University system in Nigeria.

Goodluck in your pursuit!

Faithfully,

(I. O. OPARAH)  
for: Executive Secretary.

Att’d.
September 9, 1985

Dear Sir/Madam:

REQUEST FOR YOUR DEPARTMENT'S PARTICIPATION IN A RESEARCH STUDY ON TECHNICAL TEACHER EDUCATION IN NIGERIA.

I am a graduate student pursuing a Ph.D. degree in Industrial Education and Technology here at Iowa State University. To meet the requirements for my degree, I am proposing to conduct a study with the objective of developing a model for undergraduate industrial teacher education program development in Nigeria.

It is hoped the results of my study will enable vocational and technical educators and administrators in Nigeria to develop new undergraduate industrial teacher education programs as well as improve existing ones.

In order to carry out my proposal, I shall seek the opinions of administrators like you as well as those of others in the profession, such as your teaching staff. May I, therefore, respectfully request for your participation and that of your staff in the study.

If you accept to participate in the project, I shall mail a set of questionnaires to you to be completed by you and your teaching staff. I shall provide stamped and addressed envelopes for the return of the completed questionnaires.

For me to know whether you will participate in the study kindly mark (√) on the appropriate space in the enclosed form.

Your cooperation will be highly appreciated.

Sincerely,

Godfrey Ifeanyi Nwoke

William D. Wolansky, Professor of Industrial Education (Supervisor)
Title of Proposed Study: A SYSTEMS MODEL FOR DEVELOPING UNDERGRADUATE INDUSTRIAL TEACHER EDUCATION PROGRAMS IN NIGERIA.

Dear Sir/Madam:

Kindly indicate by checking (✓) in the appropriate box whether you and your teaching staff will be willing to participate in the above research study.

I will participate in the study. [ ]
I will not participate in the study. [ ]
The staff of my department will participate in the study. [ ]
The staff of my department will not participate in the study. [ ]

Many thanks for your cooperation.

Sincerely,

Godfrey Ifeanyi Nwoke

Ps. Mail this form back to me at the following address:

Godfrey I. Nwoke
Department of Industrial Education and Technology
Iowa State University
Ames, Iowa 50011
U.S.A.
APPENDIX B: LETTERS OF TRANSMITTAL AND QUESTIONNAIRE
Dear Sir/Madam:

As a follow-up to my letter of September 9, 1985, and based upon your willingness to participate in my study, I have enclosed a questionnaire for you to respond to.

The success of this research depends on professionals like you. It will, therefore, be greatly appreciated if you would sacrifice about ten minutes of your time to complete the questionnaire.

I should emphasize that the responses on the questionnaire will be analyzed on a group basis and that no attempt will be made to associate responses with individuals or institutions.

Also find enclosed a set of questionnaires for members of your teaching staff who are willing to participate in the study. As I requested in my previous letter, kindly give the questionnaires to the staff members to fill out and have them return the completed questionnaires to you so you can mail everything back to me in the enclosed self-addressed envelope.

It will be appreciated if you mail all the completed questionnaires to me by March 10, 1986 with the envelope properly sealed.

Sincerely yours,

Godfrey I. Nwoke
Graduate Student

Approved by:

Professor William D. Wolansky, Dept. of Industrial Education & Technology
Dear Industrial Educator:

I am a Nigerian student currently working on my Ph.D. degree here at Iowa State University. As a part of my degree requirements, I am conducting a study with the objective of developing a model for undergraduate industrial teacher education program development in Nigeria.

The results of my study, hopefully, will enable vocational and technical educators and administrators in Nigeria to develop new programs as well as revise or improve existing ones.

I consider your input very vital to the success of the study, hence I am requesting that you sacrifice about ten minutes of your time to complete the enclosed questionnaire.

Please, be assured that the responses on the questionnaire will be analyzed on a group basis and that no attempt will be made to associate responses with individuals or institutions.

It will be appreciated if you return the completed questionnaire to your department head so he could forward it to me along with others by March 10, 1986 with the envelope properly sealed.

Sincerely yours,

Godfrey I. Nwoke
Graduate Student

Approved by:

Professor William D. Wolansky
(Major Professor)
Dear Fellow Nigerian Graduate Student:

I am working towards my Ph.D. degree in Industrial Education and Technology here at Iowa State University. As a part of my degree requirements, I am conducting a study with the objective of developing a model for undergraduate industrial teacher education program development in Nigeria.

The results of my study, hopefully, will enable vocational and technical educators and administrators in Nigeria to develop new programs as well as revise or improve existing ones.

I consider your input very vital to the success of the study, hence I am requesting that you sacrifice about ten minutes of your time to complete the enclosed questionnaire.

Please, be assured that the responses on the questionnaire will be analyzed on a group basis and that no attempt will be made to associate responses with individuals or institutions.

It will be appreciated if you return the completed questionnaire to me in the enclosed self-addressed envelope by March 10, 1986 with the envelope sealed.

Sincerely yours,

Godfrey I. Nwoke
Graduate Student

Approved by:

Professor William D. Wolansky
(Major Professor)
Dear Sir:

I am a Nigerian student at Iowa State University and I am pursuing a Ph.D. degree in Industrial Education and Technology. As a part of my degree requirements, I am conducting a study with the objective of formulating a model for developing undergraduate industrial teacher education programs in Nigeria.

The results of the study, hopefully, will enable vocational and technical educators and administrators in Nigeria to develop new programs as well as revise or improve existing ones.

As a person involved in this aspect of Nigerian education, your contribution is considered very vital to my study. Please take a few minutes of your time to complete the enclosed questionnaire. It will be appreciated if you return the completed questionnaire to me by March 10, 1986.

If you are an educator in Nigeria, please return the completed questionnaire to your head of department who will mail it to me in a sealed, self addressed envelope along with those of other staff members.

If you are a Nigerian graduate student in the United States, kindly staple the questionnaire booklet and drop it in the mailbox. Postage is prepaid.

Please, be assured that the responses on the questionnaire will be analyzed on a group basis and that no attempts will be made to associate responses with individuals or institutions.

Thank you in advance for your contribution and interest in Nigerian education.

Sincerely yours,

Godfrey Ifeanyi Nwoke
(Graduate Student)
SECTION 1

Considering the current status of vocational and technical education in Nigeria, rate on a scale of 1 to 99 the extent to which importance should be attached to the aspects of industrial and technical teacher education identified below. The scale is anchored as follows:

- 75 - 99 = Very Important
- 50 - 74 = Moderately Important
- 25 - 49 = Somewhat Unimportant
- 1 - 24 = Unimportant

You are encouraged to use any number from 1 to 99 in your rating.

I. How important is it that colleges of education and the universities offer degree programs in industrial and technical teacher education in Nigeria? (1)

II. How important is it to provide specialization in the following areas of teacher education:

1. Industrial arts for teachers of prevocational programs in Nigerian secondary schools. (1)
2. Trade and industrial education for teachers of vocational subjects in senior secondary and technical schools. (2)
3. Industrial technology for industrial trainers. (3)
4. Other (please specify). (4)

III. To what extent do you consider the following as important objectives to be pursued in industrial and technical teacher education programs in Nigeria:

1. Providing technical knowledge and vocational skills necessary for effective technical teaching. (1)
2. Providing a balance of general, technical, and professional education. (2)
3. Providing a balance between the theory and practice of contemporary industrial teaching. (3)
4. Producing qualified technical teachers in sufficient numbers to meet national needs. (4)
5. Providing educational experiences to meet the needs and interests of individual students. (5)
6. Enhancing and promoting students' interest and attitude toward the profession of industrial and technical teaching. (6)
7. Providing the opportunities for the development of independent thinking and problem solving skills. (7)
8. Creating in students an awareness of the impact of industry and technology on society. (8)
9. Providing extra curricular activities which enhance students' potential for further professional development. (9)
10. Other (please specify). (10)
SECTION 2

In the following questions, rate on a scale of 1 to 99 the extent to which you AGREE or DISAGREE with a given statement. The scale is anchored as follows:

75 - 99 = Strongly Agree (SA)
50 - 74 = Agree (A)
25 - 49 = Disagree (D)
1 - 24 = Strongly Disagree (SD)

If you are UNDECIDED ABOUT ANY STATEMENT, simply write 50.

VI. To what extent do you agree with the following statements?

(1) A college of education offering a degree program in industrial education should be affiliated with a university.

(2) A college of education offering a degree program in industrial education should be administratively autonomous.

(3) Certification standards in institutions offering degree programs in industrial and technical education should be monitored by a national commission.

(4) The commission to monitor certification standards should be an arm of the National Board for Technical Education.

(5) Final degree examination and certification should be handled by individual educational institutions.

VII. Content of industrial and technical teacher education programs should be determined by:

(1) Task analyses of what workers do in various occupations.

(2) Asking employers about necessary competencies needed to obtain and retain a job.

(3) A consensus of subject experts on what should be taught.

(4) Other (please specify).

VIII. Program content for teachers of prevocational courses should be organized by:

(1) Clustering related tasks into such broad areas as construction, manufacturing, energy and power, etc.

(2) Presenting the content simply as a unified body of knowledge under the title 'technology'.

(3) Teaching each occupational area as a single subject, e.g., carpentry, welding, auto mechanics, etc.

(4) Other (please specify).

SECTION 3

The following questions do not involve the use of a scale. Rather, they should be answered based upon your best judgement.

IX. How many years of industrial experience should be required for professional industrial and technical teaching? (period in years)

X. What should be the method of acquiring the industrial experience? Check (✓) only one.

(1) Supervised industrial attachment while one is a student.

(2) Full-time employment in industry following graduation.

(3) Internship immediately following graduation.

(4) Other (please specify).
IV. To what extent do you perceive the following as important components of a degree program in industrial and technical teacher education in Nigeria?

(1) Knowledge and understanding of the historical, social and philosophical foundations of vocational and technical education. (1)

(2) Applying the theories and principles of teaching and learning to classroom situations. (2)

(3) Planning and implementing instruction. (3)

(4) Designing and utilizing appropriate teaching aids. (4)

(5) Organizing group discussions, demonstrations, field trips and other instructional strategies. (5)

(6) Conducting and supervising students' practice teaching experience. (6)

(7) Conducting and supervising students' industrial work experience in cooperation with employers. (7)

(8) Measuring and evaluating student progress. (8)

(9) Conducting follow-up studies of program graduates. (9)

(10) Applying the principles of guidance and counseling and communicating same to the students. (10)

(11) Managing classroom resources and problems. (11)

(12) Managing the industrial education laboratory or shop. (12)

(13) Understanding the theoretical bases of the major industrial or technical teaching specialty. (13)

(14) Practical application of technical skills, knowledge and attitudes to real life situations. (14)

(15) Mastery of other subject areas related to technical specialty. (15)

(16) Developing student interest and awareness in the contemporary social, economic, and political life of the community. (16)

(17) Familiarity with research methods, techniques, and practices, and utilizing them to improve instruction. (17)

(18) Other (please specify). (18)

V. To what extent do you consider the following competencies as important in an industrial and technical teacher education program for Nigeria?

(1) Demonstrating practical skills in one or more occupational areas. (1)

(2) Designing and effectively utilizing instructional aids. (2)

(3) Planning and implementing instruction for a given student group. (3)

(4) Promoting safety in the industrial laboratory or shop. (4)

(5) Evaluating and reporting student achievement. (5)

(6) Working effectively with other teachers and administrators. (6)

(7) Demonstrating leadership in organizing and coordinating industrial education-related activities and programs. (7)

(8) Obtaining and utilizing research information. (8)

(9) Keeping records and inventory of materials and equipment. (9)

(10) Other (please specify). (10)
XI. How long should a degree program in industrial and technical teacher education last (excluding years of industrial experience) for holders of the following certificates?

(1) GCE O/L _______ years.
(2) NCE (Technical) _______ years.
(3) NND or HND _______ years.
(4) Technical Teachers Certificate _______ years.
(5) Other (please specify). _______ years.

XII. How should the responsibility for curriculum planning in industrial and technical teacher education be distributed? For each group below indicate the proportion of the responsibility they should have for curriculum planning. The proportions should add to 100.

PROPORTION

(1) Officials of the federal government. _______%
(2) Officials of the state government. _______%
(3) Administrators in each educational institution. _______%
(4) Other (please specify). _______%

(These proportions must add to 100). 100

XIII. At the level of educational institutions, what should be the proportion of involvement of the following in curriculum planning and development?

(1) Department Head _______%
(2) Selected curriculum committee _______%
(3) All members of teaching staff _______%
(4) Curriculum specialists from outside the department _______%
(5) People from industry _______%
(6) Other (please specify). _______%

(These proportions must add to 100). 100

XIV. Please check (✓) the category to which you belong below.

(1) Administrator (department head) _______
(2) Faculty (teaching staff) member _______
(3) Graduate student _______

XV. Your gender: (1) Male (2) Female _______

XVI. The educational level you have attained:

(1) PH.D. _______ (2) M.S./M.A. _______ (3) B.Sc./B.A. _______ (4) Other (specify) _______

XVII. If you are presently teaching, what subjects do you teach?

(1) _______ (2) _______ (3) _______

XVIII. What other suggestions would you like to make that might help institutions to plan and develop degree programs in industrial and technical teacher education in Nigeria? Write the suggestions below.
Dear

I wish to acknowledge, with sincere thanks, the receipt of the set of completed questionnaires which you mailed back to me.

My heart is full of appreciation for all the trouble you took to get the members of your teaching staff to complete the questionnaires and, most important of all, to collect them back for prompt despatch to me.

By your action, I have come to the full conviction that there is great hope for our country and our educational system. I am, indeed, encouraged.

Many thanks and goodluck in your own endeavors.

Sincerely yours,

Godfrey Ifeanyi Nwoke

[Signature]

Professor William D. Wolansky
(Major Professor)
APPENDIX C: MAP OF NIGERIA SHOWING THE 19 STATES
Map of Nigeria showing the 19 states
APPENDIX D: SUMMARY OF ANALYSIS OF VARIANCE (PROC GLM)
RELATED TO QUESTION 1 OF THE STUDY
Table 18. Analysis of variance relating to the importance of objectives to be pursued in the programs

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*Significant beyond the .05 level.
APPENDIX E: SUMMARY OF ANALYSIS OF VARIANCE (PROC GLM)
RELATED TO QUESTION 2 OF THE STUDY
Table 19. Analysis of variance relating to the program components to be emphasized

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*Significant beyond the .05 level.

**Significant beyond the .01 level.
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APPENDIX F: SUMMARY OF ANALYSIS OF VARIANCE (PROC GLM)
RELATED TO QUESTION 3 OF THE STUDY
Table 20. Analysis of variance relating to the determination of content in industrial teacher education

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Table 21. Analysis of variance relating to organization of content of prevocational teacher education programs

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APPENDIX G: SUMMARY OF ANALYSIS OF VARIANCE (PROC GLM)
RELATED TO QUESTION 4 OF THE STUDY
Table 22. Analysis of variance relating to the importance of identified competencies

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*Significant beyond the .05 level.

**Significant beyond the .01 level.
APPENDIX H: SUMMARY OF ANALYSIS OF VARIANCE (PROC GLM)
RELATED TO QUESTION 5 OF THE STUDY
Table 23. Analysis of variance relating to the distribution of responsibility for curriculum planning

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Table 24. Analysis of variance relating to the proportion of involvement of participants at the institutional level

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APPENDIX I: SUMMARY OF ANALYSIS OF VARIANCE (PROC GLM) RELATED TO OTHER ASPECTS OF PROGRAM DEVELOPMENT IN INDUSTRIAL AND TECHNICAL TEACHER EDUCATION IN NIGERIA
Table 25. Analysis of variance relating to the importance of degree programs

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source</th>
<th>df</th>
<th>Sum of squares</th>
<th>Mean squares</th>
<th>F-value</th>
<th>Prob &gt; F</th>
</tr>
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<tbody>
<tr>
<td>DEG</td>
<td>Model</td>
<td>3</td>
<td>2.846</td>
<td>0.949</td>
<td>1.23</td>
<td>0.3031</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>116</td>
<td>89.676</td>
<td>0.773</td>
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</table>

Table 26. Analysis of variance relating the importance of identified areas of specialization

<table>
<thead>
<tr>
<th>Variable</th>
<th>Source</th>
<th>df</th>
<th>Sum of squares</th>
<th>Mean squares</th>
<th>F-value</th>
<th>Prob &gt; F</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP 1</td>
<td>Model</td>
<td>3</td>
<td>2.255</td>
<td>0.752</td>
<td>1.15</td>
<td>0.3317</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>118</td>
<td>77.070</td>
<td>0.653</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SP 2</td>
<td>Model</td>
<td>3</td>
<td>6.429</td>
<td>2.143</td>
<td>3.65*</td>
<td>0.0146</td>
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<tr>
<td></td>
<td>Error</td>
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<td>69.234</td>
<td>0.587</td>
<td></td>
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</tr>
<tr>
<td>SP 3</td>
<td>Model</td>
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<td>1.679</td>
<td>2.50</td>
<td>0.0632</td>
</tr>
<tr>
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<td>Error</td>
<td>118</td>
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<td>0.673</td>
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<tr>
<td>SP 4</td>
<td>Model</td>
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<td>5.281</td>
<td>1.760</td>
<td>2.92</td>
<td>0.0738</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>13</td>
<td>7.827</td>
<td>0.602</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Significant beyond the .05 level.
Table 27. Analysis of variance relating to extent of agreement with statements on program administration

<table>
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<tr>
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<th>Sum of squares</th>
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<th>F-value</th>
<th>Prob &gt; F</th>
</tr>
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<tbody>
<tr>
<td>AGR 1</td>
<td>Model</td>
<td>3</td>
<td>20.333</td>
<td>6.778</td>
<td>4.26**</td>
<td>0.0068</td>
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<td>Model</td>
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<td>11.063</td>
<td>3.688</td>
<td>3.35*</td>
<td>0.0215</td>
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<tr>
<td></td>
<td>Error</td>
<td>115</td>
<td>126.491</td>
<td>1.100</td>
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<tr>
<td>AGR 3</td>
<td>Model</td>
<td>3</td>
<td>5.362</td>
<td>1.787</td>
<td>2.10</td>
<td>0.1043</td>
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<td>Error</td>
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<td>100.577</td>
<td>0.852</td>
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<tr>
<td>AGR 4</td>
<td>Model</td>
<td>3</td>
<td>2.588</td>
<td>0.863</td>
<td>0.84</td>
<td>0.4720</td>
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<td>116.375</td>
<td>1.021</td>
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<td>AGR 5</td>
<td>Model</td>
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<td>Error</td>
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<td>144.375</td>
<td>1.255</td>
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*Significant beyond the .05 level.

**Significant beyond the .01 level.

Table 28. Analysis of variance relating to required period of industrial experience

<table>
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<tr>
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<th>Source</th>
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<th>Mean squares</th>
<th>F-value</th>
<th>Prob &gt; F</th>
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<tbody>
<tr>
<td>YRE</td>
<td>Model</td>
<td>3</td>
<td>2.475</td>
<td>0.825</td>
<td>0.40</td>
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<td>112</td>
<td>228.836</td>
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### Table 29. Analysis of variance relating to method of acquiring industrial work experience

<table>
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<th>Variable</th>
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<th>Sum of squares</th>
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<th>Prob &gt; F</th>
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<tbody>
<tr>
<td>EX</td>
<td>Model</td>
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<td>0.98</td>
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<td>77.097</td>
<td>0.653</td>
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</table>

### Table 30. Analysis of variance relating to duration of degree programs

<table>
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<tr>
<th>Variable</th>
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<th>Sum of squares</th>
<th>Mean squares</th>
<th>F-value</th>
<th>Prob &gt; F</th>
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<tbody>
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<td>0.513</td>
<td>1.07</td>
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<tr>
<td>L 2</td>
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<td>5.968</td>
<td>1.989</td>
<td>3.18*</td>
<td>0.0266</td>
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<tr>
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<td>0.6887</td>
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<td>14.357</td>
<td>0.957</td>
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</tr>
</tbody>
</table>

*Significant beyond the .05 level.

**Significant beyond the .01 level.