THE PRESENT, FUTURE AND EMERGING EDUCATIONAL REQUIREMENTS OF PERSONNEL IN THE PLASTICS INDUSTRY IN KENTUCKY, WITH IMPLICATIONS FOR MOREHEAD STATE UNIVERSITY AND THE INDUSTRY

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by

Thomas Richard Crawford

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. by the faculty of the School of Education,
N e University, in partial fulfillment of the requirements
for ter of Higher Education degree.

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Master's Committee: Paul Ford Davis, Chairman

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ABSTRACT OF THESIS

THE PRESENT, FUTURE AND EMERGING EDUCATIONAL REQUIREMENTS OF PERSONNEL IN THE PLASTICS INDUSTRY IN KENTUCKY, WITH IMPLICATIONS FOR MOREHEAD STATE UNIVERSITY AND THE INDUSTRY

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The purpose of this study was to investigate the present, future and emerging educational requirements of personnel in the plastics industry located in Kentucky. This study is composed of the following four dimensions: (1) the extent that present and future educational needs of the plastics industry are being fulfilled in Kentucky, (2) the need for development of plastics training programs in Kentucky, (3) nature of pre-service and/or in-service training programs for plastics personnel in Kentucky and (4) the implications for Morehead State University and the plastics industry to become involved in the pre-service and in-service development of plastics personnel.

Data were secured by contacting a total of 136 representatives of the plastics industry in Kentucky. These 136 companies were stratified according to their manufacturing processes and then as to their total number of employees. A random sample of five companies were selected from the total sample to be interviewed in a pilot study. The

remaining 131 companies were then surveyed by the use of a questionnaire. All collected data were tested by two non-parametric statistical tests, the "Chi square" (x^2) one sample test and the binominal (P_x) two tailed test.

Upon completion of the analysis of data, current trends in the industry were shown. A shortage of skilled laborers, technicians, engineers and supervisors was shown to exist with procurement of these employees made possible by the upgrading of employees from within the company.

Most employees to be hired in the next five years were indicated to be drawn from the ranks of the semiskilled and unskilled laborers. There was no indication as to what type of educational program was needed or if additional or new types of programs were desired.

Based upon the tests of eight hypotheses, the writer was able to draw the following conclusions. Indications were that the present and future educational requirements were not being fulfilled and will not be fulfilled in the future. Future educational requirements were not made visible by this study so no attempt can be made to draw conclusions relating to what type of educational programs are needed. Pre-service education was shown to be undesirable and that some type of in-service program was being offered within the company. Based upon the results of this study, the writer recommends future study in

the following areas: (1) identification of the plastics industry, (2) significance of the plastics industry, (3) identification of job classifications, (4) identification of on-the-job training programs, and (5) industrial resources available from the plastics industry.

Accepted by:

Paul Ford Davis, Chairman

Lawrence Lincoln

Nelson Spicer

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CHAPTER I

THE PROBLEM

Statement of the Problem

It is the purpose of this study to investigate the present, future and emerging educational requirements of personnel in the plastics industry in Kentucky. The data collected will enable the researcher to make recommendations concerning the four basic dimensions of this study. The first dimension is to determine to what extent the educational institutions of Kentucky are presently fulfilling the educational needs of personnel in the plastics industry and if they will be able to adequately meet educational requirements in the future. Secondly, this study is concerned with the relative need for educational institutions, high schools, technical schools and/or institutions of higher education to develop programs for personnel in the plastics industry. Thirdly, this study will attempt, with data provided by industry, to determine the nature of pre-service and/or in-service training programs for personnel in the plastics industry. In addition, this study will attempt to determine the implications for Morehead State University as well as for the plastics industry to become involved in the pre-service and in-service development of personnel.

Review of Related Literature

A review of the related literature reveals that limited research has been done in the primary target area of this study. Therefore, it is necessary to review selected studies that relate to the plastics industry in a general way. They relate to the problem by the fact that they are concerned with the need for and/or education of industrial technicians. In some cases the titles of the studies and articles were misleading to the researcher and were of little value. A listing of the studies reviewed may be found in the Bibliography.

The population of these eleven studies was handled in much the same manner. Each of the writers stratified his population according to some predetermined criterion. Cooper[1] classified or stratified his population according to the different types of manufacturing users. He proceeds to define each of his stratifications in detail as to the nature of the manufacturer's use of photo-optics. Jacobsen[2] stratified his population according to the area of the county in which the industries were located and then used a second stratification to group them

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[1]Richard Cooper, Photo-Optics - A Survey to Determine the Feasibility of Instrumentation Technicians (Sacramento, California: State Department of Education, 1964), pp. 7 & 11.

[2]Eckhart Jacobsen and Merlyn Swanson, "A Survey of the Technical Needs of Industry and Implications for Curriculum in Higher Education" (unpublished Master's thesis, Northern Illinois University, Dekalb, Illinois, 1966), pp. 9 & 26.

according to their use of technical personnel. Wagner's[3] population was stratified into two groups: service trades and trades involved in the designing, manufacturing and fabrication of finished products. Chairman Ullery[4] of the Society of Plastics Engineers, Incorporated and the Society of Plastics Industry, Incorporated, Education Task Force, stratified his sample according to the size of the company surveyed.

Rather than use the whole population to obtain data, Wagner[5] and Baker[6] used a representative sample of the population. This representative sample was selected by making a random selection of a predetermined number of industries from the whole population.

Jacobsen and Swanson used a questionnaire as their method of collecting data. In order to assure that their questionnaire was valid,

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[3]Walter Franklin Wagner, "An Occupational Survey to Determine Industrial Worker Training Needs of Duval County, Florida" (unpublished Master's thesis, University of Tennessee, Knoxville, Tennessee, 1956), p. 42.

[4]Robert J. Ullery, Chairman, The Need for Plastics Education, Education Committee, (New York: Society of Plastics Engineers and The Society of the Plastics Industry, Incorporated, 1968), pp. 9 - 17.

[5]Ibid., p. 38.

[6]James Kenneth Baker, "Determining Employment Opportunities and Educational Needs for Animal Science Technicians" (unpublished Master's thesis, The Ohio State University, Columbus, Ohio, 1965), p. 16.

they first constructed a trial questionnaire and ran a pilot study.[7] The results of this pilot study brought forth two problems they had not anticipated. One problem was that each questionnaire needed to be coded to determine from which section of the sample it came. A second problem was that, in order for the data to be useful, the questionnaire must be at least 50 per cent filled in. All questionnaires with over 50 per cent unanswered blanks were treated as invalid returns. Wagner[8] discovered that in the final and published tabulation of the data, all results must be kept confidential in order for industries to respond properly. To insure the respondent that all information would be kept confidential, the following statement was placed at the beginning of the questionnaire:

> CONFIDENTIAL: No information given on this form will be given to any other agency or party. No names of firms or individuals will appear on the final tabulations and summation of the findings.[9]

By using the above statement of intent, Wagner felt that he obtained more complete and factual information.

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[7]Jacobsen, op. cit., p. 7.

[8]Wagner, op. cit., p. 37.

[9]Ibid., p. 87.

Jacobsen[10] obtained suitable results when he defined all the terms used in his questionnaire. These definitions at the beginning of the questionnaire give the respondent the meaning of the terms the way the researcher wants them interpreted for his study. Thus, the researcher can assume that all questions were answered by the respondents interpreting them in a like manner.

In Jacobsen's study, several advantages of the survey method were discussed. It was stated that the questionnaire is flexible and can be manipulated to be used in many different ways. Secondly, a questionnaire is an economical method of collecting data from a large population. One disadvantage of this method is that the questionnaire survey method lacks complete control in obtaining data.

Although Wagner did use a questionnaire, he found it necessary to make personal interviews.[11] The personal interview was used for two purposes. First, it was used to correlate the data obtained from the questionnaire to that obtained from the interview. Secondly, the interviews provided additional data needed in the study. Henrichs[12]

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[10]Jacobsen, op. cit., p. 8. [11]Wagner, op. cit., p. 35.

[12]Roy S. Henrichs, "Need for Technical Education in the New Orleans Area With Implications for the Delgado Technical Institute" (unpublished Master's thesis, University of Missouri, Columbia, Missouri, 1964).

used the personal interview entirely in the collection of data because he felt it gave him more control upon the data he received.

To insure a completion date, Jacobsen[13] set a definite date for the questionnaire to be returned. If the questionnaire was not received by this date, he processed it as a non-returned questionnaire. Wagner[14] found that after an initial return date was passed, additional returns could be obtained by sending each non-respondent a follow-up letter reminding him of the questionnaire and asking him to complete and return it to the researcher. However, in all cases where a questionnaire is used, a date must be set for its return.

Wagner's[15] study concluded that employers, as a whole, would welcome the opportunity to secure beginning technicians with a knowledge of the technology. Duval County's industries recommended an increased use of advisory committees by technical institutes. It was also the recommendation of the industries that members should be partly composed of skilled people in the trades.

In Baker's study,[16] it was discovered that not only was there a need for technical workers in the animal sciences but that the critical shortage of adequately prepared technicians is acute and will continue to grow more critical. The educational institutions of the United States

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[13]Jacobsen, op. cit., p. 10.

[14]Wagner, op. cit., p. 39.

[15]Ibid., pp. 79-81.

[16]Baker, op. cit., p. 341.

in 1965 were only graduating about 20 per cent of the needed technicians.

Of the industries studied by Baker, the following educational requirements were found. It was indicated that 30 per cent[17] of the technicians need a baccalaureate degree. Technical training which varied from six months to three years was required for 43 per cent of the population. Only 16 per cent indicated that there was a need for a high school diploma. Baker's study indicated that 9 per cent of the technicians required either less than a high school diploma or more than a baccalaureate degree as an educational requirement.

Baker recommends:[18] (1) that an educational program in animal science be started with an increase in the total educational program for technicians; (2) that this technical education should take place in the community colleges as well as in the technical schools; (3) that more advisory committees be used; and (4) that occupational experience should be an integral part of the technical education program.

In a study of the chemical, petroleum and space industries in New Orleans,[19] Louisiana, by Henrichs, there was found to be a shortage[20] of trained technicians. The study revealed not only a

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[17] Ibid., p. 148.

[18] Ibid., pp. 343-344.

[19] Henrichs, op. cit., p. 44.

[20] Ibid., p. 117.

shortage but that large numbers of trained technicians were needed[21] immediately. Of all the technical personnel needed, the drafting technician was the most in demand.[22]

Henrichs[23] suggests that the need for technicians may be lessened by retraining displaced workers as technicians. He also suggests that some technical jobs could be filled by the handicapped; and, therefore, a program should be implemented to train handicapped people as technicians.

Industry[24] indicated that they are presently employing most of their present technicians from three sources: the upgrading of "top-notch" mechanics to the position of technician; employment of formally trained technicians straight from junior colleges; and the employment of people with some college and then completing their technical education with on-the-job training. These same industries indicated a desire and a need to hire technicians trained by an outside agency.

A further recommendation of Henrichs' study is that a recruitment program be started for people to enter technical training. Another recommendation is that further study needs to be made in other areas of technical training.[25]

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[21] Ibid., p. 63

[22] Ibid., p. 60.

[23] Ibid., p. 68.

[24] Ibid., p. 51.

[25] Henrichs, op. cit., pp. 119-120.

In Venn's[26] book, Man Education and Work, several facts were made known along with some recommendations concerning technical education. In 1964, 30 per cent of the high school dropouts were unemployed in the United States. During that same year, 15 per cent of the high school graduates were unemployed. In the 1900's, there were twice the number of blue collar workers as there were white collar workers; but it is estimated that by 1975, there will be 44 per cent more white collar workers as there are blue collar workers. These statistics on unemployment, white and blue collar workers, indicate a need for more and perhaps changed technical education programs.

Some of Venn's recommendations for improving technical education are as follows:[27]

1. A continuing national research and planning body should be established with the sole purpose of translating available information into priorities for this nation's vocational and technical education effort.
2. Every state education agency, in cooperation with institutions of higher education, should organize an occupational education planning and study body.
3. Area conferences should be held throughout the United States to discuss the role of higher education in vocational and technical education, occupational needs of the area and long-term plans of institutions and states.

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[26]Grant Venn, Man Education and Work (Washington, D. C.: American Council on Education, 1964), pp. 12-17.

[27]Ibid., p. 160.

4. Higher education should assume a greater responsibility for the education of youth and adults for occupational competence in the technical and highly skilled occupations at the less-than-baccalaureate level.
5. The two-year colleges in America, if they are to assume their proper and effective role in the educational system of this nation, should make vocational and technical education programs a major part of their mission and a fundamental institutional objective.
6. Four-year colleges and universities, located in areas where a comprehensive two-year college is not likely to be established, should provide post secondary vocational and technical education. Where feasible, however, they should support the development of two-year colleges, which will provide these programs for youth and adults.
7. High schools should establish vocational education programs which offer all youths leaving high school marketable occupational skills or preparation for further occupational education.
8. Continuing occupational education for out-of-school youths and adults should become a major function of many more educational institutions, especially those with programs for highly skilled technical and professional occupations.
9. Occupational education should be an integral and essential part of the total educational system.
10. The American Council on Education, The American Personnel and Guidance Association, The American Association of Junior Colleges, and other cognate agencies should form a joint committee to secure funds for a study of ways of evaluating knowledge and learning gained from outside formal educational programs for the purpose of qualifying individuals to study in formal education programs.
11. Tuition charges for vocational and technical education should be kept within a level which will allow youths and adults to enroll on a basis of interest, need, and ability, rather than financial capability.
12. Colleges and high schools should assume the responsibility for educational guidance and placement for dropouts.
13. Colleges and universities presently offering programs in scientific, engineering, health, medical, business and other fields related to new technologies and with experience in teacher preparation should develop curricula and prepare instructors for vocational and technical education.

Creco,[28] having conducted a survey of training needs of the plastics technician in Connecticut, found that the educational requirements of plastics technicians ranged from the unskilled non-high school graduate to that of a person with a baccalaureate degree. The technical positions that he surveyed were filled from three main sources: (1) unskilled labor, (2) secondary school graduates and (3) the upgrading of present employees. This study determined that 75 per cent of the technicians in Connecticut had a secondary school education or less. Forty-eight per cent of the technicians had studied a general education curriculum with only 72 per cent having had some trade experience.

Out of sixty-seven jobs surveyed, the educational requirements were as follows: (1) four have completed grade school, (2) twenty have completed high school, (3) three required vocational school training, (4) twenty required either high school or vocational school training, (5) sixteen required training in a technical institute and (6) one required college. Of the sixty-seven employees, the actual educational achievements were: (1) twenty-one had completed high school, (2) nine had attended a vocational school, (3) fourteen had

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[28]C. S. Creco, Survey of Training Need in Connecticut's Plastic Industries, Division of Vocational Education, Bureau of Technical Institutes (Hartford, Connecticut: Connecticut State Department of Education, 1966), p. 203.

attended both high school and vocational school, (4) thirteen had attended a technical institute, (5) eight had attended a junior college or college, (6) nine were unskilled labor and (7) thirty were included in the upgrading of present employees.

The conclusion drawn by Creco was that there was no need for a plastics curricula in the vocational-technical schools or technical institutes of Connecticut. His results indicated that the training needs of the plastics technician could be met through on-the-job training programs, evening vocational-technical school and technical institute courses, or through the inclusion of the study of plastics in an existing technology.

In an article titled "Quality Programs Through College Industry Cooperation,"[29] the author reported on a survey of the plastics industry in the Los Angeles area which was designed to verify the need for technical level management trainee personnel. This study established a definite need for trained personnel for the plastics technical management positions in the Los Angeles area's plastics industries. The study also indicated that industry was willing to support such a program by donating large amounts of equipment and

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[29]Franklin R. Johnson and Fred J. Brinkman, "Quality Programs Through College Industry Cooperation," American Vocational Journal, April, 1968, p. 26.

fifteen scholarships as a starter with a promise of more. The study also found that the Los Angeles Trade-Technical College should start a two-year technology program for personnel planning to enter the field of plastics. The industry recommended that lay advisors be appointed and selected from the plastics industry. Another recommendation was that three types of people may leave the program with a certificate. First, a student may earn an Associate in Science Degree by completing the state requirements. A second option would be a Certificate of Completion for a student who finishes all the required courses but does not meet the state requirements for an Associate Degree. A third option could be a certificate for the student who completes 75 per cent of the curriculum.

The nationwide survey[30] conducted by a joint educational committee of the Society of Plastics Engineers, Incorporated, and The Society of the Plastics Industry, Incorporated, provides the writer with a current and directly related study to review and make a comparison of its results with the results of this study. Over 4,000 firms were contacted in the joint nationwide study with all fifty states being represented within the sample. Of the 4,000 firms contacted, approximately 25 per cent completed and returned

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[30]Ullery, op. cit., p. 2.

the questionnaires. This 25 per cent return was considered a good sample and a true reflection of the industry.

In the SPE-SPI study, the top ten[31] plastics producers were listed as: New York, 14 per cent; California, 13 per cent; Illinois, 11 per cent; New Jersey, 10 per cent; Ohio, 9 per cent; Michigan, 6 per cent; Connecticut, 4 per cent; and Indiana, 3 per cent. The above ten states have within their borders 85 per cent of the plastic producers in the United States. Kentucky was not ranked in the nationwide study but it can be assumed that it contains less than 3 per cent of the plastics producers in the nation, as the tenth ranked state had only 3 per cent.

This nationwide[32] study found that 60 per cent of all returns indicated a shortage of skilled employees. About 75 per cent indicated labor would be in short supply in the future. The companies responding indicated that 75 per cent of them would pay pre-trained employees a higher starting salary than non-trained employees.

The industries in the SPE-SPI study indicated various types of support for plastics training programs. Those companies not supporting a plastics training program then indicated that 55 per cent of them would support such a program if it were made available.

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[31] Ibid., p. 10.

[32] Ibid., p. 11-20.

two times as fast as that of all manufacturing and (2) that in 1983 the use of plastics will surpass that of metal in volume.

As current studies indicate that there is a national need for trained plastics personnel and that there are conflicting findings in studies completed in opposite regions of the nation, it is the opinion of this researcher (after a review of the literature) that there is a need for a study to be completed in the mid-western section of the nation. Some questions that need to be answered are: (1) What is the nature of the plastics industry in Kentucky? (2) What are the educational needs of the plastics personnel in Kentucky? (3) What is the plastics industry in Kentucky willing to do about educating its employees? This study of "The Present, Future and Emerging Educational Requirements of Personnel in the Plastics Industry in Kentucky, With Implications for Morehead State University and the Industry" will attempt to answer the above questions.

Hypothesis

1. The educational institutions in Kentucky are currently fulfilling the educational requirements for people employed in and people entering employment in the plastic industry.

2. The educational institutions in Kentucky will continue to fulfill the educational requirements for people employed in and entering employment in the plastics industry.

3. People seeking employment in the plastics industry of Kentucky do not need pre-service technical education.

4. People in employment in the plastics industry of Kentucky do not need in-service technical education.

5. The plastics industry will not be willing to support pre-service technical education conducted by the public schools in the field of plastics.

6. The plastics industry will not be willing to support in-service technical education conducted by the public schools in the field of plastics.

7. There is no need for public institutions at the post-secondary level to implement a clock-hour technology program.

8. There is no need for Morehead State University or other institutions of higher education to implement an Associate Degree program in plastics technology.

Basic Assumptions

1. That there is dignity in work.

2. That dignity in work is obtained through the education of man.

3. That it is the role of the public schools to educate man.

4. That in an industrial society, dignity in work is obtained through a technical education.

5. That it is the role of the public schools to technically educate man.

6. That the technically educated man will become a white collar worker.

7. That the white collar worker will continue to outnumber the blue collar worker in the American labor force.

8. That the plastics industry will continue to need a labor force of predominately white collar workers.

9. That the plastics industry will continue to grow at an accelerated rate and will become a dominate industry in America.

Limitations of the Study

A limitation is that the data in the study was obtained from within the Commonwealth of Kentucky. The problems associated with the identification of the plastics industry is a third limitation as the industry is developing very rapidly. In many cases, plastics processing may be concealed in a manufacturing firm. Because the

study is based upon future and emerging educational needs, there are several uncontrolled or unaccountable variables such as the age, experience, position, and bias of the respondent. The study is also limited to the use of a questionnaire and interviews in the collection of data. An additional limitation is the use of non-parametric statistics in the analysis of the data.

Definition of Terms

Assembling of plastic products. A mechanical or chemical operation that results in two pieces of plastic being fastened together. These pieces may be permanently fastened or fastened in a manner that facilitates disassembly.

Associate Degree. A rank given to a person who has successfully completed a prescribed course of studies consisting of a minimum of sixty-four semester hours of college level work.

Blue collar worker. A term used to designate a worker below foreman status, usually designating unskilled and semiskilled industrial workers in some cases.

Emerging educational requirements. Educational requirements that will become apparent or known in the future years but are not readily known at the present time.

Engineer. A person who possesses educational qualifications, work experience and legal certification where required. Requirements are established by engineering schools, employers, and licensing authorities. Engineers usually function in one or more activities, such as research, development design, production, consulting, administration and management, teaching, technical writing, or technical sales and service.

Future educational requirements. The "future educational requirements" are the educational requirements that are fully known at the present but may become more demanding or rigorous in the future years.

General education. Education that attempts to provide a core of learning which is assumed to be necessary to meet the needs of the educated man of the particular era.[35]

High school. A school composed of the grades above those of the elementary school and junior high school. This school offers more advanced studies such as college preparatory, technical and vocational education.

Higher education. An educational system that offers college level courses that may be applied toward one of the following degrees: associate, baccalaureate, master's and/or doctorate.

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[35]Jame L. Chapman, "Three Programs in General Education," The Journal of General Education, April, 1968.

In-service training. Training that is administered to personnel currently performing a particular job and that will lead to a better performance of that job.

Plastics industry. Industries that are using plastics, raw materials to manufacture plastics, and/or that are manufacturing plastics tools in either a captive or custom operation.

Plastic processes. Operations that change either the physical or chemical state of plastics. These different processes are called: assembling plastic products, blow molding, calendaring, cellular, chemical operations, compression, transfer, extrusion, injection molding, mold making, plastics machine manufacturing, reinforced plastics, thermoforming and the weaving of plastics.

Pre-service training. Training for employment that is completed before actual employment is secured.

Public institutions. Educational institutions that are supported mostly by money supplied by taxes levied upon the population.

Semiskilled laborer. A person capable of doing manual work that requires some but not extensive training. This person is usually a wage-earning worker.

Skilled laborer. A person having an ability in a particular industrial occupation gained by special experience, regular program of training and/or apprenticeship.

Specialized education. Education that trains a person for a special task in life.

Supervisor. A person who has several persons or a section of an industrial operation under his direct supervision.

Technical education. An educational curriculum at the post-secondary school level with offerings of such a unique nature that the student is instructed in a complex of skills with sufficient scientific and technological theory to prepare its students as technicians. This educational program is oriented toward scientific and technological theory, but is directed more toward application of theory, as in the education of the engineer or the scientist.

Technical school. A school uniquely designed to prepare technicians for the "world of work." This school's curricula is so designed to provide a desirable balance between cognitive abilities and technical skills to prepare technicians to work in close support of engineers and scientists.

Technician. An occupational title that refers to a large group of semi-professional and technical positions that are classified between the skilled craftsman on one side with the professional engineer and scientist on the other. Considerable use of cognitive abilities as well as a degree of technical skill is required by the technician. Preparation in most cases requires two or more years

of successful study in a post-secondary school which normally meets associate degree requirements.

Unskilled laborer. A person who is a wage-earning worker, does not have a trade, and performs work that is characterized by physical exertion requiring little, if any, skill or training.

White collar worker. A term used to designate a clerical or professional worker. These "white collar workers" are usually salaried employees and their work is not essentially manual.

CHAPTER II

BASIC DESIGN OF STUDY

This second chapter deals with general information about the selected region and the basic design of this study. In an attempt to set the stage for the selection of Kentucky as the region for the study to be conducted, a brief overview of the Commonwealth's geographical area, size, transportation, industrial development and educational system was deemed necessary. A second section of this chapter will present the sequence for the collection of data. Care is taken to fully explain the rationale of the instrumentation, selection of the sample, implementation of the pilot study, results and recommendations of the pilot study and the implementation of the data collection procedures.

Basic Characteristics of Selected Region

The state has five[1] distinct land regions which vary in elevation[2] from 4, 145 feet above sea level to 257 feet above sea level. The

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[1] "Kentucky, " World Book Encyclopedia (1961), Vol. 10, pp. 216-231.

[2] "Kentucky, " Collier's Encyclopedia (1967), Vol. 14, p. 29.

Appalachian Plateau Region is located on the eastern part of the state which forms part of the Appalachian Mountain and Plateau system. Rich and narrow valleys with steep slopes characterize the region. A Bluegrass Region is located in the north central part of the state and is noted for its gently rolling bluegrass pastures and rich farming land. The southern part of the state is characterized by the Pennyroyal Region. A combination of level land, rock cliffs and wooded hills characterize the land surface of the Pennyroyal Region. Numerous underground passages, including some of the largest caves in the nation, are also found here. In the Western Coal Region, one-half of the state's coal reserve is located. High hills with open fertile valleys form the land surface of this region. The East Gulf Coastal Plain Region is located in the western part of the state. This region, with numerous swamps and oxbow lakes, has the lowest elevation in the state.

Kentucky[3] ranks thirty-seventh in the nation in size with an area of 40, 395 square miles including 532 square miles of inland bodies of water. This area is divided[4] into 120 local governing

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[3]Ibid.

[4]"Kentucky," Compton's Pictured Encyclopedia, Vol. 8, p. 30.

systems called counties. According to the 1960 census,[5] the state's population was 3,038,156 with a density of 76.2 people per square mile, which places Kentucky twenty-seventh[6] in the nation according to population size. The distribution of the population is 44.5 per cent located in urban areas and 55.5 per cent located in rural areas. Kentucky's population grew[7] 3.5 per cent from 1950 to 1960 and 5.2 per cent between 1960 and 1968. One-fourth of the region's population is between the ages of twenty to thirty-nine years with a median age for the state of twenty-seven and six-tenths years. The number of people employed in the state was 935,944 according to the 1960 census.

Transportation is well developed within the state with all major types being readily available to industrial centers. The highway system is composed of 70,000 miles[8] of state and federal roads. To compliment the highway system, there are approximately twenty-two

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[5] Collier's, op. cit., p. 29.

[6] Jack Wayne Moreland, "An Analysis of Industrial Resources and the Extent of Their Use in the Teaching of Industrial Arts in a Selected Region of Kentucky" (unpublished Master's thesis, Morehead State University, Morehead, Kentucky, 1967), p. 15.

[7] Deskbook of Kentucky Economics Statistics, (Frankfort: Division of Research and Planning, Kentucky Department of Commerce, 1968), p. 2.

[8] Collier's, op. cit., p. 36.

railroad companies operating in the state with 3,544 miles of railroad to serve them. Air transportation is developed to where there are forty-seven airports, seven of these being private and forty non-commercial. Currently, there are nine commercial airlines providing air transportation within the state. Along with the other means of transportation, there are 3,000 miles of navigable waterways for barge traffic.

Industry as a whole grew[9] 21.7 per cent between the years 1953 to 1963, which indicates the rapid industrial growth of Kentucky. The chief[10] industrial income of the state comes from the tobacco industry with cattle ranking next. The fuels for industrial development are readily available, as the state has an abundance of coal, petroleum, natural gas and electric power. Kentucky has three basic industrial centers: Louisville, Lexington and Covington, with Louisville being the largest.

The rapid industrial growth of Kentucky can be attributed to a number of favorable economics factors.[11] The most important factors are summarized as follows:

1. An adequate supply of industrial workers which are easily trained.

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[9] Ibid., p. 35.

[10] Compton's, op. cit., p. 26.

[11] Moreland, op. cit., p. 18.

2. A well-balanced and developed transportation system which places approximately 50 per cent of the United States' industrial and consumer markets within a few hours travel from Kentucky.
3. Kentucky is located in the center of several large industrial states.
4. Financial assistance is available for industrial development with reasonable construction costs and an adequate supply of industrial sites.
5. Cities exist of desirable size as 45.5 per cent of the population is located in urban areas.
6. The tax system of Kentucky parallels the tax distribution of the United States and compares favorably with other states.

With the above factors in mind and with the plastics industry on the national scene growing more rapidly than manufacturing, it seems that the plastics industry will grow at a tremendous speed.

Plastics production in the Commonwealth of Kentucky is very small in volume. It contains less than 3 per cent of the firms in the nation that are currently producing plastics. The very fact that the plastics industry is so small makes its classification very difficult. The plastics companies sizes range from one person employed to several thousand employees. Companies that are considered to be pure plastics processors are mostly moderately small companies in size. The larger firms included in the sample are manufacturers with large amounts of plastics being used in their manufacturing processes. In many cases, these manufacturing firms are not included within the scope of the plastics industry. For the purposes of

this study which are concerned with the need for and education of persons to be employed in the plastics industry, it was deemed necessary to include all companies that utilize plastic in any of their manufacturing or assembly processes.

As previously stated in the preceding paragraph, many plastics users are placed in another classification of industry because their end products may be a typewriter, plastic sign or some other item that is composed of different types of materials and not entirely composed of plastic. Because of this mixing of plastic manufacture and use among the advertising, chemical, manufacturing, machine tool, synthetic rubber and textile industries, it was felt that the study of only the companies producing entirely plastic products would not reflect the whole scope of the total industries' needs.

As a result of this complex and inter-mingled industrial system within Kentucky, the researcher attempted to identify firms that were using plastics in their manufacturing processes. In many cases, it was an extremely difficult task to determine to what extent the companies were using plastics. For the purposes of conducting this study with as nearly normal sample as possible and with a sample that truly reflects the total personnel needs of the whole industry, the sample was made up of all companies whose end products were composed of all plastic, part plastic or the raw chemicals for making plastics in

the hope that no company with employees needing training for the processing or production of plastics would be left out. With such a population, it was realized that some companies do not consider themselves plastics producers but some other type of firm. With this consideration in mind, the industry was defined on the first page of the questionnaire (see Appendix D) as to what companies were included in the population.

Education in Kentucky is well developed with 394,000 students enrolled in 4,200 schools. Included in these schools are thirty-nine institutions of higher education, fourteen area vocational schools, 552 secondary schools, and 3,529 elementary schools. The institutions of higher education are composed of one state university, The University of Kentucky, one municipal university, The University of Louisville, four regional universities,[12] numerous state and private colleges, with a number of junior colleges. The state's expansion of junior colleges could make readily available pre-trained industrial personnel at the semi-professional and technical level.

The well-developed system of transportation and education with an adequate supply of natural resources, labor and building sites make Kentucky the ideal state for an emerging industry such as

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[12] Compton's, op. cit., p. 30.

plastics to expand. The advantages previously stated and the fact that the plastics industry is not well developed within the state at this time make the region ideally suited to conduct a survey of the plastics industry. Kentucky, bordering Ohio, the nation's largest producer[13] of plastics, leads the writer to believe that expansion of Ohio's plastics industry could conceivably take place in Kentucky. Based upon the above comments, Kentucky was selected as the region in which to conduct this study.

Procedures for Collection of Data

Data was collected through instrumentation of a total of the identifiable plastics industry in Kentucky. Because of the relatively small number of industries classified as plastics users, it was deemed feasible to use the total population in the sampling techniques. As a result of using the total identifiable population, a total of 136 companies were submitted to the data collection procedures. Five of these companies were contacted through personal interviews by the writer, while 131 were asked to present essential data through the use of a questionnaire.

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[13]Woytinsky, Emma S., Profile of the U.S. Economy - A Survey of Growth and Change (New York: Frederick A. Prager, 1967), p. 320.

An initial review of two instruments used in studies dealing with the plastics industry and a variety of instruments used in similar studies were used in an attempt to gain an insight into the construction of the instrument. In addition to reviewing these instruments, the writer reviewed the sections dealing with instrument construction in two books on educational research by Good. With information gained from other studies and Good's books, an attempt was made to construct the instrument so that it would require a minimum amount of effort by the respondent with a minimum of time required in responding.

To secure the needed data, the writer developed a two part questionnaire. Part I of the questionnaire was designed to gather data about company growth, employment trends and educational needs. The second part was designed to gather data concerning the current and future use of equipment and materials with indications of what types of support educational institutions might expect to receive from the industry. (See Appendix C)

Realizing the value of the respondent's time, the writer designed Part I of the questionnaire to require only check marks or numerical responses on all questions except one. All inquiries on the questionnaire were designed to ask only for data which the writer believed to be readily available to the respondent. The format was arranged to

give both the respondent and the writer ease when handling this section of the questionnaire.

Due to the variety and type of information desired, the second part of the questionnaire required more demanding and time consuming answers. However, every question was investigated to determine the method the required data could be obtained in the quickest and least demanding manner. Upon final evaluation, the writer decided that the most useful data could be obtained by requesting the respondent to reply to questions about equipment and materials with one or two word answers and with a simple yes or no answer regarding the type of support their companies would be willing to give.

For ease of reading, the questionnaire was printed in such a manner that the questions and spaces provided for answers would guide the respondent through the material. A test of the layout was made by the writer prior to the pilot study by presenting the questionnaire to people unfamiliar with it and asking them to read it. After this test of design and layout, it was found that by rearranging and reconstructing some of the questions, a tightly connected questionnaire was developed.

The identification of the sample was completed by the use of two main references: (1) 1968 Kentucky Directory of Manufacturers

and (2) publications prepared by the various Chambers of Commerce of the respective cities and counties in the Commonwealth of Kentucky in 1967. Identification of the industry was made by comparing the finished products of the companies to the definition of the plastics industry as stated in the Definition of Terms section of Chapter I of this thesis. This very broad and general identification of the population gave the writer a wide variety of different sizes of companies as well as types.

Realizing that the size and type of the industry could be reflected in the data, the writer attempted to handle this variance by stratifying the population. The stratification of the population was made on an a priori basis. Stratification of the population by its manufactured product was the first proposed division. Further stratification was made on the basis of the number of employees in each industry grouped together by their manufactured product. A listing of the stratified companies may be reviewed in Appendix A.

A pilot study was performed to test the appropriateness of the data collection system. The writer tested the instrument by conducting a personal interview with five companies drawn at random from the original total population. The questionnaire was edited and procedures modified in accordance with the findings of interviews. The instrument was then utilized in accordance with the design of this study.

In order to obtain an unbiased sample of five companies for the pilot study, a random selection was made from the 136 companies. The total population was arranged in alphabetical order with consecutive numbers assigned to each of the cards. A table of random numbers was used to select the first five numbers in which the last three digits were between one and 136. The five companies contacted in the pilot study are listed in Appendix B.

After the selection of the five companies was completed, the writer made personal interviews with the personnel managers of each of these companies. The personnel manager was chosen for the interview because of the interest this type of person must have in securing qualified personnel for his company. With such an interest, it was believed that the personnel manager would be more likely to grant an interview than would some other member of the firm. In addition, the personnel manager would be in the best position to give meaningful direction to the writer at this stage of development.

In order to give the personnel manager some direction as to what was expected of him and to help the interviewer be more consistent, six guideline statements were made and are listed as follows:

1. Please review this questionnaire just as if you were receiving it through the mail.
2. Please raise any questions or concerns that you as the respondent may have concerning any item or section of the questionnaire.

3. After reviewing and discussing the various questions involved, who would you suggest I address this questionnaire to in order to receive the most factual and complete set of data with a minimum amount of effort on the respondent's part?
4. In your opinion, does the questionnaire appear to be too lengthy at first glance after reviewing?
5. Could you accurately estimate the approximate time required for you to complete this questionnaire?
6. Do you have any further comments or suggestions concerning any questions or parts of the questionnaire?

Upon completion of the pilot study, it was found that there were several problem areas in the instrument. It was also discovered that there needed to be some additional questions placed on the questionnaire as well as the removal of others. Some of the recommendations were as follows:

1. Include a general information section that allows companies not sufficiently involved in the use of plastics to indicate so without requiring a large amount of time filling in the questionnaire with invalid data.
2. A second recommendation was that the plastics industry be defined as to the type of companies that should be included within the scope of the study.
3. All of the personnel managers suggested that the questionnaire be directed to either the general manager or the plant manager.
4. Three out of the five personnel managers interviewed indicated that the questionnaire appeared too long at first glance but that it would not require too much time for completion. They suggested that the writer present the questions in such a manner so that it appeared less lengthy.
5. Some terms in the questionnaire raised a degree of concern to the personnel managers, and they suggested that the writer either use different terms or that definitions be provided for the ones being used.

6. A further recommendation was that additional classfications be added to several of the questions.
7. After discussing several items of the questionnaire, it was concluded that some questions would be difficult for the respondent to answer and if answered they would be of little value to the study. As a result of this recommendation, several questions were omitted from the final questionnaire.
8. Most of the personnel managers suggested that it might be of value for the writer to set a definite date for the return of the questionnaire rather than ask it be returned within two weeks.
9. It was estimated that it would require between ten to twenty minutes to complete the questionnaire, and it was suggested that a statement be included in the cover letter estimating this time requirement.

Upon completion of the pilot study and the evaluation of the recommendations made by the five personnel managers interviewed, the researcher attempted to reconstruct the instrument. The first major change made was to include a general information section with a statement that defined the types of companies who should complete the entire questionnaire and a place for the non-plastic users to check without completing Parts II and III of the questionnaire. This section on general information was included so that companies who were not in position to complete the questionnaire would not write in information which was unuseable in the study. A second major change was the omission of several questions that were revealed to be of little value to the study and the changing of some of the unclear terms used in order to make the questionnaire more

understandable by the industry. The instrument was addressed to the plant manager or general manager with appropriate statements made in the cover letter (see Appendix D) as to the time it was estimated to take for completion of the questionnaire and a definite date was set for its return. The last alteration of the instrument was in its layout and design in an attempt to give it an effect of being much less involved and lengthy. This change was made by printing a single large sheet of paper on both sides and then folding it to form a booklet which gave a first impression of being much smaller by having fewer sheets of paper. This questionnaire may be reviewed in Appendix D.

After final evaluation of the pilot study and proper revisions were made in the questionnaire, the questionnaire was printed and mailed with an appropriate cover letter to the 131 companies listed in Appendix A. In order to require a minimum amount of effort on the part of the respondent, a self-addressed stamped envelope was enclosed. The questionnaire was mailed on the nineteenth day of February, 1969, and the writer requested that it be placed in the return mail no later than the twenty-eighth day of February, 1969. On the third day of March, 1969, a follow-up letter (see Appendix E) was mailed with the enclosures of a second instrument and a self-addressed stamped envelope. It was requested in this follow-up letter that all returns be placed in the return mail no later than the thirteenth day

of March, 1969. A deadline of the twenty-sixth day of March was set for all returns to be returned to the writer to be included in the results of this study. The follow-up letter may be reviewed in Appendix E.

Non-parametric statistics will be used to analyze the data compiled in this study. Non-parametric statistics were chosen instead of parametric statistics for the following reasons: (1) lack of sophistication in statistics on the part of the writer; (2) the use of a small population which cannot be assumed to have a normal distribution and (3) classificatory data can be treated well with non-parametric statistics.

CHAPTER III

ANALYSIS OF DATA

This chapter includes an evaluation of the response to the questionnaire, the testing of hypothesis based upon data collected and a general discussion of findings. In the evaluation of the response, the percentage of the return is recorded with some general information concerning procedures. In testing the hypothesis, the general hypotheses are stated with the sub-hypotheses placed in order and the results of the tests are stated after each. A general discussion of the data is made at the end of the chapter without drawing any inferences or conclusions.

Evaluation of Response to Questionnaire

On the nineteenth day of February, 1969, the writer mailed the questionnaire and an appropriate cover letter (see Appendix D) to 131 companies within the borders of the Commonwealth of Kentucky. A date was set for the questionnaire to be placed in the return mail by the twenty-eighth day of February, 1969. At this time, approximately 42 per cent of the questionnaires were returned to the researcher with various percentages of them completed.

After a brief initial review of the returned questionnaires, it was deemed necessary to initiate a follow-up letter on the third day of March, 1969. This follow-up letter is included in Appendix E. Enclosed with the follow-up letter was a self-addressed, stamped envelope and a second questionnaire for the convenience of the respondent in the event that he had misplaced the first. In the second mailing, the respondent was requested to place the completed questionnaire in the return mail no later than the thirteenth day of March, 1969.

A date of the twenty-sixth day of March, 1969, was set for the questionnaires to be received by the writer so that they would be included within the results of the study. By the twenty-sixth day of March, 1969, there were a total of eighty-five questionnaires or approximately 65 per cent of the sample returned to the writer. Of this 65 per cent return, approximately 15 per cent of the total sample presented the writer with usable data. Several of the companies returning incomplete questionnaires stated reasons as to why they were not fully completing the questionnaire. Some quotes from these responses are presented in Appendix F.

Of the total companies returning either completed or incomplete questionnaires, twelve, or approximately 11 per cent, requested that a summary of the results of this study be sent to them. These twelve

firms were represented by firms responding with usable data and those just returning their questionnaires.

Due to the small per cent of response obtained from the questionnaire, the writer will represent the data of the study as it applies to the total sample rather than according to the stratification previously described as a part of the design of this study. Based upon the results of the tabulation of the data compiled from the questionnaire, it was discovered that the number of responses in each of the individual strata were so small that no meaningful test could be made or conclusions drawn. Since no statistical tests of a significant level could be run on the individual strata, the writer is optimistic that by using the total sample as a whole the trends and needs of the total plastics industry can be determined without making inferences or drawing conclusions from each individual stratification.

Hypothesis Testing

Non-parametric statistics were used to test the hypothesis. In order to properly test the general hypotheses, sub-hypotheses were formed on which one of two non-parametric statistical tests were run to determine if there was a significant difference in the frequency of the data. Two types of data, ordinal and nominal, were compiled by the questionnaire (see Appendix D). The ordinal or classificatory

data was tested by using the "Chi square" (x^2) one sample test. The second type of data, nominal, was tested with the Binominal (P_x) two tailed test. All tests were computed using a significant (α) level of 0.05.

In the following report, each hypothesis was tested and then either accepted or rejected. The general hypothesis is stated at the beginning of each section with sub-hypothesis following where applications were surveyed in the questionnaire and the resulting data collected. Each general hypothesis is rejected or accepted as determined by statistical tests along with a general discussion of the results.

Test of General Hypothesis One

HYPOTHESIS 1: The educational institutions in Kentucky are currently fulfilling the educational requirements for people employed in and people entering employment in the plastics industry.

Hypothesis 1.1 - There is no significant degree of difference in the difficulty of employing a person as a supervisor, engineer, technician, skilled laborer, semiskilled laborer, unskilled laborer and in other undefined positions for service in the plastics industry. See Table 3 - A for the complete analysis.

Hypothesis 1.11 - Comparison of job classifications as to the most difficult to obtain people for employment in the plastics industry. An x^2 of 14.2 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there was a significant difference in frequencies with the skilled laborers, engineers and technicians being the most difficult to employ.

Hypothesis 1.12 - Comparison of job classifications as to the ones considered as average in the difficulty of employing people for service in the plastics industry. An x^2 of 6.5 was obtained. The null hypothesis was accepted.

Hypothesis 1.13 - Comparison of job classifications as to the least difficult to obtain people for employment in the plastics industry. An x^2 of 26.0 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there was a significant difference in frequencies with the unskilled and semiskilled laborers being the least difficult to employ.

Hypothesis 1.2 - There is no significant degree of difference as to what percentage of the plastics employees come from outside the plastics industry, within the company, other plastics pro-

cessors, customers, high schools, trade and technical schools, colleges or universities and other sources. See Table 3 - B for complete analysis.

Hypothesis 1.21 - Comparison of the class 0 to 24 per cent of the total plastic industry's foremen, supervisors, and "middle management" employees as to the sources they were employed. An x^2 of 8.2 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there was a significant difference in frequency with the most frequent personnel sources being the customers and other plastics processors.

Hypothesis 1.22 - Comparison of the class 25 to 49 per cent of the total plastic industry's foremen, supervisors, and "middle management" employees as to the source they were employed. An x^2 of 5.3 was obtained. The null hypothesis was accepted.

Hypothesis 1.23 - Comparison of the class 50 to 74 per cent of the total plastic industry's foremen, supervisors, and "middle management" employees as to the source they were employed. An x^2 of 13.4 was obtained. The null hypothesis was rejected and the alternate hypothesis accepted that there was a significant difference in

frequency with the most frequent personnel sources being from within the company in this class.

Hypothesis 1.24 - Comparison of the class 75 to 100 per cent of the total plastic industries' foremen, supervisors and "middle management" employees as to the source they were employed. An x^2 of 14.0 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there was a significant difference in frequency with the most frequent personnel sources being from within the company in this class.

The most difficult positions in which to obtain employees are: the supervisory, engineering, technical and other positions that require trained personnel. The above positions all require varying degrees of educational experience. Positions which require semi-skilled and unskilled laborers require very little, if any, education and were indicated as being the least difficult for which to obtain employees. A second factor in rejecting the null hypothesis is that the plastics industry in Kentucky is currently employing a very small number of their personnel from the public educational institutions. It was indicated that the largest frequency of companies were currently obtaining 0 to 24 per cent of their supervisory personnel from other plastics processors and customers. For the 25 to 49 per cent class,

there were no significant differences between sources of employment. The largest frequency of companies in the classes of 50 to 74 per cent and 75 to 100 per cent report that they are currently obtaining their supervisory personnel from upgrading their own employees. The first general hypothesis must be rejected. The alternate hypothesis must be accepted that the educational institutions in Kentucky are not currently fulfilling the educational needs of personnel entering and people employed in the plastics industry.

Test of General Hypothesis Two

HYPOTHESIS 2: The educational institutions in Kentucky will continue to fulfill the educational requirements for people employed in and entering employment in the plastics industry.

Hypothesis 2.1 - There is no preference as to what level of educational attainment personnel employed in and entering employment in the positions of supervisor, engineer, technician, skilled laborer, semiskilled laborer and unskilled laborer in the plastics industry. See Table 3 - C for complete analysis.

Hypothesis 2.11 - Comparison of job classifications which require from an eighth grade to a high school education. An x^2 of 15.2 was obtained. The null hypothesis is rejected and the alternate hypothesis was

accepted that there is a significant difference in frequency with the unskilled laborer receiving the most frequent responses.

Hypothesis 2.12 - Comparison of job classifications which require from a high school to a trade school education. An x^2 of 35.4 was obtained. The null hypothesis is rejected and the alternate hypothesis was accepted that there is a significant difference in frequency with the semiskilled and unskilled laborers receiving the most frequent responses.

Hypothesis 2.13 - Comparison of job classifications which require from a trade school education to a two year community college education. An x^2 of 30.5 was obtained. The null hypothesis is rejected and the alternate hypothesis is accepted that there is a significant difference in frequency with the skilled laborers receiving the most frequent responses.

Hypothesis 2.14 - Comparison of job classifications which require from a two year community college education to a four year college or university education. An x^2 of 30.5 was obtained. The null hypothesis is rejected and the alternate hypothesis is accepted that

there is a significant difference in frequency with the technicians and supervisors receiving the most frequent responses.

Hypothesis 2.15 - Comparison of job classifications which require from a four year college or university education or high educational levels. An x^2 of 37.0 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there is a significant difference in frequency with the engineer and supervisor receiving the most frequent responses.

Hypothesis 2.2 - There are currently a number of educational institutions in Kentucky offering well developed programs in plastics technology. An P_x of 1.00 was obtained. The null hypothesis is rejected and the alternate hypothesis is accepted that there are no known plastics technology programs in the Commonwealth of Kentucky.

The industry indicated that unskilled laborers needed at least an eighth grade education; however, a high school education is preferred. The data indicates that the industry prefers that semiskilled employees have a high school education. Trade and technical schools were indicated to provide a preferred educational level for skilled laborers with the preference of an Associate Degree program or its

equivalent for technicians and frequently supervisors. It was clearly indicated that engineers should have a baccalaureate or higher degree of education and that a number of companies preferred their supervisors to also have a baccalaureate degree. There were no indicated plastics programs in the Commonwealth of Kentucky as the industry did not recognize any that were providing their employees with the educational opportunities needed. The industry indicated a preference for post secondary education for skilled laborers, technicians, engineers and supervisors. Since there is no indication of any educational programs in Kentucky to provide this post secondary education, the null hypothesis must be rejected and an alternate accepted. The alternate hypothesis is that the educational institutions of Kentucky will not continue to fulfill the educational requirements of plastics personnel in the future.

Test of General Hypothesis Three

HYPOTHESIS 3: People seeking employment in the plastics industry of Kentucky do not need pre-service technical education.

Hypothesis 3.1 - Future plastics personnel entering the plastics industry do not need pre-employment training at the high school, trade school, two year college and/or four year college or university level. See Table 3 - D for complete analysis.

Hypothesis 3.11 - Comparison of companies that prefer a minimum of a high school education to those who do not. An P_x of 0.059 was obtained. This value was not significant at the 0.05 level; therefore, the null hypothesis was accepted.

Hypothesis 3.12 - Comparison of companies that prefer a minimum of a two year community college education to those who do not. An P_x of 0.910 was obtained. This value is not significant at the 0.05 level; therefore, the null hypothesis was accepted.

Hypothesis 3.13 - Comparison of companies that prefer a minimum of a four year college or university education to those who do not. An P_x of 0.996 was obtained. This value is not significant at the 0.05 level; therefore, the null hypothesis was accepted.

Hypothesis 3.2 - There is no preference as to whether the curriculum of a plastics technology program be general, specialized or specialized in depth. See Tables 3 - E and 3 - F for complete analysis.

Hypothesis 3.21 - Comparison of the general course of studies to the specialized and specialized in depth courses of studies. An x^2 of 6.2 was obtained. The null hypothesis

was rejected and the alternate hypothesis was accepted that there was a significant difference in the frequency and that the most frequent response was the general course.

Hypothesis 3.22 - Comparison of the different courses which may be included as a part of a plastics technology program with a course offering of 1 to 6 hours. An x^2 of 10.0 was obtained. The null hypothesis was accepted.

Hypothesis 3.23 - Comparison of the different courses which may be included as a part of a plastics technology program with a course offering of 7 to 12 hours. An x^2 of 7.6 was obtained. The null hypothesis was accepted.

Hypothesis 3.24 - Comparison of the different courses which may be included as a part of a plastics technology program with a course offering of 13 or more hours. An x^2 of 21.0 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there is a difference in frequency, with more frequent responses indicating general education, mathematics and chemistry.

The General Hypothesis Three must be accepted as these tests do not indicate a need for pre-service technical education for personnel entering the plastics industry. All tests accepted the null hypothesis

except two; and by observation of frequencies, they indicated that a general educational program was what the plastics industry needed. Since general education programs are currently being offered in the public schools of Kentucky, there is no need for another type of educational program.

Test of General Hypothesis Four

HYPOTHESIS 4: People in employment in the plastics industry of Kentucky do not need in-service technical education.

Hypothesis 4.1 - The hypothesis series 4.1 was previously presented in the test of General Hypothesis One. This hypothesis 4.1 series uses the same data and same tests as the hypothesis series 1.2 starting on Page 44. This repetition of data testing is necessary to provide an adequate test for the General Hypothesis Four. There is no significant difference as to the source of plastics foremen, supervisors and "middle management" personnel. See Table 3 - B for complete analysis.

Hypothesis 4.11 - Comparison of the class 0 to 24 per cent of the total plastics foremen, supervisors and "middle management" to their source of employment. An x^2 of 8.2 was obtained. The null hypothesis was rejected and the alternate hypothesis accepted that there

was a significant difference in frequency. The most frequent responses were obtained from the other plastics processors and customers as sources for obtaining these employees.

Hypothesis 4.12 - Comparison of the class 25 to 49 per cent of the total plastics foremen, supervisors and "middle management" to their source of employment. An x^2 of 5.3 was obtained. The null hypothesis was accepted.

Hypothesis 4.13 - Comparison of the class 50 to 74 per cent of the total plastics foremen, supervisors and "middle management" to their source of employment. An x^2 of 13.4 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there was a significant difference in the frequency. The most frequent responses were obtained from within the company as the source for obtaining these employees.

Hypothesis 4.14 - Comparison of the class 75 to 100 per cent of the total plastics foremen, supervisors and "middle management" to their source of employment. An x^2 of 14.0 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that

there was a significant difference in the frequency. The most frequent responses were obtained from within the company as the source for obtaining these employees.

Hypothesis 4.2 - There is no significant difference between educational levels for the unskilled laborer, semiskilled laborer, skilled laborer, technician, engineer and supervisor. See Table 3 - G for complete analysis.

Hypothesis 4.21 - Comparison of educational levels for the unskilled laborer. An x^2 of 39.8 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there is a significant difference in the frequencies with the high school being the most frequent response.

Hypothesis 4.22 - Comparison of educational levels for the semiskilled laborer. An x^2 of 42.7 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there is a significant difference in the frequency with the high school being the most frequent response.

Hypothesis 4.23 - Comparison of educational levels for the skilled laborer. An x^2 of 17.6 was obtained. The null hypothesis was rejected and the alternate hypothesis

was accepted that there was a significant difference in the frequency with the high school and trade school being the most frequent responses.

Hypothesis 4.24 - Comparison of educational levels for the technician. An x^2 of 31.0 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there was a significant difference in the frequency with the two year college being the most frequent response.

Hypothesis 4.25 - Comparison of educational levels for the engineer. An x^2 of 43.0 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there was a significant difference in the frequency with the four year college being the most frequent response.

Hypothesis 4.26 - Comparison of educational levels for the supervisor. An x^2 of 14.7 was obtained. The null hypothesis was rejected and the alternate hypothesis accepted that there is a significant difference in the frequency with the two year college and the four year college or university receiving the most frequent responses.

The above tests show that the most frequent response indicates that 50 to 100 per cent of the people employed as foremen, supervisors and "middle management" in the plastics industry are obtained from within the company. These same tests indicate that in the most frequent responses unskilled and semiskilled personnel need a high school level education or less. Since these people most frequently come from within the company, there is an indication that these unskilled and semiskilled personnel need in-service technical education. Therefore, the null hypothesis is rejected and the alternate hypothesis is accepted that the employees in the plastics industry need in-service technical education.

Test of General Hypothesis Five

HYPOTHESIS 5: The plastics industry will not be willing to support pre-service technical education conducted by the public schools in the field of plastics.

Hypothesis 5.1 - The plastics industry will not be willing to donate any type of plastics materials to a public educational institution offering a plastics technology program. An P_x of 0.24 was obtained. The null hypothesis was accepted. See Table 3 - H for complete analysis.

Hypothesis 5.2 - The plastics industry will not be willing to donate or loan any type of plastics processing equipment to a

public educational institution offering a plastics technology program. An P_x of 0.04 was obtained. The null hypothesis was accepted. See Table 3 - H for complete analysis.

Hypothesis 5.3 - The plastics industry will not be willing to supply scholarships to students pursuing a plastics technology program. An P_x of 1.00 was obtained. The null hypothesis was accepted. See Table 3 - H for complete analysis.

Hypothesis 5.4 - The plastics industry will not be willing to loan money to students pursuing a plastics technology program. An P_x of 1.00 was obtained. The null hypothesis was accepted. See Table 3 - H for complete analysis.

Hypothesis 5.5 - The plastics industry will not be willing to participate in a cooperative work program with an educational institution offering a plastics technology program. An P_x of 0.06 was obtained. The null hypothesis was accepted. See Table 3 - H for complete analysis.

Hypothesis 5.6 - The plastics industry will not be willing to furnish members for an advisory committee to serve a plastics technology program. An P_x of 0.15 was obtained. The null hypothesis was accepted. See Table 3 - H for complete analysis.

Hypothesis 5.7 - The plastics industry will not be willing to employ students from a two year associate degree plastics

program. An P_x of 0.03 was obtained. The null hypothesis was accepted. See Table 3 - H for complete analysis.

In all tests made on the data, the null hypothesis was accepted. The null hypothesis must be accepted as indicated by the data.

Test of General Hypothesis Six

HYPOTHESIS 6: The plastics industry will not be willing to support in-service technical education conducted by the public schools in the field of plastics.

Based upon the results of the tests completed on the General Hypothesis Five, this hypothesis six can be rejected because these tests indicated that there was not a sufficient number of frequencies in the data to reject the hypothesis.

Test of General Hypothesis Seven

HYPOTHESIS 7: There is no need for public institutions at the post secondary level to implement a clock hour technical program in plastics.

Hypothesis 7.1 - The plastics industry has no preference to hire a person trained in plastics technology over a non-trained person. An P_x of 0.03 was obtained. The null hypothesis was accepted. See Table 3 - H for complete analysis.

Hypothesis 7.2 - The plastics industry has no preference as to the type of education that their future employees receive. An x^2 of 6.2 was obtained. The null hypothesis was rejected and the alternate hypothesis accepted with the most frequent responses indicating the need for a general education program. See Table 3 - E for complete analysis.

Hypothesis 7.3 - The plastics industry will not hire enough new supervisory employees in a twelve month period to justify a plastics technology program in Kentucky. See Table 3 - I for complete analysis.

Hypothesis 7.31 - Comparison of the number of employees hired in the last year according to job classfications. An x^2 of 180.0 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there was a significant difference in frequency and that skilled, semiskilled and unskilled laborers are the most frequent to be employed.

Hypothesis 7.32 - Comparison of the number of employees to be hired in the next twelve months according to job classifications. An x^2 of 167.0 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there is a significant difference in frequency

and the semiskilled and unskilled laborers were the most frequent to be employed.

Hypothesis 7.33 - Comparison of the number of employees to be hired in the next five years according to job classifications. An x^2 of 753.0 was obtained. The null hypothesis was rejected and the alternate hypothesis was accepted that there was a significant difference in frequency, and the semiskilled and unskilled laborers were the most frequent to be employed.

The acceptance of General Hypothesis Seven was based upon three results obtained from the data. The first test indicated that personnel entering the plastics industry currently need a general education. Secondly, there was no significant preference by the industry to hire people pre-trained as compared with untrained people. Lastly, the employment trends are to hire a greater number of unskilled and semiskilled employees. Even though ever increasing numbers of unskilled and semiskilled laborers are being employed, it is indicated that they need only a general education. While it was previously indicated that educational institutions were not currently fulfilling the industries' needs, it is assumed that provisions should be made which will provide a greater opportunity for general education. Therefore, no indication of special educational needs were shown so that the General Hypothesis Seven is accepted.

Test of General Hypothesis Eight

HYPOTHESIS 8: There is no need for Morehead State University or other institutions of higher education to implement an associate degree program of plastics technology.

Referring back to the test of General Hypothesis Seven which indicated no need for a new plastics technology program on the post secondary level, it can be assumed from this that there is no need for Morehead State University to implement a program thus the hypothesis is accepted.

GENERAL DISCUSSION OF INCIDENTAL DATA

Upon compiling the data, it was discovered that there were data collected that would not be used in the tests of the hypotheses. This data was gained by intent in some cases, but in many cases it was written in the margins or the section provided in the questionnaire for comments by the respondent. An attempt will be made in this section to present the parts of the data that are pertinent to this study.

Most of the data gained unintentionally was written by the respondent explaining the reasons for his not completing the questionnaire. The respondent presented his comments in many forms such as notes on the questionnaire, notes attached to the questionnaire, and in many cases, personal letters were written to the writer. Most of these incidental comments expressed the respondent's wishes of "good luck" and "I am sorry I cannot help you." Some quotes from these notes and letters are listed in Appendix F.

A total of twelve plastics operations were shown to be taking place in Kentucky. These operations are listed in order to frequency obtained: assembling of plastics products, chemical operations, mold manufacturing, injection molding, extrusion, reinforced plastics, thermoforming, blow molding, compression transfer, vacuum forming,

resinblending and pattern makers. As a result of these twelve operations, the companies included within the scope of this study are processing the following types of plastics: acrylic, polyvinyl chloride, polyethylene, A.B.S., styrenes, polyolerin, polypropyline, plastisal, polyesters, polyvinylidene flouride, polytetrafluorethylene, nylon, polystyrene and vutyrate. The utilization of so many processes and operations on such a broad range of plastic materials indicated that the industry of Kentucky is moving toward a greater utilization of plastics and the development of a larger plastics industry.

CHAPTER IV

SUMMARY AND CONCLUSIONS

In this fourth chapter, a brief overview of this study is presented to set the stage for the balance of the discussion. A brief summary of the study will be presented to help the reader relate previous material to this chapter. Including a general discussion of the results, the writer will present the conclusions drawn by the study. The last section of this chapter will make recommendations for further study as they were deemed necessary.

Restatement of Problem

The purpose of this study was to investigate the present, future and emerging educational requirements of personnel in the plastics industry in the Commonwealth of Kentucky. The data collected by a survey of the plastics industry enabled the writer to react appropriately to the four basic dimensions of this study. The first dimension was to determine to what extent the educational institutions of Kentucky are presently fulfilling the educational requirements of personnel in the plastics industry and if they will be able to adequately meet the educational requirements in the future. Secondly, this study was concerned with the relative need

for educational institutions, high schools, technical schools, and/or institutions of higher education to develop programs for personnel in the plastics industry. Thirdly, this study attempted, with data provided by industry, to determine the nature of pre-service and/or in-service training programs for personnel in the plastics industry. In addition, this study has attempted to determine the implications for Morehead State University as well as for the plastics industry to become involved in the pre-service and in-service development of personnel.

Summary

This study was a survey of the plastics industry within the Commonwealth of Kentucky in an attempt to reveal some of the answers to the questions implied in the problem. The sample of the survey was selected from two primary sources: the 1968 edition of the Kentucky Directory of Manufacturers published by the Kentucky Department of Commerce at Frankfort and a group of publications written by the various chambers of commerce within the state. (See Bibliography for list of publications.)

A test of the questionnaire was completed by running a pilot study. This pilot study was conducted by the writer through personal interviews of five randomly selected industries from the total sample.

The questionnaire was then mailed to 131 industries with an appropriate cover letter and a self-addressed, stamped envelope. A follow-up letter was sent to those companies not originally responding with the inclusion of a second questionnaire and a self-addressed, stamped envelope.

After an appropriate waiting period, the results were tabulated and appropriate tests were made of the hypothesis. The findings and conclusions of this study are presented in the following sections of this chapter.

Findings

Appropriate non-parametric statistical techniques were employed to analyze the data and test the research hypothesis. For all statistical tests, a significance of 0.05 was set. The writer is placing a further limitation on this study due to the fact that only 15 per cent of the sample supplied the researcher with usable data. Because of this small percentage of data, much of the analysis was found to be statistically not significant. In this section, an attempt will be made to present the findings of this study and make comparisons to the results of the nation-wide study conducted by the Society of

Plastics Engineers, Incorporated and the Society of the Plastics Industry, Incorporated.[1]

This study found that the plastics industry had the most difficulty employing people for the job classifications of skilled laborer, technician, engineer and supervisor. Unskilled and semi-skilled employees were in adequate supply and difficult to employ. Because of the apparent shortage of pre-trained plastics personnel, it can be assumed that there is some educational program missing in the state. In a comparison of this lack of trained personnel to the results of the nationwide study, it was found that the shortage not only existed in Kentucky but exists on a national scale. In regard to the shortage of trained personnel, the results of this study compare favorably with the results of the national study conducted by the SPE and SPI.

While trained personnel are scarce and difficult to employ, this researcher felt it necessary to investigate the sources of trained personnel for the plastics industry. Companies were asked to indicate the approximate per cent of their supervisory or "middle management" personnel that were obtained from several different sources. The

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[1]Robert J. Ullery, The Need for Plastics Education (New York: Society of Plastics Engineers, Incorporated, and the Society of the Plastics Industry, Incorporated, 1968), pp. 1-20.

responses were such that it was indicated that from 0 to 24 per cent of these people were employed from the companies' customers and competitive plastics processors. The most prominent source of obtaining foremen and "middle management" personnel was to upgrade or promote present employees from the unskilled ranks to fill the need for trained personnel. There was not a statistically significant indication that any company, large or small, employed any significant percentage of its plastics personnel from post high school educational institutions or institutions of higher education. The results of the national study agree favorably with the findings of this study in that it states that the largest single source of "middle management" personnel was from within the companies.

As the companies in Kentucky are currently upgrading their employees to fill the ranks of supervisory personnel, what are the educational requirements for a person to be qualified for this type of position?

A minimum of an eighth grade education was required for any type of work that required an unskilled laborer. The companies also indicated that a person with so little education would have trouble holding this job and little, if any, chance for advancement. Unskilled laborers were also indicated to require at least a high school education as was the semiskilled laborer. However, the fact remains that there

appears to be two requirements for the unskilled laborer. Approximately 50 per cent of the sample indicated an eighth grade educational requirement for unskilled laborers while the rest indicated a high school educational requirement. A requirement of a trade school education was set for skilled employees entering the industry. Technicians were required to have post high school technical training on the two year college level or equivalent. Both the two year and four year colleges were indicated as the level of educational requirement for supervisory personnel. A baccalaureate or higher degree was set as the educational requirement for engineers. While the educational requirements of plastics personnel were handled a little differently from that of the nation-wide study, a comparison may be made. This study indicated that approximately 50 per cent of the industry would employ a person with less than a high school education. The national study indicated that 81 per cent of the plastics industry required at least a high school education. The national study also indicated that 61 per cent of the companies required a four year college education for entrance into the plastics industry.

The plastics industry gave no indication that there were any plastics technology programs in the Commonwealth of Kentucky. However, there were two educational institutions listed (The Society of Plastic Engineers, Incorporated, the Miami Valley Section and the

Los Angeles Trade-Technical College, Los Angeles, California) as good examples of plastics technology programs for the institutions in Kentucky to study when developing their specialized plastics programs. Nationally, there are very few plastics training programs, and these are unable to fulfill the rapidly increasing educational needs of the plastics industry as was indicated by the results of the nation-wide study conducted by the SPE and SPI.

Upon the analysis of the data and tests of the hypotheses, there was no statistically significant preference as to whether the plastics industry preferred pre-service technical education for their employees over no pre-training in plastics. This result was in sharp contrast to the results of the national study. The nation-wide study indicated that the industry not only needed pre-trained employees but would pay them 10 to 20 per cent extra for their training. There appears to be an inconsistency in the data at this point. Referring back to the beginning of this section, the industry indicated a critical shortage of trained personnel on the national level. The previous paragraph shows that the industry is not willing to pay people pre-trained in an educational institution a higher starting salary than those with no such training. This appears to be inconsistent because the industry is suffering from a shortage of trained employees, but they apparently are not

willing to give extra compensation to a trained person over a non-trained person.

Since there is no indication of a preference for pre-employment technical training in plastics, what type and degree of education does the plastics industry need for its present, future and emerging personnel? Given a choice of three types of educational programs - general, specialized and specialized in depth, the plastics industry in Kentucky indicated that they preferred a general course of study as opposed to the specialized curriculum. Inconsistent with this study, the nation-wide study indicates a definite need for specialized training in the area of plastics, with the industry encouraging this type of training for employees by paying them an increased starting salary.

Attempting to further define the type of educational program that the employees entering the plastics industry need, the writer requested information concerning different courses that might be included in such a program along with an indication of the number of semester hours preferred in each course. The number of semester hours for each course was classified as those preferred to have 1 to 6 semester hours, 7 to 12 semester hours and 13 or more semester hours. There was no statistically significant preference as to the courses that required 1 to 6 or 7 to 12 semester hours. It was

indicated that there was a preference to have 13 or more semester hours of general education included in the program. This preference for thirteen or more semester hours of general education is consistent with the industry's choice of a general program of studies. The level of preference being non-significant in the two other classes may indicate a desire for a survey of many courses for a more general background.

Industry uses in-service educational programs as they are currently promoting their employees into the positions of foremen, supervisors and "middle management". This is shown as the industry is currently hiring people with a high school education or less and promoting them into positions which require a post high school education. It is assumed by the writer that this in-service education program is contained within the company without any formerly recognized credit being granted to the participants.

In addition to responses to educational requirements, the plastics industry was requested to indicate preferred educational levels for people employed at different positions within the industry. The preferred educational level was very similar to that of the required level. The only two differences were for the unskilled laborer and the supervisor. The trend was for a significant number of companies to require or prefer the unskilled laborer to have at

least a high school education. Supervisors are preferred to have a baccalaureate degree but are currently being employed with less formal education. The data suggested that there was a trend for increased amounts of education for all positions, but there was not a statistically significant amount of difference in responses to definitely make the inference.

The nation-wide study indicated that there were significant amounts of industrial support being given to plastics training programs with more support being promised if there were programs available to make use of it. This is in sharp contrast with the results of this study. It was indicated by the industry in this study that there could be no significant amounts of industrial support expected by institutions offering a plastics technology program. Several types of support were included within the survey. Inquiry was made as to the feasibility of the industry donating materials, loaning or donating equipment, supplying scholarships, loaning money to students, developing a cooperative work program with educational institutions and supplying members of an advisory committee. There also was an indication that the industry would prefer not to hire a trained person coming from a public plastics technology program.

The last dimension of this study was the need to implement a plastics technology program in the Commonwealth of Kentucky.

There was no encouragement given for the development of a plastics program designed to train people for employment in Kentucky's plastics industry. The implementation of such a move in the state was discouraged by the following facts: (1) no preference was given to hire people from a plastics technology program, (2) the industrial suggestion was that the training program they needed should be very general in nature, mostly general education and (3) the employment history and trends point to the fact that the majority of new employees will come from the ranks of the unskilled and semiskilled laborers. A brief summary of the results indicated by the statistical tests made on the eight general hypotheses of this study are as follows:

1. There is currently a shortage of supervisors, engineers and technicians in the plastics industry. Companies are upgrading their employees to fill this shortage.
2. Educational preferences are: for semiskilled and unskilled personnel to have a high school education, skilled personnel to have a trade school education, technicians and supervisors to have a two year community or junior college education and the engineer to have a baccalaureate degree. There were no indications of any educational programs in Kentucky designed only to serve the plastics industry.
3. Indications were that no pre-service education was needed except that of a general education.
4. With the upgrading of employees, it was indicated that they needed an in-service program that was oriented toward general education.
5. There was no indication of aid to a plastics technology program either in pre-service or in-service programs.
6. Industry indicated an indifference as to whether a training program should be set up as a service to them by any public institution.

Conclusions

Indications are that the educational institutions in Kentucky may not be currently fulfilling the educational needs of the plastics personnel. The apparent need for more educational opportunities in Kentucky indicates that there may be a need for the public schools of the state to survey what they are currently doing and what adjustments can be made to fulfill the requirements of the plastics industry. In the writer's opinion, there is an apparent need for an extension or modification of current educational curriculums or maybe specially designed curriculum used only to prepare future employees for the plastics industry. Due to the nature and the small amount of data received, this study is unable to define the adjustments of Kentucky's educational system, if any, that need to be made.

Future fulfillments of the educational requirements of the plastics industry were not readily made visible by this study. However, there appeared to be preference for a general education program that exposed the student to many areas of study. Apparently, the different companies felt that their employees needed varying amounts of science, mathematics, quality control, time and motion study, drafting and design, metal working and plastics and that the best possible curriculum would be a survey of all with a heavy emphasis on general

education. Again, this study is unable to make any definite suggestions as to what type of curriculum future employees entering the plastics industry will require.

With the level of significance received regarding the need for pre-service education, this study was unable to conclude to what extent it was necessary. The data indicated that a high school education was necessary for most positions but that no preferences or extra compensations would be offered to a person receiving post high school technical education. There was an indication that technicians and supervisors needed a post high school education but that it was currently being provided by the different companies. If this writer were asked to make a concluding statement, it would be to the effect that it appears that the plastics industry is currently providing for its employees' technical education, and that the industry indicates a preference to continue offering this training to its employees while they are on the job.

As the advancement of unskilled employees continues, so must the in-service educational system. The preference of the industry seems to be that it provides the education for the required job skills with the public institutions of education providing the necessary general education. If this is truly the preference of the industry, then the present educational system needs only be modified and

extended to the point that it meets the educational needs of the plastics industry.

With the current indifference shown by the plastics industry about the offering of technological training in plastics, it is not surprising that they will not support such a program. The industry surveyed in this study indicated that there was not a significant number of companies indicating that they would supply any type of support. However, there were slight trends shown, but insignificant in number, to suggest that if the right approach were made some industrial support could be gained. This support would be in the form of aged, scrap or used materials.

There was almost no data gained in this study that would indicate the direct and urgent need for the implementation of any type of specialized plastics technology program. There was an indication that a generally oriented program offering basic courses of study in the fields of mathematics, physics, chemistry and industrial education with a heavy emphasis on general education subjects was needed.

This researcher cannot recommend that the public institutions of education in the Commonwealth of Kentucky implement a plastics technology educational program. This recommendation is based on the following facts:

1. There is no clearly defined need for such a program other than the shortage of trained personnel.
2. There is no open proclamation by the plastics industry that they desire such a program.
3. There is no clear indication of what the objectives of such a program would be other than to provide a general education curriculum.
4. There is no indication that the industry would support such a program if it were offered.
5. The plastics industry has indicated that it would not prefer to hire a graduate of a plastics technology program if he were available.

Recommendations for Future Study

The results of this study suggest that further study of the plastics industry should be completed. It is further recommended that additional research be considered as a group of sub-problems. There appears to be a need for further study in the following areas: (1) a complete identification of the plastics industry, (2) identification of the trends within the plastics industry, (3) identification of the job classifications within the plastics industry, (4) identification of the job requirements within the plastics industry, (5) identification of on-the-job training programs within the plastics industry, (6) an identification and study of plastics technology or training programs currently being offered and (7) the identification of the resources that the plastics industry would make available to public education.

One of the problems of this study was the percentage of usable data returned. One reason for this low percentage may have stemmed

from the classification and identification of the industry. The identification was shown to be incomplete because of the small percentage of responding companies that indicated other companies processing plastics that were not included in this study. The first recommendation of this study is that further study be undertaken in an attempt to clearly identify the plastics industry.

After the identification of the plastics industry is completed, a second study should be completed. This second study should show the significance of the plastics industry in Kentucky. Along with showing the current significance of the industry, a future study should show the growth trends. A projected growth rate should be made along with the projected economic value the industry will have in Kentucky.

A third study should be conducted to identify the various job classifications of personnel in the plastics industry. This identification of job classifications is important because it is hard to survey job requirements without first knowing what positions are being utilized. There are currently a number of jobs being performed in the plastics industry that are classified according to outdated standards. With the identification of the different jobs in the plastics industry, a study needs to be made on the requirements for these jobs.

The identification of job requirements is of primary concern to the educator. Only after a job is completely analyzed in terms of the requirements demanded of the person filling it can an educational program be established to train people to perform the task. In many cases there will be hidden job requirements which will require extensive study and research to fully discover and understand their implications for an educational program.

For the purposes of realizing what is being done by the industry and what still needs to be implemented, a study and identification of on-the-job training programs may then provide the public schools of Kentucky with the needed data to conduct a plastics technology program. With a clear picture of what is happening from within the plastics industry, the future researcher will more readily be able to conduct meaningful research in this area.

A second study should be made of plastics training programs that are located outside the industry. With a comparison of the trends in the industry to on-the-job training programs to the plastics programs offered outside the industry, a recommendation may be made of the objectives that should be set. Upon the forming of a set of objectives for a project, many paths may be set up to reach the result of a pre-trained person in the field of plastics.

The last recommendation for further study would be the surveying of industrial resources. With a number of other studies completed on the plastics industry, a person would be in the position to conduct a survey identifying the resources. With the identification of the resources made, the people in post secondary education can then make decisions as to how these resources might be readily used. An educator with the knowledge that there is a resource and that this resource is available in industry will then make the connections to obtain it for his program.

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APPENDIXES

APPENDIX A

LISTINGS OF COMPANIES SURVEYED

ADVERTISERS UTILIZING PLASTIC MATERIALS

Companies Employing 1-10 Men

A & B Signs Company
858 South Main Street
Madisonville, Kentucky

Beason Screen Process
Printing Company
224 South Seventh Street
Louisville, Kentucky

Deckel & Moneypenny
1420 South Preston Street
Louisville, Kentucky

Displays Unlimited
1180 Industrial Boulevard
Louisville, Kentucky

Dixie Sign Company,
Incorporated
1032 Prospect Street
Covington, Kentucky

G. A. Rinehart
415 South Third Street
Louisville, Kentucky

Greer Neon Company
109 South Tenth Street
Mayfield, Kentucky

Hopkinsville Sign Company
Hilltop Drive
Hopkinsville, Kentucky

Jim Ramsey
150 Jefferson Street
Lexington, Kentucky

Knox Engravers Incorporated
816 Wilson Road
Radcliff, Kentucky

Koehler Stamp & Stationary
Company, Incorporated
402 West Main Street
Louisville, Kentucky

Ludlow Display & Manufacturing
Company
233 Court Street
Covington, Kentucky

Moore Signs, Incorporated
241 East Fourth Street
London, Kentucky

Moss Company, Incorporated
606 West Main Street
Lexington, Kentucky

National Name Plate Company
3307 Camp Ground Road
Louisville, Kentucky

Ohio Valley Neon, Incorporated
401 West Tenth Street
Owensboro, Kentucky

Pabst-Rice Sign Company
934 Orchard Street
Newport, Kentucky

Progress Sign & Advertising
Company
420½ West Liberty
Louisville, Kentucky

Companies Employing 11-50 Men

Alwes Outdoor Advertising Company
150 Lexington Road
Louisville, Kentucky

Federal Sign & Signal Corporation
648 Bizzell Road
Lexington, Kentucky

Kindwell Screen Products Incorporated
234 Scott Street
Covington, Kentucky

Louisville Composition Products Company
976 Swan Street
Louisville, Kentucky

Louisville Fence Company
301 East Ottawa Avenue
Louisville, Kentucky

Myers-Thompson Displays, Incorporated
316-18 West Main Street
Louisville, Kentucky

Nelson B. Boone Company, Incorporated
815 West Market Street
Louisville, Kentucky

Neon Art Signs, Incorporated
1222 West Main Street
Louisville, Kentucky

Neon Fluorscent Engineering Company
Finn Street
Franklin, Kentucky

Paul M. Fischer Sign Company, Incorporated
1612 Mellwood Avenue
Louisville, Kentucky

Ruggles Sign Company
263 East Main Street
Lexington, Kentucky

Spotswood Specialty Company, Incorporated
218-228 Jefferson Street
Lexington, Kentucky

Sullivan Screen Print Company, Incorporated
3808 Fitzgerald Road
Louisville, Kentucky

Turner Advertising Incorporated
515 Pike Street
Covington, Kentucky

William J. Rueff Signs, Incorporated
4521 Popular Level Road
Louisville, Kentucky

Companies Employing 51-250 Men

American Sign Industries Incorporated
42 Industrial Road
Florence, Kentucky

J. V. Reed & Company
1102 West Main Street
Louisville, Kentucky

The Donaldson Art Sign
Company, Incorporated
2125 Donaldson Avenue
Covington, Kentucky

CHEMICAL COMPANIES PROCESSING PLASTICS OR RAW

MATERIALS FOR THE MANUFACTURE OF PLASTIC

Companies Employing 51-250 Men

Dewey & Almy Chemical
Division
Owensboro, Kentucky

Dow Corning Corporation
Carrollton, Kentucky

Hooker Chemical Company
Durez Plastic Division
Post Office Box 33
South Shore, Kentucky

Companies Employing 251-1250 Men

B. F. Goodrich
Chemical Company
Post Office Box 611
Calvert City, Kentucky

Gulf Oil Corporation
Chemicals Department
Post Office Drawer 3
Henderson, Kentucky[1]

Pennsalt Chemicals
Corporation
Calvert City, Kentucky[2]

Companies Employing 1251-6250 Men

E. I. Dupont D. E.
Nemours & Company
Camp Ground Road
Louisville, Kentucky[3]

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[1]1968 Kentucky Directory of Manufacturers, Kentucky Department of Commerce, Washington & Wapping Streets, Frankfort, Kentucky, pp. 131-233.

[2]"Calvert City," Industrial Resources, Kentucky Department of Commerce, Frankfort, Kentucky, p. 12.

[3]1968 Kentucky Directory of Manufacturers, loc. cit.

MANUFACTURERS UTILIZING PLASTIC

Companies Employing 1-10 Men

Covington Plating Works,
Incorporated
330 Pike Street
Covington, Kentucky

Kentucky Cabinet & Sink
Top Company
318 Fairfield Avenue
Bellevue, Kentucky

Kentucky Molded Boats,
Incorporated
Main Street
Burgin, Kentucky

Tappin Company
Route 2
Murray, Kentucky

Steele Plastics Company
445 Winchester Avenue
Ashland, Kentucky

Companies Employing 11-50 Men

Allied Lead Construction
Company, Incorporated
Covington, Kentucky

Esso Ramtite Company
South Shore, Kentucky

Harper Furniture
534 West 12th Street
Newport, Kentucky

Kitchen Planning Center
Incorporated
316 North Ashland
Lexington, Kentucky

Mathis Cabinets
Incorporated
3306-08 Linde Lane
Louisville, Kentucky

Sizimore Manufacturing
Company
Box 152
Walton, Kentucky

Southern Tent & Awning
Company
539 East Third Street
Lexington, Kentucky

Star Tool & Die Company,
Incorporated
899 Manchester Street
Lexington, Kentucky

Companies Employing 51-250 Men

Coated Metallic Products
Company
Gasen Road
Beaver Dam, Kentucky

Kitchen Mart Incorporated
4520 Louisville Avenue
Louisville, Kentucky

Companies Employing 251-1250 Men

American Printing
H. S. E. for Blind
1839 Frankfort Avenue
Louisville, Kentucky

C. T. S. of Paducah,
Incorporated
1500 North Eighth Street
Paducah, Kentucky

Irving Air Chute Company,
Incorporated
Post Office Box 989
Lexington, Kentucky

Companies Employing 1251-6250 Men

International Business
Machines
Northern Beltline Highway
Lexington, Kentucky[4]

MISCELLANEOUS COMPANIES UTILIZING PLASTIC

Companies Employing 1-10 Men

Ace Seat Covers Company
1922 Alexandria Park
Newport, Kentucky

Auto Seat Cover Company
647 South 22nd Street
Louisville, Kentucky

Covington Cabinet Company
Box 503 P. Madison Park
Soft Mitchell, Kentucky

Darling Printing Company
414 Greary Court
Owensboro, Kentucky

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[4]Ibid.

E. H. Roederer Book Binding
117 North Fourth Street
Louisville, Kentucky

Henderson Trim Shop
907 North Green Street
Henderson, Kentucky[5]

Kelley's Trim Shop
2445 Madison
Covington, Kentucky[6]

Southern Fabricators, Incorporated
1418 High Avenue
Louisville, Kentucky

Urban Industries Incorporated of Kentucky
4708 Pinewood Road
Louisville, Kentucky[7]

Weber Dental Laboratory
33½ East 7th Street
Newport, Kentucky[8]

Companies Employing 11-50 Men

DeHart Paint & Varnish Company
906 East Main Street
Louisville, Kentucky

Kent Records, Incorporated
Saint John Road
Elizabethtown, Kentucky

McCammish-Glasscock, Incorporated
Lexington Road
Winchester, Kentucky

The J. W. Ford Company
2100 South Floyd Street
Louisville, Kentucky

Vinyl Specialty Manufacturing Company
815 West Market Street
Louisville, Kentucky

Companies Employing 51-250 Men

Cabot Piping System
30th & Magazine Street
Louisville, Kentucky

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[5]1968 Kentucky Directory of Manufacturers, loc. cit.

[6]"Kenton & Boone Counties," Industrial Resources, Kentucky Department of Commerce, Frankfort, Kentucky, p. 10.

[7]1968 Kentucky Directory of Manufacturers, loc. cit.

[8]"Campbell County," Industrial Resources, Kentucky Department of Commerce, Frankfort, Kentucky.

MACHINE TOOL MANUFACTURERS PRODUCING PLASTIC MACHINERY

Companies Employing 1-10 Men

Cohorn Tool Shop
Henderson, Kentucky[9]

Louisville Pattern &
Engineering Company
3012 Duncan
Louisville, Kentucky

Robinson Industries
Veechdale Road
Shelbyville, Kentucky

Weist Industries,
Incorporated
1860 Arlington Avenue
Louisville, Kentucky

Companies Employing 11-50 Men

Robin Machine Products,
Incorporated
1554 Eastern Avenue
Covington, Kentucky

PURE PLASTIC PROCESSORS

Companies Employing 1-10 Men

American Aniline &
Extract Company
Calvert City, Kentucky

Mannsville Plastic,
Incorporated
1812 Heaton Road
Louisville, Kentucky[10]

Phillips Products
Corporation
Hopkinsville, Kentucky[11]

Plastic Laminators
Incorporated
3730 Bishop Lane
Louisville, Kentucky

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[9]"Henderson, Kentucky," Industrial Resources, Kentucky Department of Commerce, Frankfort, Kentucky, p. 9.

[10]1968 Kentucky Directory of Manufacturers, loc. cit.

[11]"Hopkinsville, Kentucky," Industrial Resources, Kentucky Department of Commerce, Frankfort, Kentucky, p. 10.

Reccuis Boats
Incorporated
123 North Thirty-Nineth Street
Louisville, Kentucky

Companies Employing 11-50 Men

Cormans Incorporated
881 Floyd Drive
Lexington, Kentucky

General Rubber & Supply
Company
3118 South Preston Highway
Louisville, Kentucky

Hydro Plastic Company
Georgetown, Kentucky

Jones Plastic &
Engineering Corporation
10301 Taylorsville Road
Jeffersontown, Kentucky

Kentucky Thermo-Plastics
Saint John Road
Elizabethtown, Kentucky

Nupak, Incorporated
1860 Arlington Avenue
Louisville, Kentucky

Opportunity Center
Workshop Owensboro
Council of Retarded
Children
721 Jackson Street
Post Office Box 72
Owensboro, Kentucky

Perma Pipe Corporation
15th & Salisbury Avenue
Middlesboro, Kentucky

Pioneer Plastics
Corporation
Box 175
Corydon, Kentucky

Plastic Printing &
Manufacturing Company
224 Fairfield Avenue
Bellevue, Kentucky

Premier Thermo-Plastics
Company
Middle Road
Jeffersontown, Kentucky

Presque Isle Paper Products,
Incorporated
1001 West Oak Street
Louisville, Kentucky

Companies Employing 51-250 Men

Container Corporation
of America
1111 Zane Street
Louisville, Kentucky

Cresline Plastic Pipe Company
U. S. 40 South
Henderson, Kentucky

Cyanede Plastics
Incorporated
Industrial Park
U. S. 60 West
Henderson, Kentucky

Kusan, Incorporated
Heilman Street
Henderson, Kentucky

Mid-South Plastics,
Incorporated
Post Office Box 423
Dawson Springs, Kentucky

Montplier Glove Company
Frederica Street
Hartford, Kentucky

Packaging Service Corporation
3001 West Madison
Louisville, Kentucky

Rohn & Haas Company
4300 Camp Ground Road
Louisville, Kentucky

Companies Employing 251-1250 Men

Airco Chemical Division
Cumberland Chemical
Corporation
Post Office Box 247
Calvert City, Kentucky

B. F. Goodrich
Chemical Company
Bells Lane
Louisville, Kentucky

Phillips Films Company
Main Street
Providence, Kentucky

Phillips Films Company
421 North Main Street
Williamstown, Kentucky

Companies With Employment Unknown

Impressive Manufacturing
514 Horse Branch Road
Soft Mitchell, Kentucky[12]

RUBBER COMPANIES PROCESSING PLASTIC PRODUCTS

Companies Employing 11-50 Men

Broadway Rubber Corporation
529 East Broadway
Louisville, Kentucky

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[12] 1968 Kentucky Directory of Manufacturers, loc. cit.

Companies Employing 251-1250 Men

American Synthetic
Rubber Corporation
Post Office Box 360
Louisville, Kentucky

B. F. Goodrich Chemical
Company
Bells Lane
Louisville, Kentucky

Gates Rubber Company
Elizabethtown, Kentucky

Parker Seal Company
817 East Third Street
Lexington, Kentucky

Companies With Unknown Employment

American Rubber &
Chemical Company
Post Office Box 1034
Louisville, Kentucky

Parker Seal Company
Under Construction
Winchester, Kentucky[13]

TEXTILE INDUSTRIES UTILIZING PLASTICS

Companies Employing 11-50 Men

G. Bittners Sons
731 East Main Street
Louisville, Kentucky

Companies Employing 51-250 Men

Auburn Hosiery Mill
Incorporated
Adairville, Kentucky

Auburn Hosiery Mills,
Incorporated
110 East Main Street
Auburn, Kentucky

Louisa Carpet Mills
Louisa, Kentucky

Trigg-Knit Hosiery Mill
East Main Street
Cadiz, Kentucky

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[13]Ibid.

Companies Employing 251-1250 Men

Bear Brand Hosiery
Company
1311 Washington Street
Henderson, Kentucky

Caron Spinning Company
Route 5
London, Kentucky

Indian Head Hosiery Company
28th & Adams Street
Paducah, Kentucky

January & Wood Company
237 West Second Street
Maysville, Kentucky

Princeton Hosiery Mills
Washington Street
Princeton, Kentucky[14]

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[14] Ibid.

APPENDIX B

COMPANIES INTERVIEWED IN PILOT STUDY

Billy Smith Signs
525 East Broadway
Louisville, Kentucky

Clopay Corporation
Fourth Street
Augusta, Kentucky

Dow Corning Corporation
Elizabethtown, Kentucky

Martin Manufacturing Corporation
South Nineteenth Street
Middlesboro, Kentucky

Modern Industries, Incorporated
Space Center
Louisville, Kentucky

APPENDIX C

Perkins Hall, Apt. 2
Morehead, Kentucky 40351
December 9, 1968

Dear Sir:

I am a graduate student at Morehead State University working towards a Master's Degree in Higher Education. I am conducting a study which will lead to the completion of a thesis with the title of "The Present, Future and Emerging Educational Requirements of Personnel in the Plastics Industry, With Implications for the Industry and Morehead State University."

I have the endorsement of the members of my Thesis Committee, the School of Education at Morehead State University and the director of my thesis, Dr. C. Nelson Grote, Dean, The School of Applied Sciences and Technology.

The data is to be gained through a survey of selected plastics and related industries in the Commonwealth of Kentucky. It is my sincere desire that you will give me your cooperation by completing the attached questionnaire.

In recognition of your busy schedule, the questionnaire has been so designed to require a minimum amount of time. For your convenience, a self-addressed, stamped envelope is enclosed. If possible, please return the completed questionnaire in approximately ten days after the date received. Thank you very much for your consideration and reply.

Respectfully,

Thomas R. Crawford
Graduate Assistant

Enclosure

cc: C. Nelson Grote, Dean
School of Applied Sciences and Technology
Morehead State University
Morehead, Kentucky 40351

A QUESTIONNAIRE CONCERNING THE EDUCATIONAL

REQUIREMENTS OF PLASTICS PERSONNEL

This questionnaire is a part of a study titled "The Present, Future and Emerging Educational Requirements of Personnel in the Plastics Industry in Kentucky, With Implications for the Industry and Morehead State University." The study is being conducted by Thomas R. Crawford, a graduate assistant, under the direction of Dr. C. Nelson Grote, Dean, School of Applied Sciences and Technology, Morehead State University, Morehead, Kentucky.

We suggest that this questionnaire be filled out by the vice-president for production or his counterpart. The information provided on this questionnaire should pertain to only the plants and employees located within the Commonwealth of Kentucky.

Name of Firm_____

Address_____ _____ _____ _____
Street City State Zip Code

Name of Respondent_____

Position of Respondent_____

I. PRORATION OF EMPLOYEE HOURS, EDUCATION AND EMPLOYMENT

(1) Please estimate the approximate number of employee hours spent this year (1968) involved in the design, processing, packaging, sales, and/or shipping of plastics in your company.

(2) Please check the processes listed below in which your company is engaged: (Check as many as apply)

no operations with plastics	☐	reinforced plastics	☐
injection molding	☐	compression transfer	☐
blow molding	☐	cellular	☐
thermoforming	☐	calendering	☐
extrusion	☐	chemical operations	☐
mold making	☐	assembling plastic products	☐
plastic machine manufacturing	☐		

Please define any other plastics processes engaged in by your company that is not included in the list above:

(3) Please rate the difficulty of hiring different types of employees in the Plastics industry by using such categories as (1) most difficulty, (2) average difficulty and (3) no difficulty until you have marked each of the categories.

supervisor	☐	skilled	☐
engineer (or equal)	☐	semiskilled	☐
technician (2 yr.	☐	unskilled	☐
college or equal)	☐	other	☐

I. (Continued)

(4) Please indicate the educational background of your company's employees by writing in the approximate number in each level of education according to the classification to the left.

Classification	Eighth Grade	High School	Trade or Technical School	2 yr. Technical Institute or Community College	4 yr. College or University
supervisor	____	____	____	____	____
engineer (or equal)				____	____
technician (2 yr. college or equal)				____	
skilled	____	____	____	____	____
semiskilled	____	____	____	____	
unskilled	____	____	____		

(5) At what educational level would your company prefer to hire men for the following positions if they were available. Please check in the approximate column for each job classification.

Classification	Eighth Grade	High School	Trade or Technical School	2 yr. Technical Institute or Community College	4 yr. College or University
supervisor	____	____	____	____	____
engineer (or equal)				____	____
technician (2 yr. college or equal)			____	____	____
skilled	____	____	____	____	____
semiskilled	____	____	____	____	____
unskilled	____	____	____	____	____

(6) Approximately what percentage of your present plastics foremen, supervisors, and "middle management" personnel come from the sources shown?

From:	0-24%	25%-49%	50%-74%	75%-100%
outside the plastics industry	☐	☐	☐	☐
within the company	☐	☐	☐	☐
other plastics processors	☐	☐	☐	☐
customers	☐	☐	☐	☐
high schools	☐	☐	☐	☐
trade and technical schools	☐	☐	☐	☐
colleges or universities	☐	☐	☐	☐
Other sources:	☐	☐	☐	☐

I. (Continued)

(7) The approximate number of new and replacement plastics employees to be hired in each of the following categories.

Classification	Number hired in last 12 months	Number expected to be hired in next 12 months	Number expected to be hired in the next 5 years
supervisor	____	____	____
engineer (or equal)	____	____	____
technician (2 yr. college or equal)	____	____	____
skilled	____	____	____
semiskilled	____	____	____
unskilled	____	____	____

(8)

(a) Does the production personnel entering the plastics industry need pre-employment training at the:

high school level? yes ☐ no ☐ two year college level? yes ☐ no ☐
trade school level? yes ☐ no ☐ four year college level? yes ☐ no ☐

(b) What type of pre-employment plastics training would most benefit production personnel?

general, broad ☐ specialized, in depth ☐

(9)

(a) What would be the nature and number of semester hours your company would want to be included in a plastics technology program preparing production workers.

Courses	Hours	Courses	Hours
General Education	____	Mathematics	____
Chemistry	____	Physics	____
Metal Working	____	Drafting	____
Design	____	Plastics	____
Other Courses	____		

(b) If you are familiar with any educational institutions with plastic technology programs which in your judgment are well developed, please list them.

Name	Address
_____	_____
_____	_____
_____	_____

II. EQUIPMENT, MATERIALS AND OTHER TYPES OF SUPPORT

(1) Function of equipment you are now using:

Function	Manufacturer

(2) Function of new equipment you expect to be using in the next ten years.

Function	Manufacturer

(3) Would your company be willing to support a plastics technology program by donating or loaning new or used equipment? yes ☐ no ☐

(4) Major types of plastics materials you are now using?

Type	Method of Processing

(5) Major types of new plastic materials you expect to be using in ten years?

Type	Method of Processing

II. (5) Continued

Type	Method of Processing

(6) Would your company be willing to support a plastics technology program by donating new, aged, or scrap plastic materials? yes ☐ no ☐

(7) What other types of resources would your company be willing to make available to a plastics technology program? Would your company:

(a) supply scholarships for men pursuing a plastics technology program? Yes ☐ No ☐

(b) loan money to students pursuing a plastics technology program? Yes ☐ No ☐

(c) allow students to work in a cooperative program while pursuing a plastics technology program? Yes ☐ No ☐

(d) be willing to supply consultants for a plastics technology program? Yes ☐ No ☐

(e) supply any other type support?_____

(8) Would your company hire men from a two year plastics technical program? Yes ☐ No ☐

(9) Comments: (Please feel free to express any personal concerns about the future of the plastics industry, the educational requirements of persons entering in or progressing within the industry or respond to this questionnaire in an expositing fashion.)

Please return this questionnaire to:

Thomas R. Crawford
Graduate Assistant
School of Applied Sciences and Technology
Morehead State University
Morehead, Kentucky 40351

☐ Please check if you should like to receive a summary of this study when concluded.

APPENDIX D

Perkins Hall, Apt. 2
Morehead, Kentucky 40351
February 19, 1969

Dear Sir:

I am a graduate student at Morehead State University working towards a Master's Degree in Higher Education. I am conducting a study which will lead to the completion of a thesis with the title of "The Present, Future and Emerging Educational Requirements of Personnel in the Plastics Industry, With Implications for Morehead State University and the Industry."

I have the endorsement of the members of my Thesis Committee, the School of Education at Morehead State University and the director of my thesis, Dr. C. Nelson Grote, Dean, The School of Applied Sciences and Technology.

The data is to be gained through a survey of selected industries in the Commonwealth of Kentucky. It is my sincere desire that you will give me your cooperation by completing the attached questionnaire.

In recognition of your busy schedule, the questionnaire has been so designed to require a minimum amount of time. During a pilot study, it was estimated by several company officials to require ten to twenty minutes for completion of this questionnaire. For your convenience, a self-addressed, stamped envelope is enclosed. Due to the limited amount of time allowed the researcher, please return this questionnaire with the appropriate questions marked by February 28, 1969. Thank you very much for your consideration and reply.

Respectfully,

Thomas R. Crawford
Graduate Assistant

Enclosure

cc: Dr. C. Nelson Grote, Dean
School of Applied Sciences and Technology

A QUESTIONNAIRE CONCERNING THE EDUCATIONAL

REQUIREMENTS OF PLASTICS PERSONNEL

This questionnaire is a part of a study titled "The Present, Future and Emerging Educational Requirements of Personnel in the Plastics Industry in Kentucky, With Implications for Morehead State University and the Industry." The study is being conducted by Thomas R. Crawford, a graduate assistant, under the direction of Dr. C. Nelson Grote, Dean, School of Applied Sciences and Technology, Morehead State University, Morehead, Kentucky.

If your company has no operations that involve the making of plastics or handling of plastic materials in any manner, please complete the General Information section only. It is essential to this study that this questionnaire be returned either with just Part I completed or with responses to the entire questionnaire.

We suggest that this questionnaire be filled out by the general manager or plant manager. The information provided on this questionnaire should pertain to only the plants and employees located within the Commonwealth of Kentucky.

I. GENERAL INFORMATION

Name of Firm_____

Address_____
Street City State Zip Code

Name of Respondent_____

Position of Respondent_____

If your company has no operations in the Commonwealth of Kentucky that involve the manufacture of materials for the purpose of making plastics, manufacture of plastics or the handling of plastic materials in any of its production processes, please check here and do not fill in the rest of this questionnaire. ☐

II. CLASSIFICATION OF PROCESSES, EDUCATION AND EMPLOYMENT OF EMPLOYEES

(1) Please check the processes listed below in which your company is engaged: (Check as many as apply)

injection molding	☐	compression transfer	☐
blow molding	☐	cellular	☐
thermoforming	☐	calendering	☐
extrusion	☐	chemical operations	☐
mold making	☐	assembling plastic products	☐
plastic machine manufacturing	☐	weaving of plastics	☐
reinforced plastics	☐		

II. (Continued)

Please define any other plastics processes engaged in by your company that are not included in the list above:_____

(2) Please rate the difficulty of hiring different types of employees in the plastics industry by using such categories as (1) most difficulty, (2) average difficulty and (3) no difficulty until you have marked each of the categories.

supervisor	___	technician (2 yr. college or equal)	___	semiskilled	___
engineer (or equal)	___	skilled	___	unskilled	___
				other	___

(3) At what educational level would your company prefer to hire men for the following positions if they were available? Please check in the approximate column for each job classification.

Classification	Eighth Grade	High School	Trade or Technical School	2 yr. Technical Institute or Community College	4 yr. College or University
supervisor	☐	☐	☐	☐	☐
engineer (or equal)				☐	☐
technician (2 yr. college or equal)				☐	☐
skilled	☐	☐	☐	☐	☐
semiskilled	☐	☐	☐	☐	☐
unskilled	☐	☐	☐	☐	☐

(4) Approximately what percentage of your present plastics foremen, supervisors, and "middle management" personnel come directly from the sources shown?

	0-24%	25%-49%	50%-74%	75%-100%
outside the plastics industry	☐	☐	☐	☐
within the company	☐	☐	☐	☐
other plastics processors	☐	☐	☐	☐
customers	☐	☐	☐	☐
high schools	☐	☐	☐	☐
trade and technical schools	☐	☐	☐	☐
colleges or universities	☐	☐	☐	☐
other sources:	☐	☐	☐	☐

(5) The approximate number of new and replacement plastics employees to be hired in each of the following categories.

Classification	Number hired in last 12 months	Number expected to be hired in next 12 months	Number expected to be hired in the next 5 years
supervisor	___	___	___
engineer (or equal)	___	___	___
technician (2 yr. college or equal)	___	___	___
skilled	___	___	___
semiskilled	___	___	___
unskilled	___	___	___

II. (Continued)

(6)

(a) Does future personnel entering the plastics industry need pre-employment training at the:

high school level? yes ☐ no ☐ two year college level? yes ☐ no ☐
trade school level? yes ☐ no ☐ four year college level? yes ☐ no ☐

(b) What type of pre-employment plastics training would most benefit future personnel?

general ☐ specialized ☐ specialized, in depth ☐

(7)

(a) What would be the nature of and the number of semester hours your company would want to be included in a plastics technology program preparing future workers?

Courses	Hrs.	Courses	Hrs.	Courses	Hrs.
General Education	____	Mathematics	____	Labor-Management Relations	____
Chemistry	____	Physics	____		
Metal Working	____	Drafting	____	Time and Motion Study	____
Design	____	Plastics	____	Quality Control	____

Other_____

(b) If you are familiar with any educational institutions with plastic technology programs which in your judgment are well developed, please list them.

Name	Address
_____	_____
_____	_____
_____	_____

III. INDICATION OF INDUSTRIAL SUPPORT

(1) Major types of plastics materials you are now using?

Type	Method of Processing
_____	_____
_____	_____
_____	_____

(2) Would your company be willing to assist in the support of a plastics technology program by donating new, aged, or scrap plastic materials?
yes ☐ no ☐

(3) Would your company be willing to assist in the support of a plastics technology program by donating or loaning new or used equipment?
yes ☐ no ☐

III. (Continued)

(4) What other types of resources would your company be willing to make available to a plastics technology program? Would your company:

(a) supply scholarships for men pursuing a plastics technology program? Yes ☐ No ☐

(b) loan money to students pursuing a plastics technology program? Yes ☐ No ☐

(c) allow students to work in a cooperative program while pursuing a plastics technology program? Yes ☐ No ☐

(d) be willing to supply men to serve as members of an advisory committee for a plastics technology program? Yes ☐ No ☐

(e) supply any other type support? _____

(5) Would your company prefer to hire men from a two year plastics technical program? Yes ☐ No ☐

(6) Comments: (Please feel free to express any personal concerns about the future of the plastics industry, the educational requirements of persons entering in or progressing within the industry or respond to this questionnaire in an expositing fashion.)

Please return this questionnaire to:

Thomas R. Crawford, Graduate Assistant
School of Applied Sciences and Technology
Morehead State University
Morehead, Kentucky 40351

☐ Please check if you should like to receive a summary of this study when concluded.

APPENDIX E

Perkins Hall, Apt. 2
Morehead, Kentucky 40351
March 3, 1969

Dear Sir:

Approximately ten days ago, we mailed a cover letter and a questionnaire to you. After reviewing the returned questionnaires, I find that I have not received a response from your company. In the event the questionnaire did not reach your desk or was mislaid, I am enclosing a duplicate for your convenience.

As you recall, I am a graduate student at Morehead State University working towards a Master's Degree in Higher Education. I am conducting a study which will lead to the completion of a thesis with the title of "The Present, Future and Emerging Educational Requirements of Personnel in the Plastics Industry, With Implications for Morehead State University and the Industry."

The data is to be gained through a survey of selected industries in the Commonwealth of Kentucky. It is my sincere desire that you will assist me in this research by completing the enclosed questionnaire.

In recognition of your busy schedule, the questionnaire has been so designed to require a minimum amount of time. During a pilot study, it was estimated by several company officials to require ten to twenty minutes for completion of this questionnaire. For your convenience, a self-addressed, stamped envelope is enclosed. Due to the limited amount of time allowed the researcher, it would be helpful if you could return this questionnaire with the appropriate questions marked by March 13, 1969. If this follow-up letter passes the completed questionnaire in the mail, please consider this letter as a thank you.

Respectfully,

Thomas R. Crawford
Graduate Assistant

Enclosure

cc: Dr. C. Nelson Grote, Dean
School of Applied Sciences and Technology

APPENDIX F

Perkins Hall, Apt. 2
Morehead, Kentucky 40351
February 26, 1969

Mr. Hans Jungk, General Superintendent
Development Section
E. I. du Pont de Nemours & Company, Inc.
P. O. Box 1378
Louisville, Kentucky 40201

Dear Mr. Jungk:

I received your letter concerning my questionnaire on the plastics industry. For the purposes of this study, I have included the synthetic rubbers in my definition. For this reason, I am returning the questionnaire to you.

I would like to express my appreciation to you for the fine manner that you returned my questionnaire. I hope that it will not inconvenience you too greatly to handle this questionnaire a second time.

Thanks again for your cooperation.

Sincerely yours,

Thomas R. Crawford
Graduate Assistant

lc

APPENDIX G

LISTINGS OF QUOTES RECEIVED FROM

THE PLASTICS INDUSTRY

"We are an industrial fabricator of foam plastic materials. We do not manufacture any of these materials. I do not believe our company should be included in your survey."

"Every year we receive hundreds of request.....asking for help with questionnaires.

While we recognize the importance of these inquiries.....we would need a team of specialists.....answering inquiries.

Since we can't reply to all, it would be unfair of us to cooperate with a selected few, as much as we would like to."

"We have not completed your questionnaire.....because it is our feeling.....a non-profit institution, highly specialized in its work, would not be representative enough to be valid material for consideration in your report."

"We have only recently started a venture in plastics and are not in a position to speak with much experience or knowledge."

"Since I do not consider this a plastic by my definition, I have answered Part I only of this questionnaire."

"Your plastics questionnaire does not apply to our company."

"We appreciate your letter but we are not now interested in participating in such a survey."

APPENDIX H

TABLE 3 - A

ANALYSIS OF DEGREES OF DIFFICULTY IN

EMPLOYMENT OF PLASTICS PERSONNEL

Sources of Variance#	1	2	3
supervisor	7	5	1
engineer	7	4	1
technician	5	6	1
skilled laborer	7	6	1
semiskilled laborer	1	6	6
unskilled laborer	2	2	10
other	0	1	1
x^2*	14.2	6.5	26.0

* x^2 significant when $>$ 12.59

\# 1 = most difficult to employ
2 = average difficulty in employment
3 = least difficult to employ

TABLE 3 - B

ANALYSIS OF SOURCES OF EMPLOYEES

FOR THE PLASTICS INDUSTRY

Sources of Variance	0-24%	25%-49%	50%-74%	75%-100%
Outside plastics industry	4	2	1	4
Within the company	1	1	5	7
Other plastics processors	9	1	1	0
Customers	8	0	1	1
High schools	5	0	3	2
Trade and technical schools	6	1	0	0
Colleges or universities	6	2	0	2
Other sources	4	0	1	0
x^2*	8.2	5.3	13.4	14.0

* x^2 significant when $>$ 7.8

TABLE 3 - C

ANALYSIS OF EDUCATIONAL REQUIREMENTS OF THE PLASTICS INDUSTRY

Sources of Variance#	A	B	C	D	E
supervisor	0	0	2	6	7
engineer	0	0	0	1	11
technician	0	0	0	9	1
skilled	0	7	9	3	0
semiskilled	0	13	2	0	0
unskilled	3	13	0	0	0
x^2*	15.2	35.4	30.5	22.3	37.0

* x^2 significant when $>$ 11.07

\# A = eighth grade education
B = high school education
C = trade or technical school education
D = two year technical institute or community college
E = four year college or university

TABLE 3 - D

INDICATED EDUCATIONAL LEVEL NEEDED BY PERSONNEL

ENTERING THE PLASTIC INDUSTRY

Sources of Variance	yes	no	P_x*
High school level	11	4	0.059
Trade school level	8	7	0.996
Two year college level	9	6	0.910
Four year college level	7	8	0.996

* P_x significant when $<$ 0.025

TABLE 3 - E

ANALYSIS OF INDICATED DEGREE OF SPECIALIZATION

IN A PLASTICS TECHNOLOGY PROGRAM

Sources of Variance	
General program	9
Specialized program	6
Specialized in depth program	1
x^2*	6.2

* x^2 significant when $>$ 5.99

TABLE 3 - F

ANALYSIS OF SUGGESTED PLASTICS TECHNOLOGY PROGRAM

Sources of Variance	1-6 hrs.	7-12 hrs.	13+ hrs.
General Education	1	1	3
Chemistry	2	3	2
Metal Working	1	1	0
Design	4	2	1
Mathematics	3	3	2
Physics	5	1	1
Drafting	3	2	1
Plastics	4	4	1
Labor and Management Relations	4	5	0
Time and Motion Study	5	1	0
Quality Control	5	2	0
x^2*	10.0	7.6	21.0

* x^2 significant when $>$ 18.31

TABLE 3 - G

ANALYSIS OF EDUCATIONAL LEVELS FOR

DIFFERENT POSITIONS IN THE PLASTICS INDUSTRY

Sources of Variance#	A	B	C	D	E	x^2*
unskilled laborer	3	13	0	0	0	39.8
semiskilled laborer	0	13	2	0	0	42.7
skilled laborer	0	7	9	3	0	17.6
technician	0	0	0	9	1	31.0
engineer	0	0	0	1	11	43
supervisor	0	0	2	6	7	14.7

* x^2 significant when $>$ 9.49

\# A - eighth grade education
B = high school education
C = trade or technical school education
D = two year technical institute or community college
E = four year college or university

TABLE 3 - H

ANALYSIS OF INDUSTRIAL SUPPORT TO A PLASTICS

TECHNOLOGY PROGRAM OFFERED IN PUBLIC INSTITUTIONS

Sources of Variance	yes	no	P_x*
donation of materials	11	7	.24
donation or loan of equipment	4	12	.04
furnishing of scholarships	0	17	1.00
loan money	0	15	1.00
cooperative work program	11	4	.06
serve on advisory committees	10	5	.15
employ 2 yr. college graduates	11	3	.03

* P_x significant when $<$ 0.025

TABLE 3 - I

ANALYSIS OF EMPLOYMENT TRENDS ACCORDING

TO JOB CLASSIFICATION

Sources of Variance	Last 12 Months	Next 12 Months	Next 5 Years
supervisors	5	5	26
engineers	12	13	40
technicians	6	4	5
skilled laborers	46	29	68
semiskilled laborers	97	79	331
unskilled laborers	56	71	232
x^2*	180.0	167.0	753.0

* x^2 significant when $>$ 11.07

VITA

Thomas Richard Crawford was born on the fourteenth day of February, 1944, the son of Thomas Luther and Dorothy Jane Crawford of Manchester, Ohio. His elementary and secondary education was completed in the Manchester Local School System. He entered Ohio State University in 1962 in the program of pre-engineering and then transferred to Morehead State University in 1965. Upon the completion of his Bachelor of Science Degree in Industrial Arts in January, 1968, he entered the graduate school at Morehead State University and received his Master of Higher Education Degree in June of 1969.

While at Morehead State University, he worked three years under the Federal Workstudy Program and then served as a graduate assistant for one and one-half years in the School of Applied Sciences and Technology. During his undergraduate and graduate programs, he was active in the Industrial Education Club, Kentucky Industrial Education Association, American Industrial Arts Association and American Vocational Association.

He is married to the former Ellen Louise Roush also of Manchester, Ohio, and they have a daughter named Tamera Sue. Future goals are to continue graduate school and obtain a position as a technical drawing or graphic arts instructor in a college or university.