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ABSTRACT

This study is the first of eight in a project on teachers in industrial education. The study was designed to lead towards the identification of tasks required in the successful performance of the professional role of the secondary school industrial education teacher. It was also designed to be of specific use in the re-evaluation of the M.S. degree program at the University of Wisconsin-Stout. This paper is devoted to a review of related literature. The use of analysis as a basis for identifying objectives for education is traced back to Plato (c. 400 B.C.) and, in the field of industrial education, to Pestalozzi's analysis (c. 1800). The literature review describes the work of Taylor, Allen, Charters, and Smith, among others, and ends with the current emphasis on performanced-based teacher education. (JA)

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Part I: Introduction to the Study

Part II: Frequency and Importance of Their Professional Tasks as Reported by Wisconsin Junior High School Industrial Art Teachers

Part III: Frequency and Importance of Their Professional Tasks as Reported by Wisconsin Junior-Senior High School Industrial Art Teachers

Part IV: Frequency and Importance of Their Professional Tasks as Reported by Wisconsin Senior High School Industrial Education Teachers

Part V: Frequency and Importance of Their Professional Tasks as Reported by Wisconsin Capstone Industrial Education Teachers

Part VI: Frequency and Importance of Their Professional Tasks as Reported by Wisconsin Secondary School Industrial Education Teacher Groups

Part VII: Significant Differences Between Wisconsin Industrial Education Teacher Groups with Respect to (1) Frequency and (2) Importance of Their Professional Tasks

Part VIII: Importance of Industrial Education Teacher's Professional Tasks as Seen by a Jury of Selected Leaders in Education Together with Significant Differences Between Responses of Selected Wisconsin Industrial Education Teacher Groups and the Jury

University Forum
Developing Competency Based Content
in Business, Industry and Education

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DEVELOPMENT OF TASK ANALYSIS STUDIES IN INDUSTRIAL EDUCATION

In August of 1972, a paper was prepared which reviewed the development of the task analysis studies at Stout up to that point in time.[1] These studies form the basis for the work reported here.

The following outline of the August report is presented for information:

- Introduction
- Need for Role Descriptions
- Program Development Model
- Position Paper Implications
- Identification of Tasks
- Development of Task Analysis Survey Instruments
- Processing the Data
- Appendices:
  - Role Descriptions needed for Positions in Industrial Education
  - Role Description of the Junior High School Industrial Arts Teacher
  - Role Description of the Senior High School Industrial Arts Teacher
  - First-, Second- and Third-Level Tasks Performed by Industrial Education Teachers
  - Six Survey Instruments: Selected Tasks of the Industrial Education Teacher, Secondary School Teacher Response Forms
  - Six Survey Instruments: Selected Tasks of the Industrial Education Teacher, Jury Response Forms
  - Coding Information

STATEMENT OF THE PROBLEM

It would seem reasonable to assume that instructional programs should be based on societal needs. To keep programs in tune with needs which obviously change with the passage of time requires periodical, if

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[1] Lawrence S. Wright, Development of Task Analysis Studies in Industrial Education, Graduate College, University of Wisconsin-Stout, Menomonie, Wisconsin, August, 1972.

not continuous re-evaluation. This study is one step in the re-evaluation process for the professional tasks of teachers who may be in the master of science degree program at the University of Wisconsin-Stout.

The central purpose of this study is to provide hard data from which the director of the M.S. degree program in industrial education and his program committee can (hopefully) make sound judgements with respect to re-evaluation of said program.

More specifically, an attempt will be made to answer these questions with respect to the professional tasks performed by Wisconsin industrial education teachers:

1. With what frequency do junior high school, senior high school, junior-senior high school, capstone and all of these secondary school industrial education teachers perform these tasks? (See Figure 1)

2. What importance do each of these teacher groups attach to these tasks in their teaching assignment? (See Figure 1)

3. What differences, if any, exist between these teacher groups with respect to frequency of these tasks? (See Figure 2)

4. What differences, if any, exist between these teacher groups with respect to importance of these tasks? (See Figure 2)

5. What importance does a jury of leaders in education composed of
   a. selected leaders in industrial teacher education (N=93)
   b. state consultants in industrial arts or industrial education (N=61)
   c. state teacher education officers (N=65)

   attach to each of these tasks for secondary school (grades 7-12) industrial education teachers? (See Figure 3)

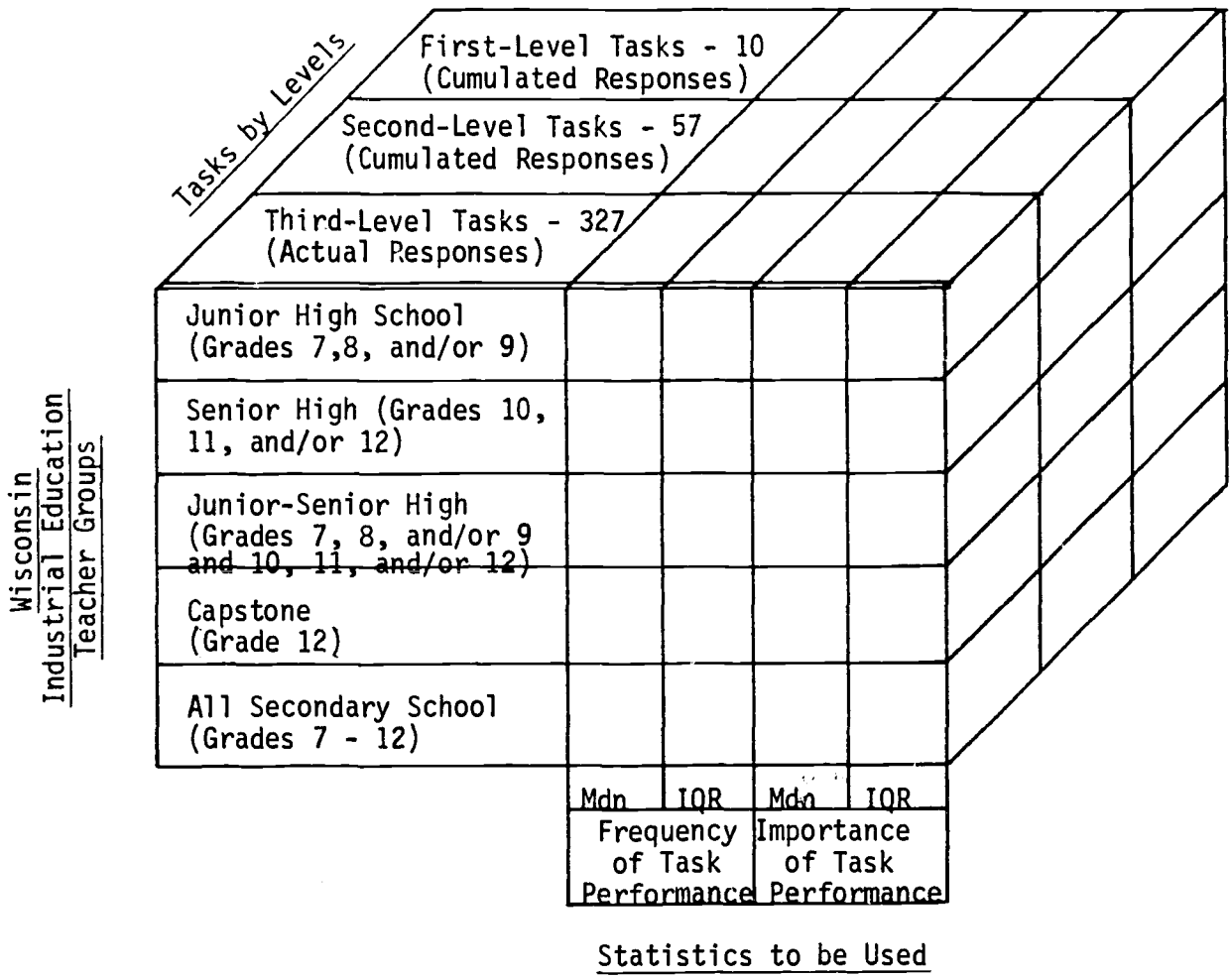

Figure 1

Wisconsin Industrial Education Teacher Groups, Tasks by Levels, and Statistics to be used in Interpreting Frequency and Importance of Tasks Performed

	Senior High School (Grades 10, 11, and/or 12)	Junior-Senior High (Grades 7, 8, and/or 9, and 10, 11, and/or 12)	Capstone Grade 12
Junior High School (Grades 7, 8, and/or 9)	0	0	0
Senior High (Grades 10, 11, and/or 12)		0	0
Junior-Senior High (Grades 7, 8, and/or 9, and 10,11, and/or 12)			0

0 = cells in which studies will be conducted.

Figure 2

Studies Between Wisconsin Industrial Education Teacher Groups to Ascertain Whether Differences Exist in Frequency or Importance of Tasks Performed

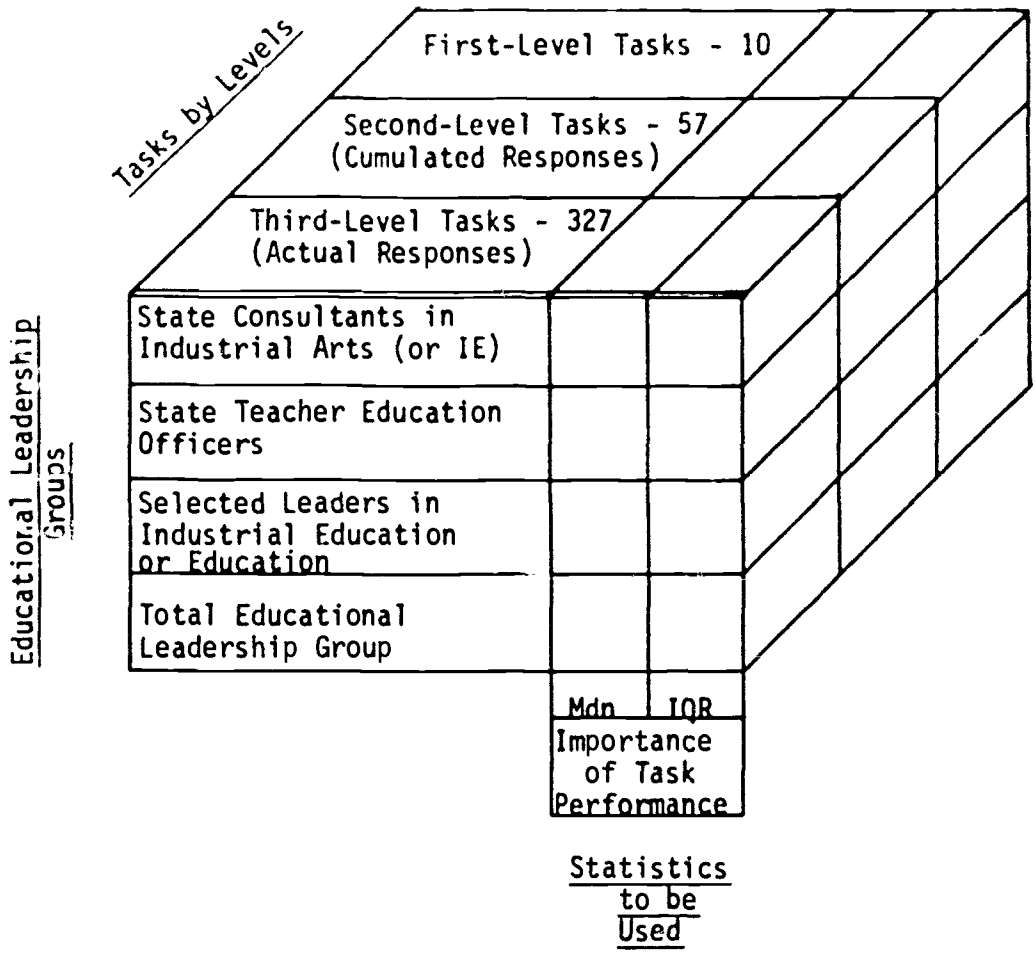

Figure 3

Educational Leadership Groups, Tasks by Levels, and Statistics to be Used in Interpreting Importance They Attach to Tasks Secondary School Industrial Education Teachers Perform

6. What differences, if any, exist between what the jury of leaders in education believe in their judgment of the importance of each task as compared to what each of the teacher groups reported that they believe. (See Figure 4)

IMPORTANCE OF THE STUDY

This study is consistent with position description statements of responsibility of Program Directors at UW-Stout. In September of 1971, the Vice-President for Academic Affairs said:

> It is the responsibility of the program director to identify the kinds of situations in which the graduate may find himself in any of his future endeavors. The program director thus must be constantly aware of the demands and challenges of the field which the student is entering....
>
> If we accept the concept of learning being central, we must then identify what kinds of situations our graduate will face, determine what kinds of competencies are necessary to be successful in facing these potential situations, and then develop a schema whereby we can develop the competencies required of the graduate.[2]

This study is designed to lead towards the goals of identification of tasks required in the successful performance of the professional role of secondary school industrial education teachers. As such it is designed to be of specific use in the re-evaluation of the M.S. degree program at UW-Stout.

This study holds significance for the undergraduate program in industrial arts education as well.

Because of the broad nature of the task listing, other teacher education disciplines should find this study of interest.

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[2]Wesley L. Face, "A Charge to AAAC" a paper presented to Academic Affairs Administrative Council, Stout State University, September, 1971, p. 8

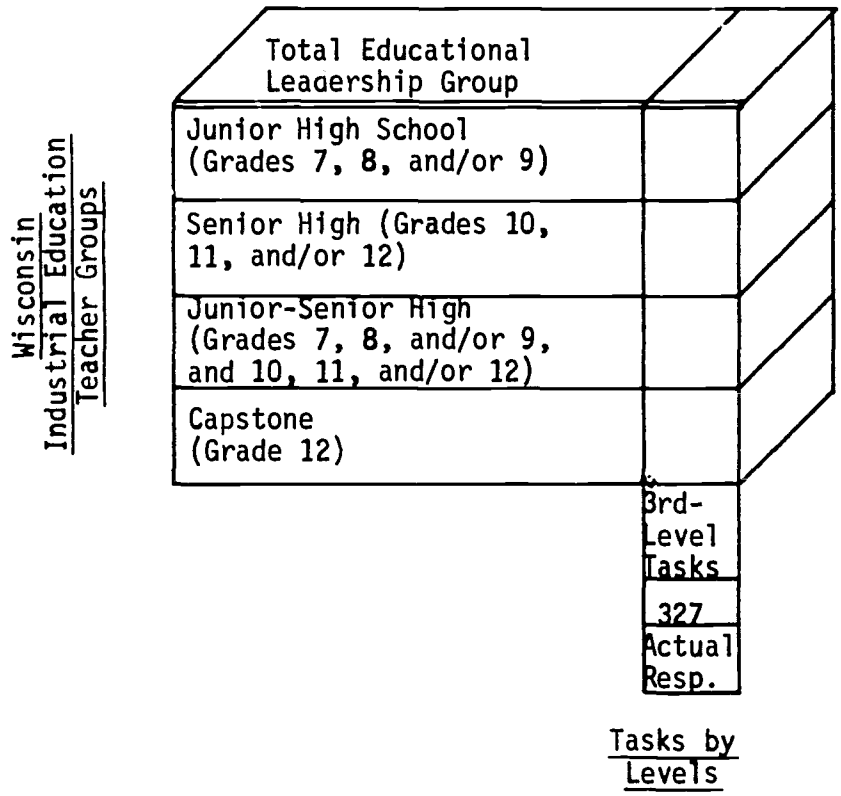

Figure 4

Studies Between the Total Educational Leadership Group and Wisconsin Industrial Education Teacher Groups to Ascertain Whether Differences Exist in Importance of Tasks Industrial Education Teachers Perform

It would seem safe to say that this study is sufficiently unique and, hopefully, carefully enough planned to produce both state and national interest in its results.

TERMINOLOGY USED

A number of terms are presented here so the reader may better understand the intent of the writer.

Industrial Education is used in its genenic sense and includes industrial arts whose focus is on the general education purpose and industrial vocational education whose focus is on the more specific purpose of preparation for (and/or upgrading within) employment.

Junior high school industrial arts teacher. Teachers who reported that they taught in grades 7, 8, and/or 9.

Junior-Senior high school industrial arts teacher. Teachers who reported that they taught in any or all of grades 7, 8, and 9 and also in any or all of grades 10, 11, or 12, but not capstone courses.

Senior high school industrial education teacher. Teachers who reported that they taught in grades 10, 11, and/or 12, but not capstone courses.

Capstone industrial education teachers. Teachers who reported teaching capstone courses at the 12th grade level whether they taught in any other grades or not.

ORGANIZATION OF THE REPORTS OF THIS STUDY

For the convenience of a variety of potential users of this study, the reporting of it has been subdivided. It is believed that some users would be primarily interested in, say, the junior high school population; others, in another population. Accordingly the parts of the reporting of this study developed as of this writing are as follows:

Part I: Introduction to the study

Part II: Frequency and Importance of their Professional Tasks as Reported by Wisconsin Junior High School Industrial Art Teachers

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FURTHER STUDIES PLANNED

Further studies are anticipated as follows:

1. To ascertain from the data obtained whether separate program emphasis for junior high school, junior-senior high school, senior high school and/or capstone industrial education teachers are desirable at the M.S. degree level at UW-Stout.

2. To develop and strengthen program(s) which the data suggest at the M.S. degree level at UW-Stout.

DESIGN OF THE STUDY

The survey on which this study is based was referenced on page 1: "Development of Task Analysis Studies in Industrial Education". A section is now presented on these pages with respect to statistics used and interpretations which may be made.

Frequency and Importance Data

To analyze "frequency" and "importance" data, two statistics, median (MDN) and interquartile range (IQR), were used. The data collected on frequency and importance were expressed in an ordinal scale. The median was selected as a statistical tool because it is an indicator of central tendency of measures expressed in ordinal values.

On an instrument with many high scores, but with a few trailing far below most of the scores, these few extremely low scores would depress the mean and give a distorted view of the respondents' average. In the case with many low scores and a few high scores, the few would elevate the mean. Therefore, the median more fairly represents the central tendency and was chosen for use in this study.

The responses to the task analysis instruments were divided into discrete categories of frequency and importance. The frequency category had a scale of five divisions, (1) Do not perform, (2) About once a year, (3) About once per semester, (4) About once per grading period (6-9 weeks), and (5) Weekly or more often. A guide for interpretation of median points related to frequency of task performance may be seen in Table 1.

The importance category also consisted of a five point scale as follows: (1) Unimportant, (2) Slightly important, (3) Moderately important, (4) Very important, and (5) Essential. A guide for interpretation of median points related to importance of task performance may be seen in Table 2.

Although these categories (numbered 1 through 5 on the survey instrument) were discrete by definition, it was assumed that the responses reflected varying judgements along the entire continuum. Thus, the median point is that point both above and below which 50 percent of the cases lie. "The median is a stable measure, not influenced by extreme high or low scores. However, it is a point which separates the high and low scores and is not a true average.[3]

The interquartile range was used to express the spread that will contain the central half of the observations. This statistic ensures that the spread is not upset by any extreme observations that could not be called representative values.

The range was not used because it is based upon the two extreme scores, ignoring all others, and is considered a poor measure of

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[3]Frank F. Gorow, Statistical Measures: A Programmed Text, (San Francisco: Chandler Publishing Co., 1962), p. 38.

TABLE 1

Median Points and Descriptive Terms
Related to FREQUENCY of
Task Performance

Range of Median Points	Descriptive Terms
4.50 and higher	Weekly or more often
3.50 - 4.49	About once per grading period
2.50 - 3.49	About once per semester
1.50 - 2.49	About once per year
1.49 and lower	Do not perform

TABLE 2

Median Points and Descriptive Terms
Related to IMPORTANCE of Task

Range of Median Points	Descriptive Terms
4.50 and higher	Essential
3.50 - 4.49	Very important
2.50 - 3.49	Moderately important
1.50 - 2.49	Slightly important
1.49 and lower	Unimportant

dispersion. "It might be improved by eliminating the extreme scores and finding the range of the others; or by cutting off the top fourth and the bottom fourth of the scores and finding the range of the middle half (which is the (inter-)quartile range)."[4]

The center of the interquartile range is the median. A low interquartile range indicates a high level of agreement in the responses. "The degree of variation, deviation, or dispersion is an important factor in determining the extent to which the measure of central tendency is representative of the entire group."[5]

A guide for interpretation of the interquartile range (IQR) may be seen in Table 3.

Together the median and the interquartile range give a good picture of central tendency and variability of distributions.

Tables in which data are presented were formulated from data collected from the task analysis instruments. These data form the substance of the evidence gathered for this study. It will be recalled that responses were made to each of 327 third-level tasks. Additional evidence is presented for the second-level tasks. This was obtained by cumulating the responses to the third-level tasks which define or cluster under a given second-level task.

In a similar manner, the data for first-level tasks were cumulated from the second-level tasks which define and cluster under them.

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[4]Ibid., p. 39.

[5]Dennis H. Cooke, Minimum Essentials of Statistics, (New York: The Macmillan Co., 1936), p. 30.

TABLE 3

Terminology for Describing the Interquartile Ranges

Interquartile Range	Descriptive Terms
.50 - .75	Very high agreement
.76 - 1.25	High agreement
1.26 - 3.25	Moderate agreement
3.26 - 3.75	Low agreement
3.76 - 4.00	Very low agreement

Note: With a five-point scale there can be no IQR's lower than .5 and none higher than 4.0 on the five interval scale.

It may be observed then, that the data for the 327 third-level tasks are based on actual response while the data for the 57 second-level tasks and for the 10 first-level tasks are not actual response data but are cumulations by definition.

Significance of Difference Studies

After identifying the median of frequency and importance ratings by various groups, it was the purpose in this study to ascertain whether there were significant differences between groups with respect to their responses to each of the third-level tasks.

Because the data were ordinal and because the numbers of cases was appropriate, the Kolmogorov-Smernov two-sample test for large numbers was used (n_1 and n_2 are larger than 40 and n_1 and n_2 need not be equal).[6]

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[6]Sidney Siegel. Nonparametric Statistics for the Behavioral Sciences, New York: McGraw-Hill Book Company, Inc., 1956, p. 127-136.

In this test, the largest difference between cumulative percentages of responses to each of the five categories is calculated. If the value of this difference is equal to or larger than the critical value, a significant difference is said to exist at the level of confidence chosen. Comparisons were identified at the .05 and the .01 level of confidence. These calculations were made by computer.

REVIEW OF SELECTED RELATED LITERATURE

Origin of analysis probably goes back as far as thinking man himself. It is conjectured that when man began to see things as they existed in order around him and began to question this order that analysis was born.

Analysis is classified by Bloom[7] as one of the six levels of the cognitive domain. The six levels identified are: (1) knowledge, (2) comprehension, (3) application, (4) analysis, (5) synthesis, and (6) evaluation. These levels are arranged hierarchically. Analysis is an ability that requires knowledge, comprehension and application.

> At a somewhat more advanced level than the skills of comprehension and application are those involved in analysis. In comprehension the emphasis is on the grasp of the meaning and intent of the material. In application it is on remembering and bringing to bear upon given material the appropriate generalization or principles. Analysis emphasizes the breakdown of the material into its constituent parts and detection of the relationships of the parts and of the way they are organized.[8]

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[7]Benjamin S. Bloom, Editor, Taxonomy of Educational Objectives, The Classification of Educational Goals, Handbook I: Cognitive Domain, New York: David McKay Co., Inc., 1956.

[8]Ibid., p. 144

Implications of analysis for teaching seem evident. To the extent that one can analyze the elements of his discipline, he will have identified the elements from which selections can be made for teaching content.

Early Evidences of Analysis in Industrial Education

Bennett turns attention to this point as it relates to industrial education:

> An important turning point in the history of manual and industrial education was reached when an adequate teaching analysis had been made of the tool processes and construction methods employed in the mechanic arts. This is true whether one thinks of manual arts as being taught for vocational purposes or as a part of general education.... when the idea of analyzing the manual arts into their elements and of arranging these elements in pedagogical order was shown to be possible and practicable, it was recognized that these arts could be taught in schools by essentially the same teaching methods as other school subjects.[9]

As one searches for the origins of analysis for teaching purposes in industrial education, such points of origin are not too clear. Bennett[10] reports at some length on Pestalozzi's analysis of geometric drawing as one of the early recorded incidents.

> Pestalozzi maintained that the same principle of analysis and the construction of an alphabet which he used in teaching form should be applied in the teaching of practical abilities.[11]

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[9] Charles A. Bennett, History of Manual and Industrial Education, 1870-1917 (Peoria, Illinois: The Manual Arts Press, 1937), p. 13

[10] Charles A. Bennett, History of Manual and Industrial Education, up to 1870 (Peoria, Illinois: The Manual Arts Press, 1926), pp. 120-121.

[11] Ibid., p. 122

Another instance is reported by Bennett in which an analysis of sewing processes was used for identifying what should be taught.

> The system of samplers and other progressively graded exercises or problems employed in teaching the fundamental processes of sewing was a long step forward because it was the direct result of analysis made of the sewing processes with reference to teaching.[12]

But perhaps the real bench mark in using analysis as a basis for instruction in industrial education occurred in Russia. Victor Della Vos in the Imperial Technical School in Moscow developed a system of teaching shopwork as a part of the technical education of college-grade students. Bennett's conclusion about this work follows:

> But the outstanding fact concerning the system remains that it was the first to use scientific principles in analyzing the mechanic arts and basing courses of instruction on these analyses.[13]

In the first decade of the 1900's in an attempt to find more efficient methods of production, principles of scientific management were being developed. In his book on this subject, Frederick W. Taylor,[14] sometimes called the father of scientific management has described the situation that then existed as one of "initiative and incentive." By this he meant that workmen were ordinarily left pretty much to their own initiative as to how to proceed with their job and those that proceded effectively were likely to be given special incentive for their efforts. Management did not know more about the jobs than the collective group of workmen who performed them.

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[12] Ibid., p. 236.

[13] Charles A. Bennett, History of Manual and Industrial Education, 1870-1917 (Peoria, Illinois: The Manual Arts Press, 1937) P. 47.

[14] Frederick W. Taylor, The Principles of Scientific Management, New York: Harper and Brothers Publishers, 1911. p. 34.

In making studies of work performed, Taylor suggested that:

> Perhaps the most prominent single element in modern scientific management is the task idea. The work of every workman is fully planned out by the management at least one day in advance, and each man receives in most cases, complete written instructions, describing in detail the task which he is to accomplish, as well as the means to be used in doing the work....This task specifies not only what is to be done but how it is to be done and the exact time allowed for doing it.[15]

Here we have evidence (presented in 1911) of the need for analyzing tasks as they were being performed in industry for the purpose of more effective performance. It might be noted that the performance element was described, the conditions under which the performance was to take place were specified and the standard for performance was spelled out.

The purpose here was not for education. It was for increased production.

While Taylor worked in the area of "scientific management" for more efficient production and identified the "task" as the most prominent single element, Charles R. Allen was concerned with analysis of tasks for purposes of instruction which would subsequently result in production efficiency.

Wilbur[16] reports on some of the early analysis work by Charles R. Allen.

> During the first World War, as was the case also in the second World War, the United States found itself critically short of skilled workers needed in vital war

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[15]Ibid., p. 39.

[16]Gordon O. Wilbur, Industrial Arts in General Education, Scranton, Penn.: International Textbook Co., 1954, pp. 171-172.

> industries. A method for training large numbers of men quickly and effectively was needed. In this crisis, Charles R. Allen, a leader in vocational education, was asked to study the situation and develop a method for the training of shipyard workers. The study culminated in an analysis of all the "jobs" performed by shipyard workers and the preparation of carefully planned "job sheets" explaining exactly how each should be performed. A "job" was defined as "anything for the doing of which a man was paid." A book by Mr. Allen, entitled The Instructor, The Man and the Job, described the method of analysis, the preparation of "job sheets" and how to use them. This book was widely used as a text.

Allen applied the techniques of analysis of production jobs to the work-role of instructor. He referred to the job of instructor as a particular trade which when properly analyzed would reveal the elements required in providing effective instruction. He reasoned that for untrained instructors there are six common difficulties which they encounter.

> First, inability to take account of stock as to what he knows; that is, he knows it, but he has never listed it out. He cannot analyze his trade. Second, when he has to put over more than one job he does not know how to arrange the different jobs so that each job that the learner masters makes the mastery of the next job easier. He does not know how to arrange his jobs in an effective instructional order. Third, he is often unable to distinguish between what must be taught as jobs and what should be given to the learner in the form of information. Fourth, he does not know how to plan so that it will be given to the learner at the time that he must apply it on the job for the first time. Fifth, he does not know how to teach or put over any given job rapidly, effectively and thoroughly. Sixth, he does not know how to handle learners under instructional conditions though he may know how to handle them under production conditions.[17]

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[17]Charles R. Allen, The Instructor, The Man, and the Job, Philadelphia: J. B. Lippincott Co., 1919, p. 39.

In discussing the mechanic who is asked to help a fellow-workman (and is therefore, an instructor):

> It is one thing to know; it is another thing to know what you know. A man who has learned to do things by doing them is not, as a rule, in the habit of "taking stock" of his trade knowledge. On the job, he uses his knowledge and skill so unconsciously that he hardly gives a thought to how he does it or what he does to do it. He works, so to speak, automatically.
>
> When he undertakes to put over to somebody else what he knows, or what he can do, that is, when he becomes an instructor, he must be able to determine what he is going to teach. The learner does not know it; he has got to learn it. The instructor does know it and he must therefore know what he is going to put over to the learner so that he can determine just what the learner must know when he has instructed him.[18]

Allen dealt primarily in the area of vocational education and trade training. Another quotation focuses on analyzing the trade:

> Analyzing the trade simply means listing out all the things that the learner must be taught if he is to be taught the complete trade. If the trade is that of a carpenter, the instructor notes down all the different jobs that a carpenter has to do. If it is plumbing, or book binding, or machine shop work, the same listing of jobs must be carried out. If, in addition to the jobs themselves, there are certain special words (technical terms) whose use he must learn, or special tools whose names he must know, or construction or computations which he must be able to make or special safety precautions that he must take, these must also be listed completely out.
>
> The point in each case is to make a complete list of all that the man must know when the instructor has trained him for the complete trade. If less than the complete trade is to be taught then the problem is to pick out what is required in that case from the complete "trade list."[19]

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[18] Ibid., p. 39-40.

[19] Ibid., p. 43.

It remained for others to develop the use of analysis for identifying content for disciplines. Robert W. Selvidge wrote in 1923 on teaching a trade. His experiences in World War I provided his background. He explains the values of analysis toward this end:

> In order to teach a trade successfully, we must have a clear notion of what is required of the mechanic whose trade we would teach. Every important item must be known and listed. The teacher who does not have such a list is likely to go far astray and waste much valuable time even though he be highly skilled in the trade.
>
> Such a list is called 'The Analysis of the Trade.' It consists of the things one must know and must be able to do in order to be proficient in the trade. One part of this analysis is a list of the distinct processes involved in doing the work of the trade. Every operation of the trade involving skill or requiring instruction should be listed. The unskilled or low skilled operations need not be listed, as these may be performed by any person of ordinary intelligence with little or no instruction or practice.[20]

He also suggests analysis as a technique for identifying needs in related fields to the trade to be taught:

> In addition to the things one must be able to do and the information he must have, there are certain problems in science, mathematics, drawing, and in the business side of the trade which the proficient worker must be able to solve.[21]

W. W. Charters described the uses that had been made of job analysis prior to 1923.

> A somewhat more formal sort of analysis is that which is known as the job analysis. Used at first in the vocations as a device in the employment offices of organizations which were too large for the employment officer to be familiar with the duties of all the jobs in the organization, it spread very rapidly and came to

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[20]Robert W. Selvidge, How to Teach a Trade, Peoria, Ill.: The Manual Arts Press, 1923, p. 24.

[21]Ibid, p. 3.

> have its greatest usefulness and largest amount of publicity in connection with the Army during the World War. While its widest use in the vocations has been in connection with employment, its most valuable use is in connection with training programs.[22]

Selvidge, in 1926, writing about analysis, differentiated between the use to which industry put job analysis as compared with the use of analysis for instruction.

> Every manufacturer recognizes that the analysis of the product into such elements is the first step in efficient production. The differences between the manufacturing process and the educational process is that the manufacturer is satisfied to teach the worker the one small part he must do in order to get a given product, and rests at that, while in teaching it is considered desirable to give attention to the various elements involved in order that the training may have as wide an application as possible. The manufacturer bases his analysis on convenient units of instruction. The manufacturer seeks efficient production on a given job; the teacher seeks to give a training that will be effective in any job that may arise within the field. In either case, however, the analysis is necessary in order to find out what must be done to get the desired product.[23]

He goes on further to discuss the importance of analysis in preparation for developing instruction sheets for teaching.

> Whatever the type of instruction sheet, the first step in its preparation is to determine what is to be taught. This is done by careful analysis of the trade or subject in order to determine the items in which instruction is needed. Whether our task is to teach a complete trade, a division of it, or how to do a simple work job, it is necessary to have a list of the things we wish to teach if we are to perform our duties efficiently. Such a list should contain, in detail, the skills we wish to teach, the information we wish to impart, and the attitudes we wish to develop. It is the answer to the question "What do we expect the boy to know?"; "What do we expect him to be?"; and, "What do we expect him to be able to do at the end of our period of training?" Such an analysis gives us a list of topics upon which instructions may be based.[24]

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[22]W. W. Charters, Curriculum Construction, New York: The Macmillan Co., 1923, p. 35.

[23]Robert W. Selvidge, Individual Instruction Sheets-How to Write and How to Use Them, Peoria, Ill.: The Manual Arts Press, 1926, p. 6.

[24]Ibid., p. 15.

Smith indicated that in vocational fields their must be an analysis to identify content. Wide spread acceptance in the decade following World War I was then evident (in 1927):

> Those engaged in vocational education are agreed that an effective training program, for entrance to or for upgrading within any specific field of service, cannot be constructed on the basis of general knowledge of the work to be performed. It can be planned only after close study of the specific requirements and working conditions of the occupation in question. There must be an analysis, the nature and method of which shall be determined by the type and level and complexity of the work under survey....
>
> The extent to which those in charge of American public education, following the lead of, or with the cooperation of, professional training centers, have recently accepted the foregoing assumption has been very great. It has been so great, indeed, that surprise must continue that the method of analysis in curriculum construction waited so long for wide acceptance and was then, throughout the past decade, used so consistently and in such a variety of conditions.[25]

Smith also presented a critical review of the analysis method. Points he raised at that time sound very much like those in existence today.[26]

1. Analysis is never completed but should be made as nearly continuous as possible.
2. Certain marginal responsibilities may be difficult to analyze.
3. It is difficult, if not impossible to locate work-performers who are doing a good job which would then yield the most appropriate content.
4. We should be looking for what ought to be rather than what is.

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[25] Homer J. Smith, Industrial Education, Administration and Supervision, New York: The Century Co., 1927, p. 11.

[26] Ibid., pp. 19-21.

5. Analysis is the discovery of what a person must know and be able to do in selected type of employment.

6. Analysis results in the location of erroneous or wasteful practices and suggests improved procedures.

Evidences of Analysis to Derive Objectives for Education

Uhl suggested that objectives of education are derived by analysis and that there are seven different approaches that man has used to this end.

> The objectives of education are derived by observation and analysis of and speculation upon human activities, interests, needs, and capacities. Plato, Erasmus, Rousseau, and Spencer as well as more recent educationists, have followed this procedure. The differences among their ultimate objectives are due usually to differences in the character of the observation, analysis, and speculation employed and the amounts of attention given to activities, interests, and capacities rather than to differences in the activities, interests, and capacities considered.[27]

The seven approaches are as follows:

The derivation of objectives:

1. from an ideal form of society
2. by an analysis of "good character".
3. by an analysis of one class of individuals
4. by an analysis of the nature of children
5. by special reference to a certain branch of knowledge
6. by analysis of sociological values
7. by activity analysis.[28]

Uhl's work suggests something of the heritage analysis has as a technique for identifying objectives toward which education might be directed, going back as he does to the time of Plato.

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[27]Willis H. Uhl, Secondary School Curricula, New York: The Macmillan Co., 1927, p. 293.

[28]Ibid., pp. 294-299.

Charters visualized job analysis as having value as a method for analyzing instruction not limited to vocations. He indicates that:

> Analysis of activities is not an unfamiliar operation. It has long been used as a method of instruction, but its application has not been wide and the present emphasis upon analysis is an effort not so much to use a new method as to make wide application of a method which has been used for a long time in a few situations.[29]

He indicates that techniques of analysis are valuable in the public school curriculum:

> The public school curriculum. - In the reorganization of the course of study in the elementary schools we have now considered three points. We must, first of all, determine the size of the unit for which the curriculum is to be organized....after the unit has been selected, it is necessary, in the second place, for the faculties of the schools, the school boards, and public-spirited citizens generally, to decide upon the ideals which shall dominate the instruction of the youth in schools. Then, in the third place, an analysis must be made of the important activities of laymen, irrespective of the vocation which they may enter; this involves making an extra-vocational analysis; and, finally, determining after the analysis the essential elements of learning common to all vocations.[30]

Charters seems to be one of the earliest writers to apply analysis techniques to curriculum development outside of the realm of vocational subjects.

Bobbitt writes that activity-analysis should be employed to determine "activities which ought to make up the lives of men". In writing on How to Make a Curriculum he states:

> When we know what men and women ought to do along the many lines and levels of human experience, then we shall have before us the things for which they should be trained. The first task is to discover the activities which ought to make up the lives of men and women; and along with these, the abilities and personal qualities necessary for proper perfor-

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[29] W. W. Charters, op. cit., p. 34.

[30] Ibid., p. 54-55.

mance. These are the educational objectives.

> The plan to be employed is activity-analysis. The first step is to analyze the broad range of human experience into major fields. The lines can be drawn in any number of ways. Each curriculum-making group will make the divisions that seem best to it for its purposes.[31]

Bobbitt does not limit the analysis to practical arts and vocational fields. His recommendation in 1924 is to analyze the full range of human experience and to build a curriculum on that basis.

Evidences of Analysis in Teacher Education

Charters reports on a study by a committee of the Society of College Teachers of Education in which an analysis of work performed by teachers was made. In 1924 he wrote:

> A list of 139 duties was obtained by this means, and the returns from the questionnaire are now in process of being compiled to show the amount of participation, the frequency, the presence or absence of professional preparation, and the presence or absence of assistance from superiors.[32]

Bowman suggested that the teachers professional skills are made up of three elements, one of which is analysis:

> The teacher's professional skill is accordingly made up of three large factors: analysis, selection, and teaching. If any one of the three is lacking there is a drop in the professional skill.[33]

One of the landmarks in analysis as applied to teacher activities was the Commonwealth Teacher-Training Study. It proposed to

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[31]Franklin Bobbitt; How to Make a Curriculum, Boston: Houghton Mifflin Co., 1924, p. 8.

[32]W. W. Charters, op. cit., p. 340.

[33]Clyde A. Bowman, Graphic Aids in Occupational Analysis for Guidance and Teaching, Milwaukee: The Bruce Publishing Co., 1924, p. 15.

analyze the activities of teachers but to also give direction to the general non-technical knowledge the teacher should possess.

> A functional study tries to determine what the professional practitioner does under modern conditions of practice. From the objective record of what he does it attempts to derive the determination of what he must know and what he must be to perform these duties effectively. The functional study, if complete, should determine the technical knowledge and skill actually used by the practitioner. It should give helpful guidance in the determination of the general non-technical knowledge that the practitioner should possess.
>
> The Commonwealth Teacher Training study represents the most exhaustive application thus far of this new method to one of the more highly developed learned professions. In the opinion of the committee that sponsored it, it is especially timely. Of all the curriculum problems in higher education, that of the schools devoted to the preparation of teachers is perhaps the most vexed. It is hoped that both the new approach of this investigation and the wealth of material that it contains will furnish a more substantial basis than any hitherto available for the solution of the problem.[34]

The study identified 881 teacher activities organized under seven divisional headings:

Teacher Activities:

Division I Classroom instruction
- A. Teaching subject matter
- B. Teaching pupils to study

II School and class management
- A. Recording and reporting information concerning pupils
- B. Contacts with pupils

III Supervision of extra-classroom activities

IV Relationships with the personnel of the school staff

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[34]W. W. Charters and Douglas Waples, The Commonwealth Teacher-Training Study, Chicago, Ill. The University of Chicago Press, 1929, p. xvi.

V. Relationships with members of the school community
VI Professional and personal advancement
VII School plant and supplies

Caswell and Campbell point out the extensiveness of this study and the use of job analysis to undertake it.

> The "job analysis" technique is another procedure which implies the selection of subject matter by reference to adult needs. This technique is in fact closely related to "activity analysis." It is employed in developing curricula to prepare students to engage in particular occupations or professions. The activities involved in carrying on a particular occupation or profession are analyzed in detail and the student is trained in the performance of these activities. This, of course, determines in large measure the subject matter or content to be employed. The most extensive application of this technique is in connection with the Commonwealth Teacher-Training Study in which the activities of teachers are analyzed in detail and proposed as a basis for developing a suitable curriculum to train prospective teachers.[35]

It would seem that sufficient evidence has been presented to show that:

1. Analysis has been used as an important tool at least since the first decade of the 1900's to the end of providing for efficiency in industrial production.

2. Analysis has long been a significant tool in the identification of what should be taught in trade and vocational education.

3. Analysis techniques are useful not only in selecting content for trade instruction, but are believed to be useful for identifying content for instruction in any discipline.

4. Analysis of the work-role of the teacher as a basis for content for teacher education can be traced to the Commonwealth Teacher Training Study in 1929 and before that to the Society of College Teachers of Education immediately prior to 1923.

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[35] Hollis L. Caswell and Doak S. Campbell, Curriculum Development, New York: American Book Co., 1935, p. 259.

Developments from the 1930's to the Early 1960's

The thirty-year period from the early 1930's into the early 1960's finds a number of writers re-examining analysis as a technique for curriculum development.

Many of these writers were in the field of vocational education: Fryklund,[36] Selvidge and Fryklund,[37] Struck,[38] Silvius and Bohn,[39] and Rose[40] to mention a few.

A doctoral dissertation by Street in 1953 developed "Job Tasks of the Industrial Arts Teacher."[41]

In his study he developed eight groups of tasks as follows:

1. Cooperative endeavor in the design, execution and improvement of the total program of education.

2. Curriculum design -- both in the area of industrial arts and in the total program.

3. The providing of a permissive learning and working atmosphere - materials, space, time allotments, tools and machines and like items.

4. Student instruction -- discussions, demonstrations, use of teaching aids, motivation, and selecting learning experiences.

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[36]Verne C. Fryklund, Trade and Job Analysis, Milwaukee: The Bruce Publishing Co., 1942.

[37]R. C. Selvidge and V. C. Fryklund, Principles of Trade and Industrial Teaching, Peoria, Ill.: C. A. Bennett Co., 1946.

[38]F. Theodore Struck, Vocational Education for a Changing World, New York: John Wiley & Sons, 1945.

[39]G. Harold Silvius and Ralph C. Bohn, Organizing Course Materials, Bloomington, Ill.: McKnight and McKnight Publishing Co., 1961.

[40]Homer C. Rose, The Instructor and His Job, Chicago: The American Technical Society, 1961.

[41]Calvin M. Street, "The Development of a Competency Pattern with Application to the Area of Industrial Arts Education" (unpublished Doctor's dissertation, University of Tennessee, 1953)

5. Promotion and stimulation -- public and professional understandings, student interests, and the like.

6. Student guidance -- student objectives, learning difficulties, and others.

7. Administrative duties -- record keeping inventories, grades, and purchasing.

8. Evaluation -- industrial arts program effectiveness, total educational program effectiveness, and the assessment of student progress.[42]

Under each of these headings he listed from ten to twelve subtasks under each of the classifications of attitudes, skills, knowledges, and understanding.

Bloom's taxonomy provided a base for analysis in the educational domain as has already been cited. He identified three types or levels of analysis:

> Analysis, as an objective, may be divided into three types or levels. At one level the student is expected to break down the material into its constituent parts, to identify or classify the elements of the communication. At a second level he is required to make explicit the relationships among the elements, to determine their connections and interactions. A third level involves recognition of the organization principles, the arrangement and structure, which hold together the communication as a whole.[43]

The work by Bloom and others is an especially significant bench mark. In addition to analyzing "analysis" as a part of the cognitive domain, the entire taxonomy is applicable across all disciplines and therefore, forms a base for all educational objectives in this domain. The curriculum developer may use the taxonomy as a standard against

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[42] Ibid., pp. 229-263.

[43] Benjamin S. Bloom, op.cit, p. 145.

which he can inquire whether he has built into his curriculum a desired balance within each of the six levels of the domain: knowledge, comprehension, application, analysis, synthesis and evaluation.

As a continuation of the work in the classification of objectives a further volume in the affective domain was published in 1964. The nature of the affective domain is described as

> Objectives which emphasize a feeling tone, an emotion, or a degree of acceptance or rejection. Affective objectives vary from simple attention to selected phenomena to complex but internally consistent qualities of character and conscience.[44]

Also identified is the psychomotor domain. Objectives in it are described as follows:

> Objectives which emphasize some muscular or motor skill, some manipulation of material and object, or some act which requires a nueromuscular co-ordination.[45]

Such a classification of the psychomotor domain was made by Simpson[46] in 1966.

With the completion of this work in classification of objectives within the cognitive, affective, and psychomotor domains, a new and strong standard was made available whereby the curriculum worker could assess the extent to which his curriculum reflected in the desired proportions, each of these domains. These then were powerful analysis tools which became available and used in the decade from the middle '50's to the middle '60's.

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[44] David R. Krathwohl, et.al, Taxonomy of Educational Objectives, The Classification of Educational Goals, Handbook II: Affective Domain, New York: David McKay Co., Inc., 1964, p. 7.

[45] Ibid.

[46] Elizabeth J. Simpson, The Classification of Educational Objectives, Psychomotor Domain. Report of Contract OEC-5-85-104, U.S. Office of Education, Urbana: University of Illinois, 1966 (ERIC ED 010 368).

Developments Since the Early 1960's

In the 1960's and since, there has been another flury of activity in studying and writing about analysis as an effective technique in curriculum development. Several factors seem to be responsible for this increased activity.

1. Programmed learning required a very careful analysis of content to develop a systematic movement from step to step.

2. Bloom's taxonomy had provided a base for analysis and a structure for the cognitive domain.

3. Efforts to individualize instruction required careful analysis.

4. Specification of behavioral objectives required analysis of behaviors into carefully sequenced instructional groups.

5. "Packaged instruction" required an analysis of elements of instruction in order to permit orderly progression of the learner.

6. Systemization of instruction was based on analysis of elements and careful organization.

7. Assessment and accountability depend upon clear statements of pre-requisite tasks, instructional tasks and criteria for performance.

8. Dissatisfaction and criticism of the schools resulted in clear needs to make schools and instruction more relevant.

9. Use of computers permit handling of more data and again require analysis of content into component elements.

10. A movement toward self-instruction and self-paced learning focused on the need for clear specification of content and objectives.

11. Progress in educational technology permitted new techniques to be employed within various instructional systems.

12. Federal funding permitted and usually encouraged systematic development of instruction based on analysis.

13. Performance based teacher education programs require the use of analysis for identifying content.

14. Increased use of models in curriculum development usually are based upon analysis as the technique for curriculum development.

15. Competency based teacher certification is based upon careful analysis of work-role of the teacher.

16. Military training programs were quite successful in developing instructional systems based on analysis of the needs of persons occupying various work-roles in the military.

17. Flexible and modular scheduling techniques are based on careful analysis of content and "mods" that are appropriate to instruction in varying time blocks.

In the view of this writer, the report that seems to provide the best rationale for the use of analysis of behavior required as a basis for the development of programs of learning leading to successful work-role performance is by Gagne.[47] Gagne[48] identifies three broad goals of education upon which he believes their is high agreement:

1. making it possible for the individual to participate in and to share with other people a variety of aesthetic experiences.

2. development of responsible citizenship.

3. development of individual talents to the end of achieving satisfaction in a life work or vocation.

He raises the crucial question of How can we tell when an individual has achieved these goals? To answer this question he suggests that we must "analyze, or break down into smaller components or stages, the progression towards these goals."[49]

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[47]Robert M. Gagne, "Educational Objectives and Human Performance", Chapter 1, Learning and the Educational Process, John D. Krumboltz, Ed., Chicago, Rand McNally & Co., 1965.

[48]Ibid., p. 2

[49]Ibid., p. 4

"The fundamental reason why human performance is related to education is that it must be used to define what happens, or what is supposed to happen, in the educational process."[50]

"Human performance is the fundamental class of data one must have in order to infer learning."[51]

"One cannot tell whether learning has occurred until a difference in performance is observed."[52]

"Since observable human performance forms the basis on which the inference of learning is made, it would seem to be a corollary that these same performances should constitute the objectives of education."[53] However, Gagne points out that to define objectives by human performance is the subject of some debate. There are two primary issues: (1) accomplishment versus direction of change and (2) long-range unanticipated outcomes versus intermediate specified events.

> First, there is the argument that objectives should state what is to be attempted, not what is to be accomplished. In line with this idea, one sometimes finds objectives stated in some such was as this:
>
> The student should acquire a developing awareness of the magnitude of the solar system and the universe or
>
> The child should become increasingly confident in extemporaneous oral expression.
>
> It is difficult to know what to say about such statements except that they are weasel-worded. Why is it not possible to say exactly what one wants the student to do in showing his awareness of solar system magnitudes. Why is it not possible to state what kind of extemporaneous oral expressions one expects the child to perform? The answer may be,

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[50] Ibid., p. 4

[51] Ibid., p. 5

[52] Ibid., p. 4

[53] Ibid., p. 5

of course, that the latter kind of objectives can indeed be stated, but not all students will attain them. Unfortunately, this is probably true under present circumstances. It would be good, though, if we could amend the statement to read: "Not all students will attain them with the same speed." Then they would still remain objectives which any intelligent person could identify rather than descriptions which if not deliberately hedging are at least ambiguous.[54]

A second kind of objection to clearly stated objectives is a much more serious one. It runs like this: "I can't be sure exactly what the student should be able to do at the end of some period of instruction. In fact, I am not interested in this. What I am interested in is how he will perform five or ten or even twenty years hence."[55]

This is the only reason I can see that it is more serious, because actually it is intellectually insupportable. If one is actually interested in performances which will appear ten years hence, there is nothing wrong with that. Two courses of action are then available. The first is to perform some longitudinal studies to determine what differential factors are in the current educational backgrounds of people who behave desirably and people who behave undesirably at some future time. Alternatively one could experimentally introduce certain differences in the education of groups of present students, and follow them up after five or ten years to see what kinds of decisions they make. Both of these techniques are of course well known to behavioral scientists, and successful studies have been and are being done to find answers such as these.[56]

If we must make hypotheses concerning the precursors or determinants of some ultimate performances in advanced stages of education, or in adult life, by all means let us do so. But there is no reason not to make these hypotheses explicit. In fact I should call it presumptuous not to do so.[57]

But I return to an earlier point-unless it can be demonstrated that learning has occurred, the expectations of some other outcome seems slim indeed. And if one expects that learning is going to occur then this means there must be a demonstrable change in performance. There may be some other unexpected kind of change, but there has to be some particular

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[54]Ibid., p. 5-6

[55]Ibid., p. 6

[56]Ibid., p. 7

[57]Ibid., p. 7-8

> kind of change that can be specified. And that brings us back to human performance, since that is where the observable change will appear. There would seem to be no valid reason why such performances cannot be described.[58]

It seems clear enough that performances must be explicitly described whether they are long-range goals or not, and that even when we are interested in a direction for behavioral change that this can be identified by careful wording.

Gagne then reports three reasons for seeking to define educational objectives in terms of human performance.

> These objectives are used to tell us whether the inference of learning can be made. They are used as specifications of the kinds of questions to ask the student in assessing his current capabilities. They become important guides for the teacher's behavior in selecting appropriate instruction. And they could probably be used to greater advantage than they are at present in informing the student of goals to be achieved.[59]

Any description of human performance must contain a strong verb referring to observable human behavior. Such a verb is the action part of the tasks which are to be performed. Gagne states that:

> The task is, then, an extremely useful unit of description, which can be rather readily identified for any job, old or new.[60]

These tasks as descriptions of behaviors should serve in these ways: (1) they should express a purpose which makes sense within the larger context of the person's life goals; (2) this purpose should be distinguishable from others.[61]

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[58] Ibid., p. 8

[59] Ibid., p. 10

[60] Ibid., p. 12

[61] Ibid., p. 13

Gagne sees three reasons for analyzing human performance:

1. In designing a curriculum, it becomes very evident that certain objectives depend on other ones.[62]

2. Closely related to this reason for breaking down educational objectives into finer units is the need for assessing student progress.[63]

3. One of the most important reasons for analyzing objectives is to determine some important facts about the conditions for learning them.[64]

As a consequence of analyzing objectives Gagne sees two major outcomes

> a marvelous possibility becomes evident: all of this tremendous variety of human performance begins to fit together into categories, which can then be dealt with and thought about as classes of events, rather than as separate and distinct ones.[65]

By utilizing a relatively small number of categories or classes of behavior which are important to education, the steps that a student may take toward each more generally stated objective can be specified.

There are three implications suggested for the use of these behavior categories.[66]

> First, the establishment of each of these categories of performance requires a different set of conditions for learning and thus makes a difference in the method of instruction used to bring it about....
>
> Second, each of these performance classes implies something different with respect to the sequencing of instruction within a topic to be learned....
>
> Third, the classes of performance which are analyzed out of educational objectives suggest the possibility of "diagnostic" assessments of student progress along the way to a more comprehensive goal.

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[62] Ibid., p. 14

[63] Ibid., p. 15

[64] Ibid., p. 16

[65] Ibid., p. 17

[66] Ibid., pp. 20-21

Gagne's positions seem to clearly show the importance of specification of the work-role requirement to programs of effective preparation. Certainly, teachers would be better able to execute their tasks if these were explicitly stated and sound strategies were employed to lead the prospective and in-service teacher to competency in each task.

It is toward such a goal that these studies in industrial education are being undertaken.

Halfin and Courtney[67] studied common training requirements of secondary vocational teachers. Ten states were arbitrarily selected and respondents were drawn from vocational agriculture, trade and industry, home economics, business, and distributive education. The factor analysis of 130 items indicated that items tended to cluster into common groupings. These suggested that a common training effort might be appropriate for each of the types of vocational teachers included in this study.

An analysis by Cotrell[68] in 1970 yielded ten categories with 50 clusters and 390 performance elements related to vocational and technical teacher education. This study gained wide visibility in vocational technical education. It is reported that instructional packages for these tasks are being developed and field-tested by teams at the University of Missouri and at Oregon State University.

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[67]Harold H. Halfin and E. Wayne Courtney. Competencies of Vocational Teachers: The Identification of the Common Professional Training Requirements of Vocational Education Teachers, Menomonie, Wisconsin: Stout State University, the Graduate College, May, 1970.

[68]Calvin J. Cotrell, Model Curricula for Vocational and Technical Teacher Education: Teaching Career Analysis; Columbus, Ohio: The Ohio State University, The Center for Vocational and Technical Education, October 1970.

The Spanbauer[69] study at Fox Valley Technical Institute was based directly on the Cotrell study. This was a study to ascertain the feasibility of differentiated staffing for the Fox Valley Technical Institute.

Adapted from the Cotrell study is a study of teacher competencies currently underway at Wayne State University, Detroit, Michigan. This study,[70] is an effort by the Department of Vocational and Applied Arts Education to develop a competency-based teacher education program. A unique feature of the study is the specification of performance objectives for the professional and pre-service courses in their department.

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[69]Stan Spanbauer, The Process of Instruction: A Task Analysis, Fond du Lac, Wisconsin: Fox Valley Technical Institute, Division of Instructional Services. December 1971.

[70]Fred S. Cook, VAE Pre-Certification Teacher Education Program: Competencies and Performance Objectives, Detroit, Michigan: Wayne State University, College of Education, Department of Vocational and Applied Arts Education, Competency-Based Teacher Education Series, No. 1, September, 1972.

An extensive review of analysis in curriculum development was completed in 1969.[71] This report carries forward from about 1963 the role of analysis in curriculum development. In addition to a thorough treatment of analysis a 21-page bibliography is included. Larson summarizes this material by saying:

> Slow progress has been made towards the process of building vocational education curriculum on analysis. The present trend reflects improved analysis methodology, broader application to all services, and greater attention to the development of a systems approach to curriculum building.[72]

Growing out of the work of leaders such as Gagne, Mager and others who suggesting that performance is the basis for deriving educational objectives was the work of the American Association of Colleges for Teacher Education and its committee on Performance-Based Teacher Education.

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[71]Milton E. Larson, Review and Synthesis of Research: Analysis for Curriculum Development in Vocational Education, Columbus, Ohio: The Ohio State University, The Center for Research and Leadership Development in Vocational and Technical Education, 1969.

[72]Ibid., p. 52

> The committee has been charged with responsibility to study many efforts currently taking place in the United States in the area of performance-based teacher education. Based on this study, the committee is further charged to give direction to these developments so that their potential for improving teacher education will be brought into sharp focus for consideration by all who are involved in the renewal of teacher education.[73]

Current practice in teacher education seems to be collecting credits and completing student teaching. In performance-based programs:

> performance goals are specified, and agreed to, in rigorous detail in advance of instruction. The student must either be able to demonstrate his ability to promote desirable learning or exhibit behaviors known to promote it. He is held accountable, not for passing grades, but for attaining a given level of competency in performing the essential tasks of teaching; the training institution is itself held accountable for producing able teachers. Emphasis is on demonstrated product or output. Acceptance of this basic principle has program implications that are truly revolutionary.[74]

Elam has identified what he believes to be "the promise of PBTE" under ten points:

> The promise of performance-based teacher education lies primarily in: 1) The fact that its focus on objectives and its emphasis upon the sharing process by which those objectives are formulated in advance are made explicit and used as the basis for evaluating performance. 2) The fact that a large share of the responsibility for learning is shifted from teacher to student. 3) The fact that it increases efficiency through systematic use of feedback, motivating and guiding learning efforts of prospective teachers. 4) The fact that greater attention is given to variation among individual abilities, needs, and interests. 5) The fact that learning is tied more directly to the

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[73] Stanley Elam, Performance-Based Teacher Education, What is the State of the Art? Washington, D.C., American Association of Colleges for Teacher Education, 1971, p. iii.

[74] Ibid., p. 1-2.

objectives to be achieved than to the learning resources utilized to attain them. 6) The fact that prospective teachers are taught in the way they are expected to teach. 7) The fact that PBTE is consistent with democratic principles. 8) The fact that it is consistent with what we know about the psychology of learning. 9) The fact that it permits effective integration of theory and practice. 10) The fact that it provides better bases for designing research about teaching performance.[75]

A series of publications coming from the sponsorhip of this committee is now available:

1. Performance-Based Teacher Education: What is the State of the Art?
2. The Individualized, Competency-Based System of Teacher Education at Weber State College
3. Manchester Interview: Competency-Based Education/Certification
4. A Critique of Performance-Based Teacher Education
5. Competency-Based Teacher Education: A Scenario
6. Changing Teacher Education in a Large Urban University
7. Performance-Based Teacher Education: An Annotated Bibliography
8. Performance-Based Teacher Education Programs: A Comparitive Description
9. Competency-Based Education: The State of the Scene
10. A Humanistic Approach to Performance-Based Teacher Education

Work-role analysis is the basis upon which performance-based teacher education exists. It seems a natural extension of educational analysis as it was developing in the '20s.

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[75] Ibid., p. 14-15.

Criticism of this approach is still evident today even as it was at that time. Broudy[76] says that the assumption that teaching the whole is merely the sum of the parts is "a notoriously inadequate description of any human action, let alone one so complex as teaching." Critics have long reported the "fragmentation" that may occur when work-role behaviors are analyzed as a base for curriculum work. Critics have not argued that the fragments cannot be taught. They have argued that some complex behaviors cannot be reduced to this treatment and that the criterion of successful performance for these complex behaviors is not definite. The matter is not resolved.

Hopefully, the problems raised by critics will be looked upon as problems to be solved. Eventually this should strengthen the PBTE approach. Mager[77] has written several widely read books in the area of objectives, instruction, and analysis. One deals with analyzing performance problems. In it he presents a model for dealing with performance problems.

In another book he deals with goal analysis.[78] This is an attempt to be of assistance in the analysis and specification of performances that are desired. As practitioners use this information and as others write, perhaps the answers to criticisms that have been raised will overcome these criticisms.

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[76] Harry S. Broudy, A Critique of Performance-Based Teacher Education, Washington, D.C., American Association of Colleges for Teacher Education, 1972, p. 3.

[77] Robert F. Mager, Peter Pipe, Analyzing Performance Problems, Belmont Calif.: Fearon Publishers, 1970.

[78] Robert F. Mager, Goal Analysis, Belmont, Calif.: Fearon Publishers, 1972.

Summary

Analysis as a basis for identifying objectives for education and thereby suggesting content to be taught is certainly not a new technique. Uhl's reference to Plato (Circa: 400, B.C.) places it at least before the time of Christ.

In the field of industrial education, Bennett referred to Pestalozzi's analysis (Circa: 1800) of geometric drawing as among the earliest of recorded records. He suggested that the work of Victor Della Vos (Circa: 1870) was a turning point in using analysis as a basis for instruction in industrial education.

Taylor's work in industry (Circa: 1910) dealt with analysis of jobs for the purpose of more efficiency in production.

Allen (Circa: 1915) used job analysis as the basis for training skilled workers demanded by the war effort. When the war was over he turned his efforts to trade and job analysis in vocational education.

Charters in 1923 saw job analysis as having value as a method for analyzing instruction not limited to vocations.

Charters also identified the Society of College Teachers of Education as among the earliest formal attempts to use this method of analysis of the work performed by teachers (1924).

Smith identified several of the earliest criticisms being leveled at the analysis technique (1927).

Charters and Waples Commonwealth Teacher Training Study (1929) was one of the most exhaustive analysis studies in the teacher training field.

Considerable additional literature on analysis as a basis for curriculum work came forth in the 1930's, the 1940's and the 1950's.

Among the more significant of these was the Taxonomy of Educational Objectives, the Classification of Educational Goals, Handbook 1: Cognitive Domain by Benjamin Bloom, Editor, in 1956. The hierarchical structure of six levels within the cognitive domain, one of which was analysis, formed the basis for additional curriculum work in most, if not all, disciplines.

A number of additional factors caused the increased activity in the use of analysis as a technique for curriculum development into the 1960's and 70's.

Perhaps one of the most carefully developed papers, and certainly one that most influenced the present writer was by Gagne on "Educational Objectives and Human Performance" (1965). His clear statement of the need for careful analysis of broad educational goals into their constituent parts, thus making goals more explicit and more directly related to the human performance required seems sound indeed.

Current efforts of the Performance Based Teacher Education committee of the AACTE is producing a series of publications useful for those interested in PBTE.

These studies in industrial teacher education at UW-Stout are a natural extention of earlier efforts to develop the best possible programs of pre-service and in=service preparation for industrial education teachers.

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