12-1977

Curriculum Development at the Ottawa Area Skills Center in the City of Holland

Weyman V. Helton
Western Michigan University

CURRICULUM DEVELOPMENT AT THE OTTAWA AREA SKILLS CENTER IN THE CITY OF HOLLAND

by

Weyman V. Helton

A Project Report
Submitted to the
Faculty of the Graduate College
in partial fulfillment
of the
Specialist in Education Degree

Western Michigan University
Kalamazoo, Michigan
December 1977

ACKNOWLEDGEMENTS

I would like to express my appreciation to Professor Carol F. Sheffer. Before and during the writing of this project she has been an inspiration to me. She has never accepted anything less than the best of which the student was capable. It is my sincere hope that this project will not be a disappointment to her.

I would also like to acknowledge the assistance and help of Mr. John Hyde. This project would not have been possible without his help.

While acknowledging the assistance of these two fine persons, I accept full responsibility for this project.

Weyman V. Helton

TABLE OF CONTENTS

		PAGE
INTRODUCTION		1
PROSPECTUS		4
CHAPTER		
I	PLANNING THE INTERNSHIP	9
	Introduction	9
	The Prospectus	9
	Administrative Experience	11
	The Log	12
	The Project	12
	Summary	13
II	THE PROGRAM	14
	Introduction	14
	Strategy of Instructional Development	14
	Preparation Phase	17
	Development Phase	18
	Improvement Phase	19
	Task Analysis	20
	The Target Population	25
	Job Description	28
III	THE COURSES	34
	Course Objectives	34
	Course Prerequisites	39
	Measuring Instruments	42

CHAPTER PAGE

Types of Performance 48

Sequencing Instructional Units 58

Lesson Plan Development 61

Improving Course Efficiency 66

Improving Course Effectiveness 68

Summary 72

IV THE PROCEDURES 73

Introduction 73

Characteristics of Instructional Procedures and Methods 73

Advantages of Instructional Procedures and Methods 75

Summary 81

V LOOKING BACK 82

Summary 82

BIBLIOGRAPHY 84

INTRODUCTION

Within every school system there are differing thoughts and theories about the learning process. At one end of the continuum are the thought process that promote mental development. The intellectual teacher will generally be found promoting this theoretical position, insisting that we are nothing more than what we have thought. The other end of the continuum can be represented by the coaching fraternity and the manual training teacher, who generally insist that the position of the intellectually oriented teacher is incomplete. They will say that s/he is not a balanced individual and, therefore, that s/he lacks something as both a person and a teacher. While I would like to be regarded as an intellectual teacher, I recognize the validity of the statement. It was as a result of this process of intellectualizing that I decided to investigate the learning processes involved in a vocational school setting. I remembered from my first contacts with psychology about the concepts of recall, chaining, and reinforcement. Do these concepts complete the total methodology involved in learning? Does a man learn to tune a guitar with the same ear that he learns to tune an automobile engine? Do we forget ninety per cent of all we are exposed to? It was in order to answer these questions that I chose to become an intern at The Ottawa Area Skills Center in the summer of 1977. During this internship I was exposed to the techniques and guidance of a fine instructor and administrator, Mr. John Hyde. Mr. Hyde had been successful in beginning three vocational schools in various parts of the country. Obviously I was

fortunate to have the benefit of his experience. One of the concepts that Mr. Hyde had developed over the years was task analysis, which is the process of breaking a complicated task into its smallest component parts. Several State Departments of Education have used this process in the development of their vocational school programs. Mr. Hyde had acquired manuals or modules from several states incorporating the task analysis processes. During my research time and on the weekends, I studied these programs diligently. I also reread Robert Gagne's The Conditions of Learning.[1]

Mr. Hyde had employed eleven instructors, of whom most had no background at all in teaching. They were skilled in their trades, but they had yet to be tested as classroom teachers. The major task that Mr. Hyde desired of me was to assist him in developing in-service training experiences for these instructional managers. I was regarded as an experienced teacher and my major contribution to Mr. Hyde's program was to assist him in getting these instructors off to a good and successful beginning. Mr. Hyde and I went through the process of task analysis at least three times with each instructor. It was my plan to integrate the learning concepts of Gagne with the modules of the various institutions that Mr. Hyde was using.

The plan or prospectus for the internship is included in the following section. It was developed prior to the internship and without a comprehensive understanding of what the experience would involve. Consequently, some of the expected goals of the prospectus were not attained.

---

[1]Gagné, Robert M., The Conditions of Learning (New York: Holt, Rinehart and Winston, 1966).

The Ottawa Area Skills Center serves the following school systems: Holland Public Schools, Holland Christian Schools, Hudsonville Public Schools, Hudsonville Unity Christian School, Hamilton Public Schools, Saugatuck Public Schools, Zeeland Public Schools, Allendale Public Schools, Grand Haven Public Schools, West Ottawa Public Schools, Spring Lake Public Schools, Coopersville Public Schools, and Jenison Public Schools. These school districts make up the Ottawa Intermediate School District in western Michigan. The area is conservative, not cosmopolitan, frugal, and religious. It is also unique culturally, having a large percentage of Dutch immigrants.

The Ottawa Area Skills Center opened in the fall of 1977. However, the program was incomplete. The full program awaits completion of the buildings. The Center is administered by Mr. Gordon Rinquist, Principal, Mr. John Hyde, Program Director, and Mr. Dennis Ericson, Director of Special Services.

MAJOR INTERNSHIP PROSPECTUS

SPONSORING ORGANIZATION: Ottawa County Intermediate School District

FIELD SUPERVISOR: Mr. John Hyde, Director of Curriculum for The Ottawa Area Skills Center

UNIVERSITY SUPERVISOR: Dr. Carol Sheffer, Western Michigan University

MAJOR FOCUS OF EXPERIENCE: Analysis and research into the makeup of the vocational skills teaching methods, and of the operation of the vocational skills center.

DURATION: Six weeks, beginning on July 5, 1977, with a break from August 5, 1977 until August 22, 1977.

RATIONALE:

The American system of public education is under attack from virtually every quarter as inept, impractical, devious, selective, prejudicial, and as a promoter of inequality. The general focus of these attacks is on programs and their effectiveness in meeting the needs of the student of today. At a time when equality of opportunity is the legal order of the courts, researchers have found that the typical urban high school is not meeting the needs of the non-college bound student.

During the course of this internship, I hope to become acquainted with the methods of instruction in the vocational setting, the selection process by which the students enter their programs, and the Career Ladder curriculum process through which the student travels from career decision to gainful employment.

I anticipate this experience as a great opportunity for personal growth.

Weyman Helton
88 West 20th Street
Holland, Michigan 49423

PROJECTED NATURE OF INTERNSHIP EXPERIENCES

OBJECTIVES	EXPERIENCES AND CONTACTS	TERMINAL SKILLS
CONCEPTUAL	The intern will:	The intern will:
1. To become acquainted with Center policy.	have conferences with administrative personnel and have input into writing student handbooks	be able to compose a student handbook
2. To know how students are selected.	read and discuss policy in regard to the selection process.	be able to advise students on the advantages of the programs in a pragmatic manner
3. To know if only lip service is paid to the handicapped and special needs student.	discuss these problems with the advocates	know if real equality of
4. To know the different teaching methods that are required for the vocational setting.	have conferences with teachers, read journals and other publications in the vocational field	internalize the various methods of instruction in this area
5. To foster true equality for the vocational student.	observe the selection process; observe affective behaviors of regular school personnel	promulgate the attitude of hand work as an equal to head work
6. To become a more effective teacher in my home school.	maintain a positive attitude toward this opportunity for a broadening personal experience	become a more effective teacher

OBJECTIVES	EXPERIENCES AND CONTACTS	TERMINAL SKILLS
	The intern will:	The intern will:
7. To become aware of community input into the skills center.	attend board meetings, meet with the advisory council, and visit REMC	use outside resources more effectively
8. To become acquainted with varying methods of evaluation.	observe the process of evaluation based on competencies	be able to evaluate more reliably
HUMAN		
9. To become personally familiar with the advocates.	confer with the three advocates hired for the center	introduce the resource person to public education
10. To become acquainted with the administrative plan of relaxation.	meeting in the coffee room with other personnel	become familiar with the continuous day
11. To establish good rapport with the instructional managers.	going through the schedule with each person; becoming personally appreciative of the background of each instructor	appreciate the varying skills of the instructional managers
12. Become familiar with the work certification process.	compose a terminal report of skills for the student to give to a prospective employer	foresee the job market and the supply and demand for services in the vocational fields taught at the center

OBJECTIVES	EXPERIENCES AND CONTACTS	TERMINAL SKILLS
	The intern will:	The intern will:
13. Meet the personnel of the Intermediate School District.	coffee breaks, Board Meetings, informal	appreciate the relationship of this group to the home school
14. To personally become more appreciative of the work problem and its relationship to the spiritual or academic aspect of teaching.	the instructors, the students, and the construction personnel	visualize the many stages of construction and the enormity of the planning process
15. To appreciate assistance of personnel under whom this experience takes place.	spend time with them, both formally and informally	be able to reciprocate to another student
16. To observe the social levels at work in the program.	spend time with personnel, construction men, instructors, and students	appreciate heterogeneous grouping
TECHNICAL		
17. Be able to write a lesson plan for a vocational area.	meetings with Mr. Hyde and other instructors	plan improved lessons
18. Become knowledgeable about the various vocational areas.	meeting with instructors and the construction men	experience personal growth
19. Be able to design a Career Ladder curriculum.	curriculum planning	become more appreciative of all types of labor

OBJECTIVES	EXPERIENCES AND CONTACTS	TERMINAL SKILLS
	The intern will:	The intern will:
20. To keep an accurate log.	daily procedure	keep an accurate record
21. To compose a meaningful project as a culminating experience based on this internship.	inclusive of all experiences and contacts	produce an acceptable project

I. PLANNING THE INTERNSHIP

Introduction

In this chapter I shall present my prospectus objectives, the experiences I had which fulfilled these objectives, a listing of objectives that were not achieved, administrative experiences that I had, and the log which I kept. Also, I shall try to guide the reader to the heart of this paper with some rational statements about the way in which the paper was formed and the reasons for the project paper.

The Prospectus

The prospectus was written before the internship was well understood. Therefore, many of the goals of the prospectus were not achieved. I had not a great deal of choice in finding this experience. In fact, I had only two positive responses to my inquiries. One of these proved to be unacceptable after an interview. I considered myself fortunate to have had the contact that led to the internship which I had. I feel that I was able to obtain the internship at The Skills Center because of a positive experience shared there by Mr. John Hyde and an intern from Western Michigan University last summer. So the prospectus was written rather boldly and broadly with the anticipation that not all objectives would be realized.

One of the objectives written into the prospectus was to become acquainted with the policies of the Center. I believe that this objective was realized in the following manner. On several occasions

Mr. Rinquist, Mr. Hyde, Mr. Ericson and I sat down and discussed Center policy, and I had input into a revision of several of the items.

A second objective was to learn the structure whereby the students were selected for the programs. I learned that the students were selected by the local school, usually by the counselors. Other than that, this particular objective was not realized.

Another objective was to find out how handicapped students were treated and selected for training. I spent several hours with Mr. Kenneth Heuvelman, Special Education Director for the district, and I was very impressed with the man and the programs. In fact, I count my experiences with Mr. Heuvelman as some of the most rewarding of my internship. Signs were placed at the Center, indicating special emphasis for the handicapped. Special walkways and ramps were constructed. However, I was not able to observe actual training programs for handicapped students. I feel that these programs may be more lip service than anything else.

I wanted to gain knowledge of teaching methods used in the vocational setting. I believe that I was quite successful in realizing this objective. The body of this paper concerns teaching methods. I found that Mr. Hyde was an expert in this field, and I was able to share many hours of discussion with him. As a matter of fact, we discussed the process of instruction until I tired of it.

Another objective was to become a better teacher in my home school. I do not believe that my internship experience has had any effect on my classroom effectiveness. To promote equality for the vocational education student was one of my goals. It should not have been

written into the prospectus as it was wordy, idealistic, and without real meaning.

In becoming acquainted with the advocates, the intern found them to be counselors as far as role was concerned. Rapport was established with the instructors, with one exception. No further reference will be made on the basis of ethics. Meeting the personnel of the Intermediate School District office was very rewarding. One of the adjustments that had to be made was the manner of taking breaks. The intern had been accustomed to taking five minutes between classes. It was soon discovered that one thirty minute break for coffee early in the morning was the norm for the executives. This provided a convenient forum for discussing the "scores."

Another objective was realized quite well. That was the writing of lesson plans for the vocational school. Helping twelve different instructors write plans for their courses was very useful.

Altogether there were twenty-one objectives in the prospectus. Some degree of success was obtained in about seventy per cent of these.

Administrative Experiences

The intern did not feel that he was given any power of decision in this area. He really did not expect any either. However, he was allowed input into many discussions. Frankly, the intern felt a little uncomfortable several times. It was not an overt thing, just a feeling of being in the way. I helped Mr. Ericson compose a student handbook. While this was mostly research, it was an administrative function. One of the better experiences in this area was relating to the building contractors. Since so many new schools are being built, the writer

thought that this function was very good. The conducting of several sessions of in-service training for the instructors had some administrative value. Also, the participation meetings with area school administrators in reference to the program of the Center was useful. This area of the internship was a disappointment.

The Log

I did keep a log of hours spent and activities participated in. However, they proved of little value in the final product of the internship, and it has been omitted from this paper. The intern must accept some responsibility for the failure of the log to be useful in writing of the paper.

The Project

It was my understanding that the intern could choose virtually any subject he wished from the internship for the purpose of the project. This intern chose to write a paper on the development of the program of instruction at the Center. Mr. Hyde informed the intern in the beginning that he considered my major function to be the helping of instructors in the development of their teaching methods. Mr. Hyde had developed a curriculum process which he called Task Analysis. This process was to be the basis of instruction in all of the different programs. The process was based on his experience and the modules from Ohio State University, the University of Georgia, and the University of Washington. Basically, the procedure was that of taking a complicated task and breaking it into smaller parts and teaching these smaller parts separately. The process also involved entrance and exit

tests to avoid useless instruction. The instructional managers, as the teachers were called, were not trained in pedagogy. Many did not have a college degree. However, they did have skill and knowledge in their field. My major task during the internship was to take my experiences as a teacher and integrate those experiences with Mr. Hyde's Task Analysis process and produce a product that would be helpful in the classroom for the instructional managers. I reviewed some of my psychology of learning and attempted to integrate some valid concepts into the paper. The following three chapters are the heart of that effort.

Summary

The internship did not fulfill all of the objectives listed in the prospectus. The area of actual administrative decision making was the weakest part of the experience. The most rewarding part of the internship was the personal relationships established. While the internship was not completely satisfying, I do feel that I was fortunate in having had the experience.

II. THE PROGRAM

Introduction

Many times during a considerable number of years, various people interested in education have asked me what is involved in learning. I have given them the answer that seemed suited to the climate, clientele, and the cause. While my answers were not the same in their terminology, I believe they were somewhat similar in their themes. To the person who is interested in knowing what principles of learning apply to education, my reply is: "The question must be asked and answered with consideration of what type of skills and knowledge is being learned." The point is that learning involves the same process wherever it occurs.

While there is little agreement about the way in which human behavior is changed, there are some generalizations that can be made about several types of performance changing. For purposes of this paper this change in performance is what I shall refer to as learning.

Strategy of Instructional Development

How does one go about setting up a plant to manufacture a particular product? Would one begin by ordering machinery, by setting up a production line, or by hiring personnel? Or would one begin by insisting on seeing a detailed blueprint of the product one intended to produce?

What is usually meant when someone says that he performs a job systematically? Does it mean that he picks a tool at random from his toolbox, that he tries the first thing that comes to his mind, or that he uses the same tool for every job? Or does it mean that he first tries to see the various parts of the problem, decides exactly what results he wants to obtain, selects and applies the tool most suitable to getting the desired result, and then checks to see that the result has actually been obtained. These kinds of questions were brought to my attention many times during my internship with John Hyde.

The systematic development of curriculum is accomplished by a procedure similar to that implied in the paragraph above. It involves detailed specifications of the desired result, development of an instrument by which success can be measured, development of procedures, lessons, and materials designed to achieve the specified result, and steps to insure the continual improvement of course effectiveness.

In this chapter, I will summarize all the steps of the systematic development of curriculum. In the sections to follow, I will describe how each of the steps may be accomplished. Some of the steps are easier to perform than others. Although some of the steps will ask one to do things he may not have done before, the overall process is one with which many persons are already familiar. The reason for this is simply that systematic development of a course of instruction is no different than the systematic construction of an airplane, or the systematic design and construction of a building, or systematic performance of the tasks associated with teaching. The instruments are different, but the procedure is the same.

Essentially, the three phases of the curriculum development procedure are:

1. Determination and description of what is to be achieved.
2. Identification of the steps necessary to achieve the desired result.
3. Evaluation of the extent to which results were achieved.

In developing curriculum, this means identifying and describing the objectives, developing lessons and materials designed to meet these objectives, determining how well the objectives were achieved and then modifying the course to improve the results. Regardless of subject matter, the ultimate goal of vocational instruction is to send the student out into society with the capability of performing satisfactorily on the job and of improving her/his skill with further practice.

To achieve the first objective, it is necessary to know what the job entails, what one needs to do to perform each of the tasks, and how frequently each of the tasks is performed. The student must be provided with practice in performing these tasks under conditions as much like the job as possible. To reach the second objective, it is essential that the student be taught enough about each task so s/he can tell the difference between doing it right and doing it wrong, so that attempts to perform each of the job tasks can be evaluated.

Experience is no teacher unless it is accompanied by information about the quality of the performance. Therefore, for the student to be able to improve with practice, it is necessary that s/he be able to recognize good performance and bad performance, whether seeing it in others or in oneself.

The strategy of developing effective instruction, then, is one that calls for performance orientation rather than subject matter orientation. The intellectual teacher is prone to be subject matter oriented.[1] The strategy in performance orientation is to use the job as the basis for deciding what will be taught and in what order and depth, rather than simply to present as much subject matter as possible in the allotted time. Consequently, the subject matter orientation is not appropriate in vocational skill development settings.

The three phases of vocational course development include: the preparation phase, the development phase, and the improvement phase. Each phase includes several steps.

Preparation Phase

The steps of the preparation phase are designed to insure that all information and practice necessary to perform the job are included in the course. These steps lead to the systematic derivation of course objectives, and begin with the job itself rather than with content.

The first step in the preparation phase includes describing in general terms those tasks that a person does when performing the job successfully. The second step is to describe job performance in greater detail, listing each of the tasks of which the job is composed and describing the steps in each of these tasks. This is task analysis. In the next step the student population is described, as it exists, rather than as one might like it to be. Then entry skills are prepared,

---

[1]Hyde, John, "The Process of Curriculum Development." Ottawa County Intermediate School District, 1977.

primarily on the basis of the student description, and are adjusted on the basis of the course objectives. Course objectives are derived primarily from the task analyses formation steps; they are adjusted on the basis of course prerequisites and such administrative constraints as available time and facilities.

The final step of the preparation phase is that of preparing measuring instruments (examinations) with which to measure success. The criterion exam (which is similar to final inspection) is developed strictly from the course objectives, and the prerequisites test (entering skill test) is developed strictly from the course prerequisites. An entrance skills examination is necessary if the resources of the learning process are going to be used efficiently.

Development Phase

Prerequisites define the starting point of instruction; objectives define the end point of instruction. The difference between what the student has as prerequisite skills and what s/he should have as terminal objective skills is the gap instruction is designed to bridge.

Course development begins by outlining instructional units in terms of job tasks so that at the end of each unit the student will be able to do something that s/he could not do before, thus helping to insure the continued motivation of the student. The next step is to identify the type of performance associated with each of the steps in each of the tasks so thatintelligent decisions may be made about instructional techniques most appropriate for the teaching of each task and about selection of instructional materials and devices.

Preliminary sequencing of the units is then carried out according to guides intended to maximize student skill and course efficiency. Content is identified, instructional procedures or materials relevant to each lesson are listed, and an appropriate selection is made. Final sequencing is established, lesson plans are completed, and the course is ready for implementation.

Improvement Phase

The professional instructor would no more stop improving her/his instruction than the professional physician would stop improving her/his medical skills. Vocations change, new teaching techniques and devices become available, and the general characteristics of the incoming students may gradually shift. It is appropriate, therefore, to establish a process guaranteeing that the course will be as current as possible. This is probably the simplest part of the development process, and involves checking how well the instruction meets the objectives, and how well the objectives meet the job. Indicated modifications are then made, and another course is conducted.

In the following pages I will describe each of the steps in the process of improvement previously mentioned and provide an assortment of examples. Though the steps are described in sequence, it is not intended to imply that any step is completed and then forever left untouched. In practice it is often necessary to modify what was done in earlier steps in light of what develops in later steps.

Task Analysis

The implication of studies in problem solving is clear. Individuals may learn to instruct themselves. Presumably problem solving principles are learned in the same manner as other principles are. However, they do not appear as part of the problem solving process itself. It is reasonable that the ability to analyze problems is learned as any other concept. The ability to break a problem into its component parts is vital to vocational training. The ability to analyze can be taught as a skill. This is the principle I will discuss in this segment.

Developing modules

The job description sketches the outlines and important aspects of the job to be taught, but the job description alone is not an adequate enough basis from which to develop a course of instruction. It is not specific enough. Therefore, from the job description one must turn to the more detailed concept of task analysis. By task analysis the job can be broken into smaller component parts. These parts are referred to as modules.[2]

A task is a logically related set of actions required for the completion of a job objective. Stated another way, a task is a complete job element. A job or vocation includes a number of tasks. For example, one of the tasks that must be performed by the auto mechanic is that of changing a tire; all of the steps involved in tire changing

---

[2]Hyde, op. cit., p. ii.

make up the complete task. One part of the salesperson's job is writing orders. That is one task that makes up the salesperson's job. Preparing a batch of mortar is one task making up the mason's job.

Task listing

The first step in task analysis is listing all the tasks that might be included in the job description. A person can probably list most of them just by thinking about the job for awhile and by looking at the job description. One will develop a more complete list if s/he observes and talks with individuals now working at the job. This effort will help avoid a serious teaching trap or pitfall. That trap or pitfall is loading the course with irrelevant content.

Consulting with a person now on the job will help one identify what tasks comprise the job. The supervisor could be consulted to determine the precise job description. Based on this finding, evaluation should take place as to which tasks are reasonably included in a list of qualifications based upon the probability of need.

A note of caution is in order. An instructor will not be teaching all of the tasks listed in the analysis. Some will be deleted for reasons explained later in this project. The important thing is to list all the tasks that go to make up the vocation.

Here are two examples of such a list. The first is taken from Harless.[3]

---

[3]Harless, "The Ugly Duckling Learns to Fly," NSPI Journal, 1966 Vol. 5, pp. 3-6.

Example 1: service station mechanic-attendant

1. Cleans or replaces spark plugs.
2. Adjusts and bleeds brakes.
3. Replaces wheel cylinders.
4. Inspects and flushes radiators.
5. Tests antifreeze.
6. Repairs tube or tubeless tires.
7. Rotates tires.
8. Lubricates vehicles.
9. Balances tires.
10. Replaces air cleaners.
11. Cleans or replaces gas filters.
12. Washes and waxes automobile.
13. Sells automobile accessories.
14. Replaces oil filters.
15. Checks oil, brake fluid, power steering, etc.
16. Washes windshields, replaces blades.
17. Fills gas tanks, radiators.
18. Keeps daily records of sales, inventory changes.
19. Orders supplies.
20. Opens and closes station.

Example 2: painter

1. Refinishes old as well as new surfaces.
2. Selects paint, varnish, lacquer, or other types of finishing material.
3. Selects appropriate brushes and rollers.
4. Removes trim and obstacles before finishing.
5. Removes existing finish from surfaces when required.
6. Fills cracks and holes with appropriate substitutes.
7. Mixes and thins finishing material to correct consistency.
8. Adds color to finishing material when necessary.
9. Masks areas not to be finished.
10. Selects and supplies appropriate ground and furniture covering.
11. Operates a ladder truck.
12. Countersinks nails, brads, and other obstructions.
13. Waxes, and replaces doors, drawers, etc., when finished.
14. Acts as a consultant to the public.
15. Cleans area when finished.
16. Orders supplies.
17. Maintains records of previous jobs, colors, and materials.

Task detailing

The second position in task analysis is the delineation of each of the listed positions in terms of what an individual is capable of

accomplishing. If this step is omitted, it is possible to fall into one of two teaching traps. One is the trap of spending a lot of time teaching something that is difficult to teach, even though it is not one of the highly important things to teach. It is possible to spend more and more time teaching a difficult but relatively unimportant topic.

The other trap is that of forgetting to include in the course something that is very easy to teach but that is absolutely essential to learn. For example, it is very easy to teach that a missile repairperson be able to locate each of the units s/he might be expected to restore. Going on the assumption that teaching the location of components is relatively simple, one course felt "a student couldn't possibly get through the course without learning the location of the units."[4] However, students did graduate without knowing how to find many of the things they were expected to repair. By knowing in detail what the job involves, it is less likely that those essential but easy tasks will be left out of the curriculum.

Following are some sample tasks that have been developed into routines.

Example 1: electronics technician

Task: Soldering components

1. Identify joint to be soldered.
2. Select the appropriate iron and solder.
3. Clean joint and tin if necessary.
4. Place the iron on the joint.
5. Apply the appropriate amount of rosin.
6. Check and examine the joint; seal if necessary.
7. Clean surroundings and replace tools when finished.

---

[4]Ibid.

Example 2: service station mechanic-attendant

Task: Clean and replace air filter

1. Identify the type of cleaner to be used.
2. Remove filter assembly.
3. Drain and clean cartridge and filter holder.
4. Refill bowl with clean oil.
5. Reassemble unit into mount.
6. Check for performance.
7. Clean area and replace tools.

Example 3: service station mechanic-attendant

Task: Clean and replace spark plugs

1. Note plug location relative to the cylinder; remove plug covers, leads.
2. Remove all spark plugs.
3. Identify the type of plugs.
4. Decide whether to clean, adjust, and/or replace plugs.
5. Adjust and clean plugs, if appropriate.
6. Reinsert plugs in engine.
7. Connect ignition wire to appropriate plugs.
8. Check engine firing for maximum performance.
9. Clean and replace equipment and tools.

Example 4: painter

Task: Refinishes wood

1. Identify the type of wood to be refinished.
2. Select appropriate paint or finish remover.
3. Remove old finish with appropriate remover.
4. Sand and fill where necessary.
5. Apply stain, sealer, or other agent.
6. Apply finish coat of lacquer, paint, varnish or some other finishing agent.
7. Smooth and polish when dry.
8. Repeat steps above as often as required for quality finish.
9. Check for color, smoothness, and completeness.
10. Clean work area and equipment.[5]

The taking of a task and the breaking of it into its smaller parts is the heart of the modular process. Therefore, one of the vital skills in the process of task analysis is the ability to divide the

---

[5]Hyde, op. cit., p. iii.

task properly. This skill requires knowledge of the total task and knowledge of the most effective division of the task into modular form. One of the interesting problems I discussed during the internship was the process by which the instructor acquires this skill. Mr. Hyde and I discussed the possibility that the skill was an inborn one. That approach did not last too long when placed under the microscope of human learning. Then, Mr. Hyde and I viewed the process as one of acquired experience of a single person working at the task over an extended period of time. We finally settled on the concept that skill was the combined experiences of many persons who had worked at the particular task.

I was given a first hand experience with the process as part of my internship. It was through explaining the process many times to the instructors that I learned the process myself. I believe that the process is well integrated into my thought processes at this time.

The Target Population

Although the design of a vocational course is strongly influenced by a careful analysis of the vocation itself, it is also influenced by the kind of students who enroll for training. The course must be designed for the target population that actually exists. It is foolish and wasteful to design a course without knowing the target population. The major characteristics of the target population constitute the starting point of the course. The performance level demanded in the course objectives constitutes the finishing point. The process of turning the incoming student into the skilled graduate constitutes

the course itself. The substance of the course, therefore, is what the student has learned and accomplished from the instruction given.

If a person were to ask you to tell him about the students you have, or expect to have, in one of your classes, what would you tell him? The answer to this question should constitute the description of the target population. Some of the categories about which one might wish to comment are as follows:

Physical characteristics

The physical nature of the students may influence the tools and procedures that can be included in the instruction. Describe the general nature of the population; indicate general handicaps as well as assets such as special strength, agility, balance, or endurance.

Education

The kind of education that incoming students have had in the past will have a great deal of influence on the length of the course, level of vocabulary to be used, and the level of abstraction that might be meaningful. Some instructors use "exit" examinations. If a student scores high enough on this examination, he is exempted from some parts of the instruction. Such a test might also show that the course is valueless for some students.

Motivation

Are the students generally willing to learn the occupation taught in the class, or is motivation a problem? The less motivated the

students are, the more the teacher will have to be concerned with keeping students interested throughout the course of instruction.[6]

Interests

Do you know what things are interesting to the students? Knowing their interests will keep them motivated. The instructor needs to know their special skills and aptitudes. Are the students skilled in the art of repairing automobiles? Are they able to perform with manual dexterity? The answers to these kinds of questions will assist the teacher in writing realistic prerequisites, and may have some influence on what the teacher can reasonably expect in the way of terminal performance from the students.

Attitudes, biases, and prejudices

Does the target population consist primarily of one ethnic group? What are their value systems? Do they have strong convictions? This type of information will help determine the kinds of examples that the instructor can use effectively. It may also provide clues to student motivation.

Example 1:

Physical characteristics	Female; 18-30 years of age
Education	Two years of college
Motivation	Desires to learn a skill relative to husband's occupation
Interests	Civic activities, local politics
Attitudes, biases, and prejudices	Prefers to associate with educated people

[6] Gagne, op. cit., p. 5.

Example 2:

Physical characteristics.....Male; 16-20 years of age
Education.....High school dropout
Motivation.....Desires recognition, and women
Interests.....Likes to work with hands
Attitudes, biases, and
prejudices.....Hates school; is prejudiced against minorities

Summaries such as these provide a place to start in the description of the target population. An additional requirement is information about specific knowledge relevant to the subject of the course. What do incoming students know that will make learning the subject easy? Do they know or feel anything that will make learning of the subject matter more difficult? Does the student have a knowledge that is transferable from one skill to another? If the student has nothing to transfer, these skills must be taught in their entirety.

Job Description

This section deals with types of learning that are truly representative of human intellectual capacities. There are two types of learning being compared in this project. One is the acquiring of knowledge and the other is the ability to solve problems. The first type is more likely found in the traditional classroom. The second type will be found most likely in the vocational school setting. Both situations demand descriptions of jobs to be performed by students if effective learning is to be carried out. Defining what is expected of the worker in a job is becoming quite an exact science. Job descriptions are used to fit the personality to the job and to make decisions about cause for removal from a job. Given the internship experience

and the view of my supervisor, I am persuaded that if a vocational training center is to be effective, job descriptions must be accurate.

The task

From the very beginning of the course development process, it is appropriate to adopt a job-oriented point of view so that only the most relevant subject matter and learning activities are built into the course. The first step of the preparation, therefore, is to locate or write a job description. A job description may be defined as a general statement about what a person will be required to do if he performs his task successfully. A job description also tells something about the conditions under which the task is performed. For example, a description of the plumber's job probably would indicate that s/he often has to work in confined places and in the houses of her/his customers. A radio announcer must work under time pressure, and a waiter is expected to be polite to her/his customers.

It is important to include all types of activities that are done on the job, even though they may not relate directly to the basic skill. If the job being taught is that of auto mechanic, and if the mechanic on the job is required to fill out certain forms, or to do other paper work, that part of the task should be included in the job description. If, for example, the person on the job is expected to give an occasional guided tour through the work area, that should be included in the job description. A job description always should describe the job as it is, not as one would like it to be. The following are some examples of job descriptions.

Example 1: machinist

The machinist is a skilled metal worker who shapes metal or non-metal parts by using machine and hand tools. S/he is able to select the proper tools and materials required for each job, and to plan the cutting, bending, etc., and finishing operations in their proper order so that s/he can complete the finished work according to blueprint or written specifications. S/he is able to interpret blueprints and read precision measuring instruments. S/he is able to convert fractional values into decimal equivalents.

The machinist is able to set up and operate most types of machine tools. S/he selects the appropriate machine and cutting tools that will turn raw material into an intricate, precise part.

Example 2: radio and television technician

A radio and television service technician may be required to install, maintain, and service amplitude and frequency modulated home and auto receivers, transistorized radios, monochrome and color television systems, high fidelity amplifiers, and tape recorders. The service technician is able to read circuit diagrams and codes of values and to select component substitutes.

The radio and television service technician's work requires meeting the public both in the repair shop and on service calls. In order to service home receivers or equipment, s/he may be required to drive a car or truck. S/he must be able to tolerate heights, as antenna installations on rooftops are often an everyday occurrence. A service technician who establishes her/his own business may need to know how to maintain business records and inventory.

Example 3: welder

The welder possesses a great deal of manipulative skill both in the art of welding and in jig preparation. S/he is able to read blueprints and has some knowledge of metallurgy. S/he is able to specify the type of metal that most likely will meet blueprint specifications. Since there are many ways to weld, s/he is able to select the method that will yield a satisfactory finished product.

In addition to understanding the principles of welding, the welder is able to operate sheet metal tools. S/he is able to shear, brake, and manipulate sheet metal before joining. S/he is also experienced in silver and lead soldering techniques. In essence, s/he is able to construct, join, and finish two pieces of metal according to blueprint specifications and to repair broken or perforated members.

Example 4: landscape gardener

A landscape gardener has horticultural knowledge of lawns, shrubs, annual and perennial flowers, pest and disease control, soil structure, fertility, and other information that enables her/him to plant and maintain beautiful landscapes. S/he provides a service in the area of design, selection, and maintenance of most plant life, and possesses fundamental knowledge of the methods of propagation by seeding, grafting, layering, and cutting. S/he is an expert in taxonomy, is acquainted with the various plant diseases and physiology, and is able to provide sketches of landscaping design to various clients to meet their specifications. S/he is often required to supervise nonskilled helpers.

The job requires that s/he be able to drive a truck, meet customers, and be acquainted with and operate manual equipment. During

the off-season, s/he may be required to participate in tree surgery or other forms of work related to the job. S/He is often required to keep systematic charts showing planting areas and maintain customer records pertaining to plant maintenance or rotation.

Summary

The more the instructor knows about the target population, the more accurately the content of the course can be taught. The knowledge that should be gained will be discussed in the next section.

The job description is adequate only when it contains a comment about each of the types of activities a person engages in during performance of the job, and when it suggests the special or unusual conditions associated with the performance of the job. Regardless of the methodology used, it is clear that learning takes place more efficiently when the learner knows what behavior pattern is expected to change. The first task of the instructor is to inform the student exactly what is required of him.[7]

There are three phases in the development of any course of instruction. They are the preparation phase, the development phase, and the improvement phase. While the systematic development of instruction is a specific procedure that can be described in detail, the procedure is not specific when related to subject matter or vocational training. Regardless of the intent of the instructional program, the procedure for developing the course is basically the same.

---

[7]Gagné, op. cit., p. 51.

Dividing the task into its component parts is vital in vocational education. The rationale is simple. All complicated tasks are nothing more than a series of simple tasks. The simplest portion of a task that can be taught is a module. One of the most difficult tasks that Mr. Hyde and I had during the summer was getting the instructors to divide the tasks into their simplest parts. It was not an easy task to accomplish. In fact, I am quite sure that we did not succeed in all cases.

III. THE COURSES

Course Objectives

Introduction

One of the most difficult tasks which the new or inexperienced instructor must do is develop course objectives. Course objectives must be specific. It seems to be easy to write general objectives and difficult to write specific objectives. Gagné[7] suggests that the same condition exists in the traditional classroom. Vocational education, like special education, has its own vocabulary. When course objectives are referred to as a blueprint for learning, it is not difficult for me to see the comparison. The same type of problem exists in developing course objectives. Therefore, one of the first objectives of the instructor is to communicate the peculiar vocabulary or terminology to both the student and society.[8]

Writing objectives

The statement of course objectives consists of as many statements, items, or examples as are necessary to describe the desired behavior of the student at the time he leaves the course. Course objectives should be written with enough detail so another professional instructor

---

[7]Gagné, op. cit., p. 77

[8]Hyde, op. cit., p. 2

could teach a student those skills the original instructor desired taught.

Course objectives differ from task analysis in several ways. The task analysis describes the vocation or job as it is performed by a highly skilled person. Objectives describe the kind of performance that will be expected at the end of the learning experience controlled by the instructor. For example: While a highly skilled person may be able to perform a particular machine adjustment in five or ten seconds without using any job aids to remind her/him of the steps, it might be unrealistic to expect a course graduate to perform that well on the day of graduation.[9] It might be far more realistic to expect the graduate to be able to perform the task without the use of job aids in ten to fifteen minutes. If the steps of the job can be performed, and if it can be determined when the job is properly performed, then practice on the job will improve the proficiency.

The task analysis states what steps must be carried out in the performance of the job and whether or not the student knows how to perform some of these steps before entering or having completed the course. The objectives of the course differ from task analysis in that they are what the instructor hopes the student will accomplish in the course.

Another difference between task analysis and course objectives is in the subject matter itself. It may be that some of the skills called for in performing an occupation are either unrealistic to teach in the classroom or are taught better on the job. An example of this might

---

[9]Mager, R. F., Preparing Instructional Objectives (Palo Alto, Fearon Publishers, Inc., 1962), p. 27.

be the paper work expected of a skilled craftsman. This task is likely to be so different from one location to another, and so easy to teach, that it might be a task better learned on the job.

The key question to ask is this: What kinds of things should the student be able to do at the end of the course that will most facilitate her/his becoming a skilled craftsperson in the least amount of time? In other words, what should the student be able to do at the end of the course so that s/he will be able to perform on the job effectably.

Course objectives represent a clear statement of instructional intent, and are written specifically to clarify the intent. In practice, the instructor should have at least twice as many statements as tasks on the list. These statements should have the following characteristics:

1. An objective says something about the student. It does not describe the textbook, the instructor, or the kinds of classroom experience to which the student will be exposed.

2. An objective refers to the behavior or performance of students. It does not describe the performance of the teacher, nor does it describe what the student is expected to know or understand. Though one might state an objective by using a general statement such as, "...the student must understand the operation of the XYZ sewing machine," the instructor would continue and explain exactly what is meant by the statement. In some cases the student may be expected to answer questions, or to solve some problems, or to describe a procedure, or to construct a gadget. Whatever it is the instructor means by understanding would be defined in the sentences to follow the general one. In any case, an objective describes what the student will be doing to demonstrate achievement of the teacher's instructional intent.

3. An objective is about ends rather than means. It describes a product rather than a process. As such, it describes what the student is expected to perform at the end of the instruction rather than the means that will be used to get there. It refers to terminal performance rather than course content.

4. An objective describes the conditions under which the student will be performing terminal behavior. In some cases the student will be expected to perform in the absence of any assistance provided by job aids; in some cases, such aids are acceptable. For example: Sometimes the student may be expected to solve problems with the use of a slide rule or calculator, and sometimes without these items.

5. An instructional objective also includes information about the level of performance that will be considered acceptable. If a student will be expected to perform a task within five minutes at the end of the course, this will be stated as part of the objective. If the student's performance at the end of the course is expected to be error-free or if some error will be tolerated, this would be indicated. In most instances, the decision about what performance will be considered acceptable is an arbitrary one. This is one place where the experience and wisdom of the instructor is most important, because specification of satisfactory performance is one of the unique contributions that can be made only by the skilled instructor.

Classifying objectives

For convenience, it is possible to classify objectives into two broad categories, those that describe specific performance of the student and those that may be needed to describe personal affective behaviors. For example: If it is important to send the student more interested in the subject than when s/he arrived, this must be stated in an objective so that the course may be systematically organized to achieve it. If the student will be expected to perform with persistence, then the nature of this persistence should be made clear so that the course may be designed to achieve this end. It may be that when the student is performing the job, each failure will be expected to result in another immediate attempt, as is often the case in jobs involving repair of equipment. If one attempt at fixing fails, another attempt is expected. In other words, each failure experience is expected to trigger another attempt to succeed. Unless this persistence

objective is made explicit, it is possible that the procedures used during instruction will produce a student who will give up after one or two attempts. This may happen if the instructor makes critical comments following every student attempt to come into contact with the equipment s/he is expected to master. The instructor must be careful not to discourage the fledgling apprentice. Positive reinforcement is one of the instructor's most valuable tools.[10]

On some jobs it is important that a pleasant tone of voice be used, as well as a patient manner. When this is the case, it is important to specify this objective and design a plan for its achievement. Most people do not know whether others perceive them as sounding pleasant or patient. This requires instruction. Such instruction may fail to be included in the curriculum unless the objective is made explicit.

It is important to describe as comprehensively as possible how the student is intended to behave when he leaves the course. In the following examples of objectives, notice that each tells what the student will be doing when demonstrating that s/he has achieved the objective. Also note that each objective says something about what will be considered as acceptable performance. Some are stated in a single sentence; others are more detailed. The form is not the important thing; what is important is that the instructional intent be made clear. The examples are:

1. Given an unfinished metal casting, be able to surface, drill, and tap according to the specifications indicated on the attached blueprint.

---

[10]Gagné, op. cit., pp. 75, 77.

2. Given a model XYZ sphygmomanometer, be able to take blood pressure to within 0.05 cm. The student must correctly complete five consecutive trials to this criterion.

A task analysis sheet should be composed if the instructor wishes to prepare her/his own objectives. Simply divide a sheet into three columns. Place a general objective statement in the left hand column. Describe the conditions under which the student will work in the middle column. The right hand column is used to describe what the student will be doing to demonstrate achievement of the objective.

Course Prerequisites

There probably should be some minimum prerequisites for entering any course of instruction. The student should be prepared to profit from the class, should have the basic skills necessary to learn the skills which the instructor will demand, and should have the motivation to attend class. If these background and affective behavior elements are absent or diminished, attending the class might very well be an unprofitable and negative experience.

Selection guidelines

Will incoming students be expected to be within certain age limits, be able to read at a certain rate, be able to perform certain mathematical operations, or be able to operate certain machines? The answers to these questions determine the prerequisites for the course, and the prerequisites will exert some influence on the length of the course. Prerequisites will also determine whether or not remedial instruction will be required. If remedial instruction is required the structure of the course will be altered substantially.

Some of the elements and inputs into the class that should be considered can be identified. The fewer the restrictions on the entering student, the larger the number of people who will qualify for the course. At the same time, the fewer the restrictions, the more necessary it will be to design the course to provide for individualized instruction, since students are likely to be quite different in what they can do when they enter.

If the instructor places more restrictions on the entering student it is more likely that the class will be able to progress as a group. This is not to suggest that students ought to progress as a group, but only to identify that they may be able to do so if they are similar in backgrounds and skills brought to the classroom.

The more prerequisites that are placed on the entering student, the less likely it is that the instructor will find people described by the prerequisites in the real world. The correct course of action is to write prerequisites that are realistic. Realistic criteria are suggested as follows:

1. There should be a sufficient number of students meeting the prerequisites to meet the demands for numbers in the class.
2. The students should be properly motivated so that successful completion of the course is accomplished, even though some discouragement may exist.
3. There should be some purpose served by the instruction, from the viewpoint of the student.

The development of realistic prerequisites is not accomplished in a single step. Prerequisites grow as other steps of course development are completed. A useful procedure for the development of course prerequisites is to keep a sheet of paper labeled "Prerequisites" in

the classroom while the course is being developed. Each time the teacher makes an assumption about what the student will be expected to know or be able to do upon entering the course, that assumption should be noted on the prerequisites sheet. If the instructor is not going to make assumptions, then the concept can be added to the course objectives.

A prerequisite statement that merely gives the name of some course that the student will be expected to have completed is not helpful. Such a statement is an administrative device that has nothing to do with systematic course development. Such course requirements provide no information on which to base intelligent decisions.

If one develops prerequisites continuously, there will be less likelihood of falling into the teaching trap of imposing irrelevant restrictions. For example: One electronics maintenance course had a prerequisite calling for normal color vision. "Common sense" implied that this was reasonable. After all, some electronic components are color coded, as are some of the wires used in the equipment. However, several color-blind students completed the course quite successfully. They had no difficulty performing all of the tasks required of them, because no task required that color-coded components be read. The mistake here was that the prerequisites were based on course content rather than on course objectives. Since the content included color-coded items, it seemed reasonable that the student should be able to discriminate among these colors. The tasks the student should be able to perform did not require ability to discriminate among these colors;

hence, a color-blind individual performed just as well as one with normal color vision.[11]

The development of course prerequisites, then, is done with the description of the target population and the course objectives rather than with subject matter material. For each skill the student must have at the end of the course, one must decide whether to assume that the incoming student already has that skill. If one assumes that s/he does, write that assumption on the prerequisites sheet. If the instructor feels that the student does not have it, this should be added to the objective list. Use the target population description to check the realism of the prerequisites.

Measuring Instruments

One of the most crucial items in any curriculum is the development of procedures for evaluation. In the traditional classroom, subjective and objective testing procedures are followed. Items found on true-false tests, multiple choice tests, fill-in-the blank types, matching items, and essay test items that call for factual information are examples of objective testing in this classroom setting. Methods for subjective evaluation are found in opinion questions. Growth is not easy to define. Growth may be impossible to define objectively.[12] Subjectively, it is a matter of whose value system is being used.

---

[11](From an incident related to me by an instructor at The Kent Skills Center, Grand Rapids, Michigan.)

[12]Hyde, op. cit., p. i

Evaluation is not simple in the vocational setting. Although one is dealing with objects that can be measured accurately, observed accurately, and since correct performance is quite objective; therefore evaluation should be much easier in the vocational school. However, close examination will show that this is not the case. It is quite apparent when an engine is working well. The skilled mechanic, however, may detect noises and vibrations that are missed by the layman. Testing involves the human element; hence, human behavior is still our concern.

Prerequisites test

If the design of the course is based on the documents one has developed, then it matters whether students can actually perform the tasks one has assumed they can perform. To find out, a test should be prepared based solely on the prerequisites. Items should be developed that answer the question, "What should the student do to convince the instructor that s/he has the necessary skills?" This test should be administered to students as they enter the course. If very few or none of the students can perform according to one of the assumptions, and if such performance is necessary, there can be two decisions. Students can be sent away for remedial instruction before entering the course, or they can be taught the missing skill. When one decides on the second alternative, the skill should be erased from the prerequisites sheet and added to the objectives of the course.[13]

---

[13]Mager, op. cit., pp. 31-35.

When the students come into a course lacking various prerequisite skills or knowledge, the normal response is to provide remedial instruction. Students also enter a course knowing more than the prerequisites assume. In this case, remedial action should be applied to the course itself so students will not be bored by being taught what they already know.

Criterion examination (post-test)

As the prerequisites test is constructed solely from the statement of prerequisites, the criterion exam, or "post-test," is constructed solely from the course objectives. The object is to determine how well the student's performance at the end of instruction coincides with performance called for in the objectives. The object is not to see how well the student retains whatever happened to be taught during the course. The difference is an important one.

Students can also be evaluated on the basis of how closely their performances approximate the performance called for in the course objectives. In this case, the concern is not with comparing students against each other, but with a comparison of each student against a predefined criterion. This orientation influences the way in which test items are constructed. It calls for the creation of test items that will determine whether or not the student can perform as required, rather than for test items that are "difficult" enough so there will always be some students who fail. For example: If one of the objectives of the course calls for the student to be able to change a tire with a certain set of tools within two minutes, then the appropriate test item is to ask her/him to change the tire with those tools within

two minutes. If all students can perform as specified, it is improper to make the test item more difficult arbitrarily. If none of the students can perform the task, one does not make the test item easier. The object is to teach students, not to fail them.

The following guidelines are offered for the preparation of the criterion examination:

1. Use the objectives as the guide.

2. Prepare as many items as necessary to find out how well the student meets each objective. In some cases, only one item is appropriate, as in the tire-changing example. In other cases, one may feel that several items are needed to make an assessment.

3. Create items that call for the same kind of behavior specified in the objective. If an objective calls for a student to use a certain tool, then create test items that cause the use of that tool. In such a case, it would not be appropriate to ask for a written essay about the use of the tool or to answer multiple-choice questions about the use of the tool. If an objective specifies an ability to repair something, then the appropriate test item is one that asks the student to repair the malfunctioning item. Multiple-choice items are not necessarily appropriate. If an objective asks that the student be able to talk about something rather than do it, then an oral item or essay item is appropriate.

The list that follows identifies some examples of objectives and test items. Some are appropriate for testing the objective, and some are not appropriate. Items that are appropriate for testing are indicated by an asterisk at the end of the sentence. The inclusion of inappropriate objectives is for the purpose of discrimination.

Objective:

Using a slide rule, be able to find the log of a three-digit number.

Test Items:

1. Describe in your own words how to find a logarithm on a slide rule.

2. Using a table of logarithms, find the log of:
   a. .00872
   b. 3.24
   c. 9716

3. Using your slide rule, find the log of the following numbers:*
   a. 456
   b. 0.0752
   c. 34.5

4. Identify the mantissa in each of the following:
   a. 0.602
   b. 1.398
   c. 2.659

Objective:

Given a pair of earphones and a pure tone generator, be able to tell the difference between two consecutive tones that are 50 cycles apart.

Test Items:

1. Discriminate between two tones of 5000 and 5050 cycles.*
2. Define the range of audible frequencies.
3. Explain in your own words the theory of audition.
4. List the steps in measuring a just-noticeable difference.

Objective:

Given a wood lathe, appropriate tools, and rectangular walnut stock, be able to turn a table leg suitable for a coffee table. The leg should be tapered in any way desired by the student, provided the narrow end differs from the wide end by at least 1/2" in diameter.

Test Items:

1. Construct a table leg from rectangular walnut that contains at least a 1/2" taper, using the lathe and tools provided.*
2. Describe the woodlathe and related tools.
3. List, in proper sequence, the steps required to construct a set of table legs.
4. Describe the advantages of legs.

Objective:

From three lists of merchandise and their prices, be able to fill out three appropriate sales slips without error.

Test Items:

1. Describe in detail and in your own words the difference between the three types of sales slips.
2. Identify the three sales slips in terms of color and size, and determine the price range of merchandise recorded on each.
3. Fill out the three attached sales slips for each list of merchandise.*
4. Supply the customer with a cash register receipt instead of completing the three forms.

Objective:

Given a carburetor that is misadjusted but which contains no malfunctions, be able to readjust it for maximum performance within 5 minutes. Maximum performance is defined by the oscilloscope pattern specified by the instructor.

Test Items:

1. Identify the correct pattern as seen on the oscilloscope from several examples illustrated in the carburetor manual.
2. Describe and define the functions of a carburetor.
3. Reset the misadjusted carburetor so that the correct pattern will appear on the oscilloscope within five minutes.*
4. List the differences between the two-barrel type versus the four-barrel type of carburetor.

Objective:

Be able to assemble an M-16 rifle correctly, blindfolded, within ten minutes.

Test Items:

1. List the parts of the M-16 rifle.
2. Describe the action of the M-16 rifle and why it is superior to others. Also state the history of the rifle and pertinent facts concerning its use.
3. Memorize the location of each part on the table so that a faster assembling time can be achieved.
4. On the table in front of you is a disassembled M-16 rifle. Identify the parts with your fingers and assemble the rifle within ten minutes. Once assembled, check and inspect for accuracy.*

Objective:

Given scissors, comb, and brush, be able to shape and style a client's hair to her satisfaction, taking into consideration facial contour and hair color and texture, within a half hour. Acceptable performance is achieved when the client is satisfied.

Test Items:

1. Explain in your own words the methods of good hair grooming.
2. Given scissors, comb, and brush, style a client's hair, taking into consideration her facial contour and hair color and texture, within a half hour.*
3. List ten types of hairstyles and indicate their current popularity.

It will be apparent from these examples that not all testing items are appropriate for vocational education. It should also become apparent that the best ones for skills testing are those which involve action on the part of the student. The student must be involved in activities that bring together manipulative skills, knowledge, and affective behavior if the testing item is to be a meaningful one.[14]

Types of Performance

There are several types of performances that can be measured. Discrimination is knowing what to do, and knowing when it has been done. Recall is knowing what to do, and knowing why to do it. Problem-solving is knowing how to decide what to do. Manipulation is knowing how to do it. Speech is knowing how to say it.[15]

The instruction

There may be several instructional procedures from which to choose when developing a lesson. There is, of course, the lecture. There are films, slides, filmstrips, mock-ups, books, manuals, demonstrations, discussions, recitation, practice, and more. Since all of these procedures are not equally effective all of the time, and since some of

---

[14]Hyde, op. cit., p. ii.

[15]Hyde, op. cit., p. i.

them are appropriate some of the time, the question is...how to decide when to use what.

Some teachers decide which procedures and materials to use on the basis of what they are most comfortable with. One may be most comfortable with the lecture, while another may feel more at ease with slides and discussion. Though it may be acceptable for unskilled teachers to select their teaching procedures this way, the skilled teacher wants a more rational basis for making decisions. After all, the professional instructor is an individual who can make selections in a manner that results in efficient instruction. Society would be in a terrible fix if the surgeon only performed those operations s/he was "comfortable" with, or if the carpenter refused to use any tool but the hammer because s/he "likes" the feel of it.

There is a much better basis for choosing instructional procedures. A discussion of the first step follows. In the way one selects a tool from the toolbox by knowing what needs to be accomplished one chooses an instructional procedure by first identifying the kinds of performance to be developed. As Briggs has pointed out, "The best available basis for the needed matching of media with objectives is stated in terms of the learning conditions required.[16]

There are several different kinds of performance, and different procedures and materials are appropriate for teaching each. For example: A simulator might be highly appropriate for teaching someone to fly a plane, but it would be inappropriate for teaching how to spell.

---

[16]Leslie J. Briggs, Instructional Media: A Procedure for the Design of Multi-media Instruction, a Critical Review of Research. Palo Alto, Calif.: American Institute for Research, 1965, p. 176.

Why is this statement true? It is because two kinds of performance are involved; one kind is facilitated or made easier by using a simulator, and the other isn't.

Gagne[17] has presented an excellent and scholarly description of eight different kinds of performance and has attempted to show which conditions are most appropriate for facilitating the learning of each of these performance types. In an attempt to simplify the job of course preparation, Gagne's eight categories have been consolidated into five: discrimination, problem-solving, recall, manipulation, and speech. If one determines which of these five types of performance is the one primarily associated with each of the task steps, one will be in a good position to select course content, procedures, and materials.

The expression "primarily associated with" is important to consider because each task consists of several types of performance. Performance types are interrelated. For example: Although the process of mixing cake batter involves manipulation, it also involves what to do and knowing how to recognize when it has been done properly. The important thing is to identify the principal type of performance associated with each step to simplify the identification of course content. With the principal type of performance identified, content selection becomes a matter of answering the question, "What are the enabling skills needed to perform this step?" If, for example, a step calls for selection of the proper tool, what skills does the student need? Knowledge? An ability to discriminate bolt sizes? Manual

---

[17]Gagné, op. cit., pp. 55-59.

skills? The answer identifies the instructional content associated with this step of the task. But selection of content and instructional procedures is facilitated to the degree principal performance type is identified for each step of each task.

Discrimination

Discrimination means being able to tell the difference between two or more things. When I hear the difference between a good note and a sour note, I am discriminating. I discriminate when I perceive that one object is red and another blue. Discrimination is involved in being able to taste the difference between two cups of coffee and in feeling the difference between rough surfaces and smooth surfaces.

Being able to tell whether two objects are alike or different is one form of discrimination. Another form of discrimination is being able to tell whether one thing is the same or different from a mental image of what it ought to be. How can one tell when one has a flat tire? One must discriminate a difference between the lumpy driving experienced and the mental image of smooth driving. How does one know when a particular task needs to be done? One will discriminate that there is a difference between the situation or environment and the mental picture of what it ought to be like. How can one tell the difference between a good job and a bad job? One compares what has been done with a memory of what ought to be done.

Discrimination between two objects is taught by showing the student pairs of the things so that he may distinguish the difference between the two. The difference between these pairs of objects is gradually reduced until the student is able to make discriminations

fine enough to be satisfactory. For example: If it is necessary to teach the student to recognize pitch difference between pairs of tones, pairs of tones would be played that are obviously different in pitch. The student then would be asked to tell whether the second is higher or lower than the first. The difference in pitch between the two tones would be gradually reduced until the student was able to discriminate at a suitable level.[18]

The second kind of discrimination is taught by giving the student practice in comparing single items or situations with a knowledge of what they should be like. The student is given practice in saying whether a thing is, or is not, consistent with her/his picture of it. Such practice increases the accuracy of the mental image and increases the ability to make proper discriminations. For example: If a student needed to learn how to recognize when a circle was "round enough," s/he would be shown a series of circles of varying degrees of roundness and asked to compare each one with her/his mental criterion. The student would be given immediate knowledge of results so that s/he would know how to correct her/his mental image. S/He would also be shown pairs of circles, one unacceptable and one acceptable in each pair, and provided with any other information that would help with the discrimination.

Wherever task detailing sheets list a step that calls for the student to be able to distinguish one thing from another, to tell when a proper job has been done, to tell when a task needs to be done, or to

---

[18] Ibid.

see the difference between correct and incorrect, the principal type of performance called for is discrimination.

Problem-solving

Once one discriminates that a job needs to be done, s/he normally proceeds to do the job. Sometimes, however, one sees that something needs to be done, but s/he does not know what to do. S/He sees her/his TV picture rolling or tearing, so s/he knows that something needs to be fixed. What to do? Find the trouble. One can't fix it if one can't find it. The process of finding the trouble is called problem-solving, and involves teaching the student procedures that will lead to the location of the problem.

Whenever a task step calls for the student to determine the best way of doing something or to decide what to do next, s/he is being asked to engage in problem-solving. Problem-solving is taught by showing the student those cues or symptoms that should lead to the conclusion that problem-solving is called for, by showing relationships between symptoms and possible causes, and by giving practice on the actual thing or situation needing remedial action. It is done by showing the student a problem and then requesting her/him to determine what symptoms would appear. Thus, problem-solving on TV sets is taught better on the set itself than through lectures. It is taught best by having the student solve as many problems as possible, not having her/him talk about it, write about, or answer multiple-choice questions about it.

Recall

If one decided that the dinner table needed to be set, it would immediately be known what plates and silverware were needed. If a roast needed carving, one would know that a carving knife was the thing to get and use. These things that one knows are things that can be recalled. Whenever an instructor says that there are some things the student just "has to know," s/he is asking for performance based on recall. When the student is expected to shout out the tools and parts needed when the instructor says "carburetor adjustment" one is asking for performance based on recall.

There is a special class of recall called sequencing, or chaining. Sometimes it is essential that a precise sequence of steps be followed in performing a task. Learning those steps in order is an example of chaining. For example: There is a very precise order of steps that must be followed in performing surgical operations. It is important that those who do this task know which step follows every other step.

Although the process of recall is an internal, invisible one, it is still the principal performance associated with a great deal of visible activity. For example: If one recites the names of all the states, the principal feature of the performance is that of recall rather than that of speaking. If, however, one is trying to learn to speak a given sentence with a particular accent, then speaking is the principal feature of this performance rather than recall. Whenever the principal feature of a task step is that it requires knowing <u>what</u> to do more than <u>how</u> to do it, the principal type of performance is recall.[19]

---

[19]Gagné, op. cit., p. 72.

The techniques used to teach recall depend on the nature of the performance desired. If a student is to make a certain response whenever a certain sound is heard, the technique indicated is one that presents the sound and makes the student respond. If the student is expected to be able to do something when a certain thing is seen, then a visual technique is used that shows the object or cue and allows her/him to practice the response.[20] If the recall is related to knowing how something works, then a demonstration-lecture is appropriate if followed by practice wherein the student is asked to describe the relationships that go to make up the substance of "how the thing works."

Once the problem has been identified, the person who has learned which tools and materials are required to solve the problem can then use these tools and materials in performing the task in their proper sequence. The highly skilled worker requires a minimum of memory aids to aid in remembering what to do and when, though such aids might be used whenever they can simplify either the job or the training. Knowing what to do, what to use, and the order of sequence in which to perform a task, are examples of the mental performance known as recall.

While the actual process of recalling or remembering is a mental or internal kind of performance, it is quite possible to tell whether this kind of performance is going on. This is essentially the kind of information obtained through paper and pencil tests. If a student, for example, is able to answer correctly when asked which sewing machine attachment is needed in order to sew a hem, one has performed

---

[20]Ibid.

a correct recall; the student is aware that s/he has the correct knowledge.

The two principal ways in which people interact with their environment are through the things they do and the things they say, and visible performance always appears in the form of either moving or speaking. This does not mean that a great deal of knowledge or recall may not be required in order to perform the doing or speaking. Where knowing what to do is much more important than knowing how to do it, recall is listed as the principal type of performance.

Manipulation

Knowing what to do isn't always the same as knowing how to do it. For example: If one know that the next step in a task was to get a certain tool, one could also perform the step because one knows where the tool is located and how to walk. In this case, knowing what to do is the same as knowing how to do it. But one may know that in order to remove an appendix it is necessary to make an incision with a scalpel. That doesn't mean one knows how to do it or where to do it. This may seem like a trivial point, but it is worth making because instructors sometimes fail to follow theory with practice. Sometimes instructors behave as though they believe that if the student knows what to do, s/he also knows how to do it. As a result, instructors do a good job of teaching students how to talk about doing something, but fail to teach them to actually do it. It is important, therefore, to identify the various kinds of manipulative skills required of the student. If the instructor lists only manipulation on her/his task detailing

sheet, something is wrong.[21] Either task steps are not accurately listed, or the decisions about which performance types are principally involved need review. Manipulation is taught by providing an opportunity to manipulate under conditions as close as possible to those found on the job.

Through recall, the student will know what to do when using tools, for example, but actual practice with the tools is the best way to teach how to use them. The teacher could tell the student how to ride a unicycle, or could demonstrate to the student how it is done by film or by actually riding it her/himself. Neither of these procedures would be successful in teaching the student to actually do it. The instructor could talk about riding a unicycle, or could teach the student how to write essays about it and even how to write songs about it. Again, none of these procedures is likely to result in the student being able to ride it.

Speech

For many jobs, speech is merely a form of communicating knowledge. Some tasks, however, require that speech be used in a particular way. For some tasks, speech is an essential feature of desired performance. This is true in the case of the announcer, the actor, the salesman, and the telephone operator. In these instances, the way in which the speaking is done is essential to job success, so appropriate objectives must be prepared and relevant instruction included in the course. When the style of verbal behavior called for in a task step is important

---

[21]Hyde, op. cit., p. 3.

to job success, the principal characteristic of the performance is speaking rather than knowing or recalling. It matters, for example, whether a waiter/waitress communicates with a customer through a pleasant tone of voice or a cranky one, even though the content of speaking is based on recall.

The principal technique for teaching specific speech characteristics is one involving imitation, practice, and immediate knowledge of results. The tape recorder is an indispensable tool. It not only allows the student to hear a model as frequently as necessary, but enables her/him to hear the efforts immediately after making them. When, as is very often the case, facial expression and gestures are also related to speech style, the video tape recorder is helpful.

The instructional managers at The Ottawa Area Center were given a teaching model involving all of the techniques referred to in this section. If response is any indication of success, the day was indeed worthwhile. The writer was asked to repeat the model demonstration again. It was a source of pride that there was keen interest in the methods and manner in which people learn. The point can be made that all people can be students, all of the time.

Sequencing Instructional Units

Special consideration must be given to the sequence in which the instructional units will be presented, because it is known that what is meaningful for the instructor is not necessarily meaningful for the student.[22] Units should be sequenced in an order that is most

---

[22]Hyde, op. cit., p. ii.

meaningful to the student. For example: If one suddenly had to learn how to repair a missile system, would it first be necessary to learn electronic theory, or would knowledge of what the system does and how it operates be the priority? Does one think s/he could learn to understand the details of automobile repair if s/he didn't know what a car was? If the student had to withdraw from a course for some reason, wouldn't s/he rather leave with a usable skill than merely with the theory and background leading to a skill?

Guidelines

Six guides to effective sequencing of instructional material are presented in the following section.

1. From general to specific. Students mean something different than instructors when they agree that they would like instruction to proceed from the "simple to the complex." Whereas instructors tend to be comfortable with sequencing from the elements of a subject toward the "big picture," students generally find it more meaningful to move from the "big picture" toward the details. Once the student knows the subject matter, he can also find a specific-to-general sequence meaningful. To apply this rule, one would begin by teaching the student how to operate a machine before one teaches how to repair it or before one teaches any theory. A helpful rule is to teach how something works first, and why it works that way later.

2. Interest sequencing. To maintain the motivation of the student, start with a unit that contains information which is highly interesting at the beginning of the course. For example, since most students entering a locksmithing course seem to be highly interested

in learning how to pick a lock, the first lesson might teach them how to pick one kind of lock. Identify those units that are most interesting to students, and then list these units among the others wherever possible.

3. Logical sequencing. Sometimes the subject matter dictates that one unit be taught before another. For example, a skin diver must be taught how to operate breathing equipment before learning to perform underwater maneuvers. Where it is necessary to teach one thing before another, do so. There is a caution, however. There isn't nearly as much reason for this sequencing as instructors like to believe. One doesn't have to know anything about mathematics before learning to repair a television set. One doesn't have to know the theory of how an automobile engine works before learning how to adjust a carburetor. One doesn't have to know how to lay a foundation before learning to construct a roof.[23]

4. Skill sequencing. If a student has to leave a course before finishing it, it is better to discharge her/him with the ability to do a complete, if lesser, job than to send her/him away able to only talk about a job. For example, teach what needs to be known to become a qualified plumber's helper first, then teach what needs to be known to become a qualified plumber. Teach what needs to be known about radio repair first, and then add what else needs to be known to become a television repairperson.

5. Frequency sequencing. Which skills will be used most frequently on the job? Teach first those skills that will be used most

---

[23]Hyde, op. cit.

often, then sequence the remainder of the units in order of decreasing usefulness or importance. Hence, although one may fail to teach one or two things because of time shortage, the skills not learned will be those needed least often. For example, one should teach a locksmithing student how to make keys before one teaches how to change combinations; teach an automobile repairperson how to adjust a carburetor before teaching how to weld an engine block; and teach a television repairperson how to change a tube before teaching how to change a resistor.

6. Total job practice. Some courses systematically give a student knowledge and practice in each element of a job, but allow the course to end without ever providing the student an opportunity to practice the entire job. The student needs a chance to practice the entire job as much as s/he needs practice in the bits and pieces of the job. At least five per cent of course time should be devoted to such practice, during which the student actually practices performing the total job under conditions as similar as possible to those s/he will face when the course is over.

Generally, material should be sequenced from the general to the specific. Sequence in a manner that will maintain interest. Logical sequencing is not nearly so important as often thought. Teach the job skills first, adjunctive skills last. Teach the skills used most first, those used less often, last. Strive to teach the total job.

Lesson Plan Development

The lesson plan is the instructional prescription, the plan that describes the activities the student may engage in to reach the objectives of the course. It is an administrative document that describes

how facilities, time, instructor, and content will be organized so that the largest number of students will develop the highest degree of skill. As several sources of information are used in the derivation of objectives, several sources are used as a basis for outlining instructional activities; objectives, the description of prerequisites, the task detailing sheets, and all information about materials, facilities, and time constraints. The essence of lesson planning is to develop instructional units that are maximally meaningful to the student and maximally effective in the use of time, space, and personnel.

It is during development of the lesson plan that it becomes necessary to make concessions to the rules and procedures of the institution, to force a few round pegs into square holes, so to speak. If the institution has fixed rules about the length of class periods and about what students must do during class hours, that is, if the institution is designed more for the convenience of administrators than students, it will be necessary to make more radical modifications than is the case when an institution is more flexible. But there will be restrictions or constraints of one sort or another even in the most flexible of institutions, and to compromise between the ideal and the possible may be necessary here.

The format

There are probably as many different lesson plan formats as there are instructors, and there is nothing particularly magical about the format being suggested here. With one exception, it specifically calls for identifying what the student will be doing during each phase of instruction, thus providing a good check on the appropriateness of the

selections of instructional procedures and materials. The form is one which, if followed, makes it impossible to fall into the trap of developing a course principally on the basis of what an instructor wants to do rather than on the basis of what students need to do in order to achieve. There are seven general steps, or activities, in the development of lesson plans. These steps consist of outlining the learning units, identifying the type of performance involved, identifying appropriate content, roughly sequencing the units, selecting instructional procedures and materials, final sequencing, and completion of lesson plan details.

The steps

The first step is to outline roughly the meaningful units of instruction. Each item of this outline is an answer to the question, "What do I have to do, and what does the student have to do, in order to achieve objective X or to perform task Y?" To keep the instruction as meaningful as possible to the student, and to enable her/him to leave each instructional session with a recognizable skill developed in the program, instructional sessions are organized on the basis of tasks and objectives rather than on the basis of content. The rough outline of instructional units is based on the detailed tasks and on the objectives.

The second step is to identify the type of student performance associated with each step of the tasks to be learned. This performance has already been identified on the task detailing sheets and will be used as the primary basis for the selection of instructional procedures.

Step three is the tasks and objectives to be taught and put into a preliminary sequence. This follows the recommendations presented in the section, Sequencing Instructional Units.

Content is then identified in step four on the basis of the tasks to be taught. Content is selected in answer to the question, "What does the student need to know to achieve this objective or to perform this task?" If time remains after the course is structured on the basis of knowledge and skills required for satisfactory performance, additional content of the "nice to know" variety may be added. The first priority, however, is for that content that will assist the student to become most proficient in the least amount of time. Instructional procedures appropriate to the kind of performance to be developed at each stage are then identified, and available materials and devices are listed.

The sixth step is the reviewing and modifying of the sequencing of the units if necessary. Here the sequencing is adjusted to prevent students from having to sit in one place for long periods of time, and to provide variety through variation of instructional procedure.

The seventh and final step is taken when lesson plans are completed. Adjustments are made to insure continuity between the lessons, to insure that the student is always informed of where s/he is and how far s/he has come, to insure that the student spends as much time as possible engaged in activities directly relevant to the objectives of the course, and to insure that the procedures selected can actually be implemented with the time and facilities available.[24]

---

[24]Hyde, op. cit., p. i.

The lesson plan should be thought of as a guide to the way students and instructor will spend the day, rather than as a document that precisely dictates what must happen during each instructional minute. It is impossible to make perfect predictions about the exact amount of time required to reach each objective. Consequently, instructional planning should contain a great deal of flexibility. Skilled graduates are produced by carefully specifying the objectives of instruction rather than by carefully specifying the procedures that must be followed throughout the instructional day. In a sense, it is reasonable to consider the objectives as the fail-safe mechanisms that will guarantee teacher success and that will insure the development of students who can perform as expected. With clearly stated objectives in the hands of the instructor and in the hands of students, it is both safe and efficient to give students considerable freedom in the selection of procedures and activities they feel will be most useful in helping them achieve those objectives.

During the development of a course, an instructor faces many problems and questions that are difficult to answer, with many decisions about what to include and what to exclude, about extent of coverage and emphasis, about what the student can already do, and about what interests her/him. The writer would strongly urge instructors to consider the student as their ally, because in most cases the student will be able to provide the instructor with the answers to her/his questions. If one wants to know whether an explanation is clear or meaningful, or if one wants to know whether a particular technique succeeds in teaching, ask the student. The instructor's job is to

facilitate student behavior, and the very best way to find out how well the instructor is doing is to question the student.

Improving Course Efficiency

Analyzing efficiency

Fortunately the techniques outlined in this paper contain within them procedures for checking the efficiency of a course and for identifying places where improvements can be made. One of these procedures tells the teacher how well the course succeeds in teaching what s/he has decided to teach; the other reveals how proficiently the student learned what s/he decided to teach. The first involves checking student performance against the objectives, and the second involves checking the objectives against the job. These two procedures must be kept separate to avoid making the mistake of changing an objective because it wasn't reached rather than because it is irrelevant or outdated. One could fail to perform a job adequately because the wrong tool was chosen or because the right tool was not used properly. The same is true of a course. A course could fail to produce students who are effectively prepared for a vocation because they were taught the wrong things or because they were taught the right things, but were not taught them well enough.

To enable the teacher to measure course efficiency, consider the first of these procedures. The procedure is simple in theory, and only a little more difficult in practice. It consists of answering the question, "How well did students achieve each of the objectives

specified?" How well did student performance compare with the performance called for in the objectives?[25]

The proper comparison is made between final performance of the student and the terminal objectives, and the comparison is made one objective at a time. To determine how well instructor objectives were reached, the instructor is not interested in how many objectives were reached on the average. The instructor is interested in the percentage of students that reached each objective. For example, if the teacher were to say that eighty per cent of the students reached the objectives, s/he wouldn't have any information on the basis of which to improve our course. One couldn't tell from that kind of statistic which objectives were reached and which were not. Such a figure could mean any number of things. It could mean that eight out of ten students reached each of the objectives, or it could mean that all students reached eighty per cent of them and that all students failed to achieve twenty per cent of them.

What is needed is a separate indicator for each objective. If, for example, an objective calls for students to be able to make a particular adjustment in five minutes or less, and if all students reach at least that level of skill, then the objective has been reached perfectly. The teacher may discover later that the five-minute limit needs to be changed, but that is another matter. What is important is to determine how well the teacher succeeded in doing what s/he set out to do.

If only seventy per cent of the students reached the required

---

[25]Hyde, op. cit., p. ii.

performance level, then thirty per cent of them failed to reach that level, regardless of how well they performed in other areas. In this case, one would have to consider her/himself only seventy per cent successful in developing the level of performance wanted.

The information gained from this analysis will show where course emphasis needs to be changed and where more effort would be warranted in course design. Further, it will allow the teacher to make better decisions when faced with information about an inadequacy students may appear to have on the job, because s/he will be able to tell whether the inadequacy is the result of ineffective training or improperly selected objectives.

Improving Course Effectiveness

The course is efficient to the degree it does what it sets out to do. It is effective to the degree it sets out to do those things most related to the job or vocation to be taught. Efficiency is measured by comparing actual student performance with the objectives. Effectiveness is measured by comparing the objectives with the actual job or vocation. The effective vocational course is one that selects the appropriate objectives and causes each student to reach them.

There is good reason to keep evaluating the appropriateness of the objectives. Jobs change and sometimes change rapidly. Computer programming, for example, is a course that needs revision almost monthly if it is to remain current. New tools become available, new techniques are introduced, new information must be mastered and new environments appear. The vocational educator, probably more than

anyone else, is painfully aware of the ways in which jobs change. For this reason, s/he needs to make periodic reevaluations on the relevance of course objectives.

Checking on effectiveness

The procedures for comparing objectives with job are more time consuming than difficult. They are important. The student is the principal source of information. Five suggestions about how to check on the appropriateness of course objectives, presented in order of increasing difficulty, are offered here. Unfortunately, the easiest ones are the least informative, but the writer is more interested in providing instructors with practical information than with tasks they are too busy to perform.

1. The student should be contacted between one and two months following completion of the course and from the beginning of employment. By this time, the student will have confronted most of the problems that will develop because of any weakness in the training program. The instructor should obtain knowledge pertaining to the student's employment, what type of tasks s/he is doing and how often these tasks are executed. Determine whether or not s/he has confronted any problems and if so, why and how were they solved? Were there particular tasks at which the student was especially proficient? In other words, perform a task analysis. However, ask about the job, not about the course. The instructor already realizes that the course objectives were reached. What the instructor is looking for is information about how well the objectives match the job. If the student volunteers information about the course, accept it without comment and

then ask more questions about what s/he actually does and about how well s/he is able to perform. How many students should be called? Keep calling until the answers become repetitious. Then decide how the course objectives should be modified on the basis of what has been learned.

2. If calling a few students is impractical, send them a questionnaire asking about job conditions, the frequency with which they are asked to perform various tasks, what they could do well when they began the job, and where they are lacking in knowledge. In other words, ask the questions that will help the instructor check on course objectives. Although it may make the student feel better if the instructor asks how the course might be improved, put less weight on the answer than on answers to questions about the job itself. While one may be interested in what people say about course improvement, decisions should be based on more objective information, such as is obtained by comparing what the job <u>is</u> with the objectives, as obtained by comparing course objectives with actual student performance.

3. Between one and two months after a student has reported for employment, visit her/him at the place of work. For some instructors, this is the simplest thing to do and for others it is impossible. If the instructor can make such a visit, do the same thing suggested in the paragraph above. Ask about the <u>job</u>, not about the course. In addition, look around to see what machines and instruments are used and how they are maintained. Check to see what tools are in use and ask about new procedures.

4. Between one and two months after the student has reported for a job, talk to her/his supervisor, either by telephone or with a visit.

Ask how well the former student could perform the job when s/he first arrived and how well s/he can perform it now. Ask what the student is particularly proficient in, and what the weaknesses are. Try to keep the supervisor talking about the job. Almost anyone who has ever been to school considers her/himself an expert in education, and almost everyone will be happy to tell the instructor how the course can be improved. Listen politely, but not too intently. The supervisor doesn't know in detail what the course objectives are, and is therefore in no position to compare student performance with the objectives. S/He is in a position to tell how well the student is performing the work, and that is the information needed to help make decisions about alterations in objectives. This point is very important. One is not able to prevent people from telling how to teach and about how things were when they went to school, so the strategy to adopt is that of listening politely without arguing. When it is the instructor's turn to talk, ask another question about how well the former student performs.

As an instructor in a vocational school, one should get a summer job working at her/his vocation, if possible. If the employment situation allows it, this is an effective way of keeping up with the profession, even if a working summer can be managed only every four to five years.

There are other activities that will keep the instructor current with her/his specialty; for instance, reading journals and trade papers and talking with people who are working experts in the field.

If the instructor acts to make the course objectives correspond with the needs of the vocation, and if s/he acts to cause each qualified

student to reach these objectives, s/he can be sure of having a highly effective course, as well as to be able to demonstrate success as a professional instructor.

Summary

Measuring the effectiveness of any course that involves human beings is not easy and will always be subject to error. Value judgments will also continue to be a factor in the effectiveness of the instruction. Vocational training centers are just coming of age in our society. National goals and national awareness will determine the effectiveness of the vocational school endeavor. The knowledge, the skills and the personnel will be of little effect if there is no support or understanding from the served population.

IV. THE PROCEDURES

Introduction

There are many techniques for presenting information and for transmitting skills. Since not all are equally effective in reaching each instructional goal, it will be useful to discuss the bases on which intelligent choices can be made. A word of caution may be in order. Though schools and instructors have been in existence for centuries, and though educational researchers have been at work for decades, teachers do not yet have a science-based guide that tells them how to make accurate selection of appropriate instructional strategies. Psychological research has provided some insight into this problem, and in this section an attempt will be made to translate that information into usable guides in the selection of instructional procedures and materials.

Characteristics of Instructional Procedures and Materials

The instructional procedures and materials are numerous. They range from apprenticeship training, simulators, self-instructional demonstrations, and field trips, through motion pictures, television, filmstrips, transparencies, disk and tape recordings, to the graphic media of charts, graphs, diagrams, maps, cartoons, and the symbolic media of the written and spoken word.

Each instructional medium has specific characteristics, or features. For example, lecturing is easy for many; therefore it is

convenient, but it forces the student to be relatively passive. One feature of the magnetic tape or disk recording is the organized simulation of a series of sounds. If listening discrimination is essential to the learning objective, the audio playback device is likely to have features most relevant to achievement of efficient learning.

Projection devices also have distinct features. Slide, transparencies, filmstrips, motion pictures, and television have the common characteristic of presenting a photographic reproduction of reality. They are a mirror image of life, so to speak. Magnification is another common feature, as is color. Editing is a feature of the slide and the transparency, making possible timely changes and updating content. The filmstrip, in contrast, features a fixed order of presentation. Adding a tape or disk recording to these picture devices adds a sound-message capability.

With time-lapse and slow- and fast-motion photography, the motion picture can expand and compress the real time scale. Animation, x-ray, and micro-photography can reveal processes and concepts invisible to the eye. A documentary record of an important event may be reproduced easily, history may be re-created, and on-site visits made anywhere in the world via the film.

One feature common to several instructional techniques is direct student participation. Supervised on-the-job training, for example, is an instructional procedure that has long been used by vocational-technical educators when development of manipulative skill is the primary goal. Simulators also allow skill development, as do some mock-ups and working models.

Much has been written about the characteristics or features of the many instructional techniques and devices currently available. More complete information and guidance on the characteristics and capabilities of these materials are provided by other writers.

Advantages of Instructional Procedures and Materials

There is a difference between a feature or characteristic and an advantage. A feature or characteristic only becomes an advantage if it is appropriate or relevant to reaching some goal. For example, one of the features of a pair of roller skates is that they are relatively inexpensive. But is this feature an advantage? An advantage for what? If the goal is to get to South America by the fastest means available, the fact that roller skates are inexpensive is no advantage at all.

The instructor has in her/his toolbox a small screwdriver with a blade small enough to fit tiny screws. Is this feature an advantage? It depends entirely on what is to be accomplished. It depends on the objective. If the immediate goal is to turn a large screw, then the small blade feature is clearly not an advantage. One feature of a small car is that it can be parked more easily than a large station wagon. Is this an advantage? It is if the goal is to do a lot of city driving. But if the goal is to carry as many bushels of apples as possible to market in one trip, then the characteristic of "smallness" is not an advantage.

Selecting appropriate procedures

Hopefully, the point has been made that the selection of appropriate teaching procedures begins with determining precisely what the

performance objectives are. With the type of performance identified for each part of each task, it is possible to proceed to identifying the general class or combination of procedures appropriate for reaching each objective. For example, if one objective is, "Given two pairs of engine sounds, the student must be able to identify the one most representative of a smooth-running engine," then some form of audio instruction is appropriate. If one step in learning to perform a task is learning to recognize when a table has been properly set, then some form of visual technique is appropriate; a drawing, slide, or photograph, or film might be used. A tape recording or a lecture would be less appropriate in reaching the objective. If one of the objectives calls for the student to be able to actually set a table, then a different technique is required. First, the student should be taught to discriminate between a properly set and improperly set table. Then the student should be given actual practice. For this objective, a table and utensils are more appropriate than a discussion or a filmstrip.

Guidelines

Following are three guides needed in identifying the procedures related to each of the performance objectives.

1. Choose the technique that most closely approximates the performance conditions called for by the objective. If the objective calls for the student to do something in response to what he sees, select a technique that most closely approximates the seeing to which s/he is to respond. For example, if the machinist needs to be able

to tell the difference between metals by looking at them, provide the student with something to look at. Actual samples would be better than pictures; colored pictures would be better than black and white. Any kind of picture or visual representation would be better than instruction by radio. If the student will be expected to tell the difference between materials by feeling them, just telling him how to tell the difference isn't as good as guided practice, where guided practice is defined as "actual doing by the student accompanied by verbal instruction by the instructor."

2. Choose the technique that causes the student to perform in a manner most closely approximating the performance called for on the job. If, in response to a visual cue or stimulus, the student will be expected to say something, select the techniques that will provide practice in saying. If, in response to an auditory situation, the student will be expected to repair something, then select a technique that will provide practice in repairing. If an objective calls for a student to be able to describe relationships between parts of a system, select the technique that will cause the desired behavior. In this instance, some form of recitation technique would be better than the showing of a film.

3. Choose the technique that will allow the student to make the largest number of relevant responses per unit time. For example, suppose the welder has to learn to recognize when a torch flame is properly adjusted to perform a particular task. If a photograph, slide, or film can show all the cues by which the student will be expected to discriminate proper flames from improper flames, these techniques would be better than the actual flame itself. Why? Because with a

notebook or photographs or a tray of slides the student can be given much more discrimination practice in fifteen minutes than a flame has to be adjusted to show each of the good and bad features to be practiced. Although slides or photographs would be appropriate for reaching the discrimination objective, they are not appropriate for reaching the performance objective. In this case, it is better to provide actual flame-adjusting practice. Since practice isn't much good until the student can tell when performance is right or acceptable, discrimination training would come first and actual practice second. The discrimination part would be taught faster with slides or pictures, but practice should be accomplished on the best available approximation of the actual device, and as soon after the discrimination phase as possible. For example, assume that the objective is to teach prospective woodshop instructors and on-the-job supervisors to discriminate by sound cues the various problems that arise when beginners operate the single surface planer. When properly fed, this machine gives off a "normal" hum, and any variation from this sound indicates trouble or inefficient utilization. Too heavy a "bite" in cutting the wood lowers the sound pitch. Too light a "bite" produces a vibrating sound. If the wood is fed so the grain is in the wrong direction, a chipping sound is heard. If imperfect wood is inserted, other audible clues can be detected. The objective would be reached better by a demonstration incorporating a programmed tape recording of the sound discriminations to be mastered than by a lecture about sounds or by a filmstrip showing the improper way wood can be fed into the planer.

Selection

After those procedures and materials most erlevant to desired performance have been identified, the next step is to select among them on the basis of administrative criteria. The most appropriate technique isn't always an available technique. Neither is it always practical or within the budget. For example, the best way to teach an astronaut how to work under weightless conditions is to provide him practice under zero gravity. Since this would be impractical and very costly, a substitute must be found. A variety of simulators have been constructed for this purpose.

If it is determined that slides, filmstrips, and photographs would work equally well, the one that is most valuable and most likely to be used, should be selected. If slide or filmstrip projectors are available but normally located somewhere other than the classroom, photographs would be preferable.

Consider the guides on one or two examples. The guides are: 1. Choosing the techniques that approximate the performance conditions called for by the objective; 2. Choosing the technique that causes the student to perform in a manner approximating on the job conditions; and 3. Choosing the technique that will allow the student to make the largest number of relevant responses per unit of time. Suppose an objective calls for the student to be able to respond in French to spoken questions in French. Applying Guide 1, it is seem that among the appropriate techniques are those that can speak French to the student: in other words, audio techniques. This might be done by the instructor, or by a record, by audio tape, by television, or by film. Applying

Guide 2, it is found that the student could make an appropriate response to any of these techniques, so none are eliminated on this basis. In applying Guide 3, however, using the instructor would be inappropriate because of limitations on his time. It is likely that each student will get less practice if the instructor is forced to provide the verbal stimulus than if each student were provided with her/his own tape recorder or language laboratory station. A film is likely to be eliminated for similar reasons. In comparing what is appropriate with what is available and practical, the language laboratory might have to be eliminated if one does not exist in the training situation and if the budget is not likely to provide one in the foreseeable future. If tape playback equipment is equally unavailable, the instructor personally may be the best practical alternative. For another example, assume that one of the skills involved in driving a car is the ability to sense (discriminate) potential dangers. Such dangers are detected by the eye and by the ear. Applying Guide 1, it is found that appropriate techniques for presenting relevant cues of stimuli would be through actual driving, through sound films, or through slides or pictures accompanied by audio tape. Applying Guide 2, it is found that the appropriate response can be made to any of these techniques, since it is an identification response that is wanted. Applying Guide 3, one would rule out the actual driving situation, because far discrimination practice can be systematically given through film or slides than through actual driving. One would rule out the actual driving situation when administrative criteria are applied, because it would be considerably less economical and less practical than the use of the specially designed films already available. In

this case, a film would be most appropriate, followed in appropriateness by video tape, slides, and the actual driving situation.

Summary

The best strategy is to pick those techniques most relevant to the type of performance involved and then make final selections on the basis of availability and probable use. After identifying the type of performance desired, identify those procedures most relevant to the desired performance. Finally, select those techniques that are most practical from those that are appropriate.

V. LOOKING BACK

Summary

I wish to conclude this paper by stating that I am happy to have had the experience. I am glad that the experience has been completed. Many fine people spent many hours in helping me during this experience. I shall cherish these friendships for many years. My project has been more theoretical than administrative. This is the type of paper I would write if I had to make the choice again. I do not regret it.

There are two areas where I feel the internship was less than it might have been. One was the dearth of administrative experiences. The other was the lack of closer supervision by Western Michigan University. I did feel uncomfortable several times when decisions were being made. This could have been avoided. Much more time has been spent in supervising the writing of this paper than in supervising the internship. I feel that the emphasis should be reversed.

For future internees, I would recommend more comprehensive supervision during the actual internship. I would also recommend more explicit guidelines for writing of the final paper.

I found this internship one of the greatest arenas for growth that I have experienced. I mean that sincerely. Much of the credit for that must be given to Mr. John Hyde and Mr. Dennis Ericson. The internship was enjoyable. The experiences gained were valuable. I have already enjoyed other growth experiences that were triggered by this internship.

The internship opened new doors of understanding for me. While the experience had some weaknesses, they were minor compared to the overall experience. I hope that the next intern from Western Michigan University will be as fortunate as I was.

BIBLIOGRAPHY

Bloom, B. S. (ed.), Engelhart, M. D., Furst, E. J., Hill, W. H., and Krathwohl, D. R. Taxonomy of Educational Objectives. Handbook I: Cognitive Domain. New York: David McKay, Inc., 1956.

Briggs, L. J., Campeau, P. L., Gagné, R. M., and May, M. A. Instructional Media: A Procedure for the Design of Multi-media Instruction, a Critical Review of Research, and Suggestions for Future Research. Palo Alto, Calif.: American Institutes for Research, 1963.

Cox, R. C. "Item Selection Techniques and Evaluation of Instructional Objectives." Bulletin, Learning Research and Development Center, University of Pittsburgh, Vol. 2, No. 2 (Dec., 1965).

Gagné, R. M. The Conditions of Learning. New York: Holt, Rinehart and Winston, Inc., 1965.

Glaser, R. "The Design of Instruction," Bulletin, Learning Research and Development Center, University of Pittsburgh (1966).

_____. "Toward a Behavioral Science Base for Instructional Design," Bulletin, Learning Research and Development Center, University of Pittsburgh, pp. 771-806.

Harless, J. H., "The Ugly Duckling Learns to Fly," NSPI Journal, Vol. 5 (1966), pp. 3-6.

Hyde, John. "The Process of Curriculum Development." Ottawa County Intermediate School District (1977).

Jacobs, P. I., Maier, M. H., and Stolurow, L. W. A Guide to Evaluating Self-Instructional Programs. New York: Holt, Rinehart and Winston, Inc., 1966.

Krathwohl, D. R., Bloom, B. S., and Masia, B. B. Taxonomy of Educational Objectives. Handbook II: Affective Domain. New York: David McKay, Inc., 1964.

McGehee, W., and Thayer, P. W. Training in Business and Industry. New York: John Wiley and Sons, Inc., 1964.

McKeachie, W. J., with Kimble, G. Teaching Tips. Ann Arbor, Mich.: The George Wahr Publishing Co., 1965.

Mager, R. F. Preparing Instructional Objectives. Palo Alto, Calif.: Fearon Publishers, Inc., 1962.

Miller, M. W. (ed.) On Teaching Adults: An Anthology. Chicago: Center for the Study of Liberal Education for Adults, 1960.

Popham, J. W. The Teacher-empiricist. Los Angeles: Aegeus Press, 1965.

Valentine, C. G. Programmed Instruction for Electronic Technicians. Detroit, Mich.: Michigan Bell Telephone Co., 1965.

Venn, G. Man, Education, and Work: Postsecondary Vocational and Technical Education. Washington, D.C.: American Council on Education, 1964.