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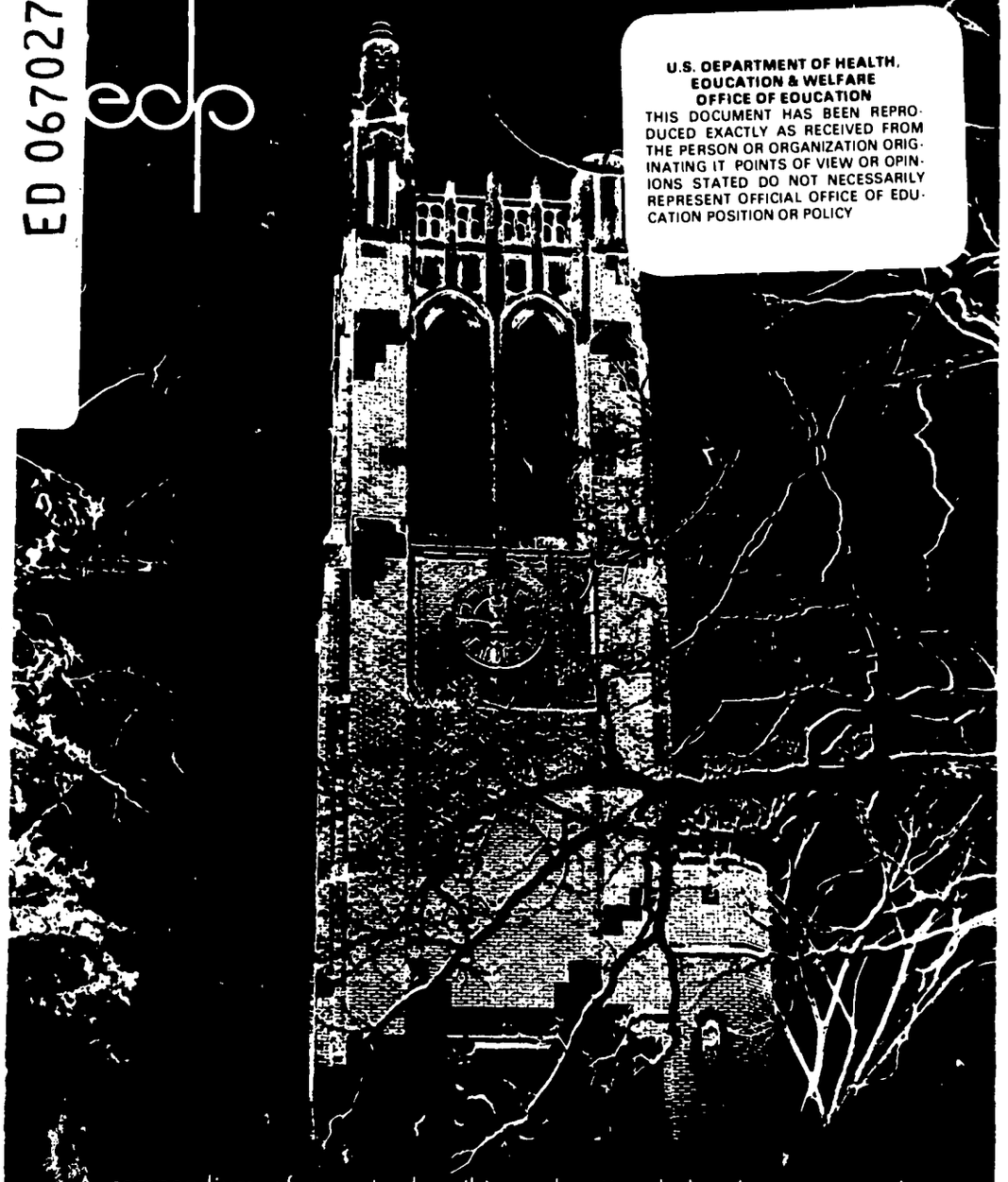
ABSTRACT

This report considers the efforts of the Michigan State University (MSU) faculty to improve undergraduate education. The report is organized into 4 parts. Part 1 describes the function, organization, and operation of the Educational Development Program (EDP). Part 2 is a collection of summaries of educational development projects conducted by the MSU faculty. These exploratory efforts attempted to improve the conditions for learning in specific courses or subject matter areas and were conducted by individual faculty with direct support from EDP. Part 3 considers projects not funded by EDP but which affect educational development. The final section offers a 6-part analysis of the Slate (Structured Learning and Teaching Environments) Instructional Model. This report describes instructional development efforts in progress from July 1970 through June 1971. (Author/HS)

# Educational Development
## at Michigan State University





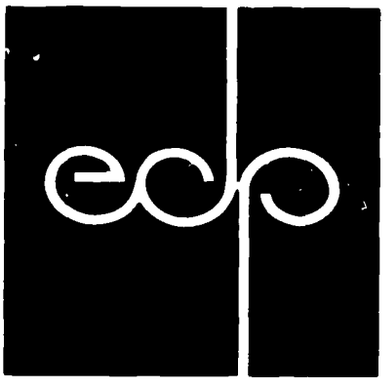


A compendium of reports describing educational developments in the disciplines and professional schools at Michigan State University.

Prepared and distributed by the Educational Development Program.

report no. 4

spring 1972




# Educational Development at Michigan State University

No. 4
Spring 1972

Prepared and distributed
by the Office of the
Educational Development Program
Michigan State University

CONTENTS

## A GLOSSARY OF ACRONYMS

Some readers of this document may find it overloaded with acronyms, some of which are local MSU terms. To increase communicability, a glossary of some of these acronyms is included.

AVT - *Audio-Visual-Tutorial*

A teaching methodology in which audio visual media are used to present information to a single learner in a carrel. Rate of presentation is learner controlled.

CCTV - *Closed Circuit Television*

A television distribution system in which taped programs or programs originating "live" in a studio or classroom are simultaneously distributed to other classrooms via coaxial cables.

EDP - *Educational Development Program*

The agency at Michigan State University which functions as a catalytic agent in developing improved undergraduate educational opportunities.

EPC - *Educational Policies Committee*

A standing faculty committee of the University serving in an advisory capacity to the Provost and other agencies of the University.

ES - *Evaluation Services*

The agency at Michigan State University whose function is to coordinate, operate and consult on student, faculty, and program evaluation.

GTA - *Graduate Teaching Assistant*

A graduate student who has instructional responsibility in a formally offered course at the University.

IDS - *Instructional Development Service*

The University agency responsible for providing supporting services to faculties and departments seeking to improve instruction.

IMC - *Instructional Media Center*

An arm of the Instructional Development Service, which provides media support, production, development and consultation services.

LS - *Learning Service*

A arm of the Instructional Development Service which provides consultation on design of instruction, objectives, and the evaluation of instructional systems.

SIRS - *Student Instructional Rating System*

A University-wide system for gathering, analyzing, and distributing data on student evaluation of faculty teaching.

SLATE - *Structured Learning and Teaching Environment*

A teaching methodology involving structured presentation of information to a single student, evocation of responses and provision of feedback. Information is self-paced, presented via multi-media in a carrel; responses are often made in a workbook.

VTR - *Video Tape Recorder*

A tape recorder, often intended to be "portable," capable of recording and playback of television video and audio.

## FOREWORD

The purpose of this report is to communicate the efforts made by MSU faculty to improve undergraduate education at the University. The report is organized into four parts. Part I describes the function, organization, and operation of the Educational Development Program (EDP). Part II is a collection of summaries of educational development projects conducted by MSU faculty. These exploratory efforts were aimed at improving the conditions for learning in a specific course or subject matter area and were conducted by individual faculty with direct support from EDP.

Another set of exploratory efforts were conducted by a variety of University agencies, again to improve undergraduate education. These efforts cut across disciplines and affect undergraduate education University-wide. Althouth not directly supported by the Educational Development Program, these activities are of sufficient importance to warrant inclusion in this report of instructional development activities, and are described in Part III of this document.

Part IV of this report is new this year. In this and future reports, this section will analyze new instructional models and synthesize knowledge acquired as a result of the developmental effort. In the present report, structured learning and teaching environments (SLATEs) are discussed and the results of a seven year program in this area are assessed.

The report style is intended to be as factual and objective as possible; to bring serious instructional problems out into the open and describe how MSU faculty and administration have attempted to solve them. This report will serve its purpose if it provides a source of useful information for college faculty and forms a basis for dialogue on improving undergraduate education.

This report describes only those instructional development efforts which were in progress from July, 1970, through June, 1971. Three previous reports summarized the developmental activities from 1964-1968, 1968-1969, and 1969-1970. Comments and requests for copies of this or earlier reports are encouraged. Please write to:

Dr. Allan J. Abedor, Assistant Director
Educational Development Program
Michigan State University
428 Hannah Administration Building
East Lansing, Michigan 48823

# PART I

# THE FUNCTION, ORGANIZATION AND OPERATION OF THE EDUCATIONAL DEVELOPMENT PROGRAM

## THE FUNCTION, ORGANIZATION AND OPERATION OF THE EDUCATIONAL DEVELOPMENT PROGRAM

### Function

The Educational Development Program is a division of the Provost's Office responsible for the improvement of educational opportunities provided MSU students. The overall goal of the program is to facilitate development and implementation of educational principles and procedures at Michigan State University which preserve and improve undergraduate education in the face of increasing enrollments, limited financial resources, and an explosive increase in the amount and complexity of knowledge.

The functions of EDP are:

1. To identify major problems in the areas of the curriculum, the learning-teaching process and the utilization of the faculty, financial and physical resources.

2. To stimulate and conduct research which will suggest solutions to identified problems.

3. To undertake projects and studies which give promise of improving both the quality and efficiency of the undergraduate program.

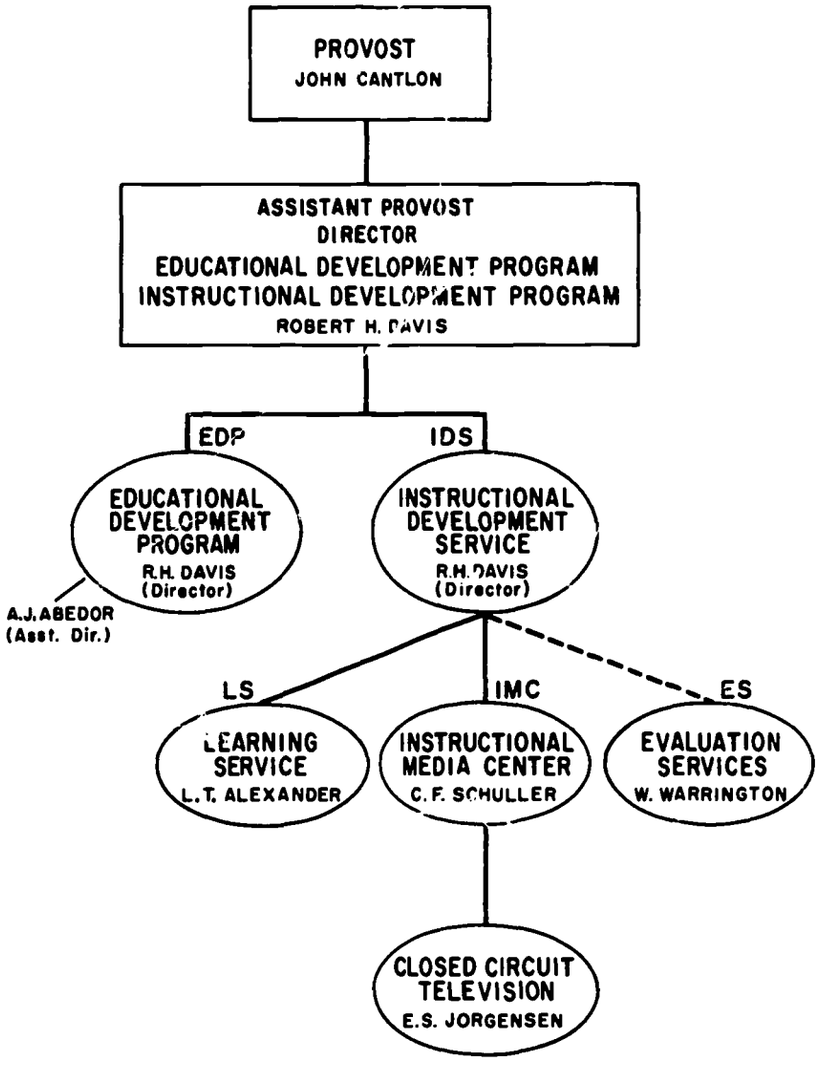
4. To support and provide service to groups interested in experimentation with new procedures and methods in learning and teaching.

5. To facilitate implementation of faculty and administration approved solutions to problems.

6. To identify and communicate progress in research, experimentation and implementation.

### Organization

In order to conserve its modest resources for academic development projects, the EDP office does not duplicate any organization or capability already present in the University. Organizationally located within the Office of the Provost, EDP operates with a staff of a Director, an Assistant Director, and one secretary. Beyond this small core staff, EDP depends on three University agencies which are coordinated to provide necessary consultative and support services for the planning and implementation of faculty conducted projects: the Instructional Media Center, the Learning Service and Evaluation Services. Two of these three agencies (Learning Service and the Instructional Media Center) are collectively titled the Instructional Development Service (IDS). Although Evaluation Services does not report directly to IDS, it represents a significant campus-wide resource for instructional improvement.


PROVOST
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LS
IMC
ES
LEARNING SERVICE
L.T. ALEXANDER
INSTRUCTIONAL MEDIA CENTER
C.F. SCHULLER
EVALUATION SERVICES
W. WARRINGTON
CLOSED CIRCUIT TELEVISION
E.S. JORGENSEN

The Learning Service consults with any department or faculty member on increasing the efficiency of student learning. It brings to bear on each problem current knowledge regarding variables which influence the learning process (e.g., motivational factors, individual differences in learning styles, student attitudes and values), and it assists in the design of instructional procedures that make use of all appropriate media and relevant techniques. The Learning Service will also lend assistance in identifying critical areas where innovations might produce the greatest improvement, and it will aid in the development, implementation and testing of instructional innovations and ideas. It serves EDP projects through consultation with faculty members who are interested in defining course objectives, specifying required behaviors, exploring new teaching techniques or relating test results to teaching practices.

The Instructional Media Center is responsible for the coordination and development of instructional applications of audio-visual media, including closed circuit television, and the improvement, through research and development, of programs and materials designed for instructional purposes. It serves EDP projects through consultation on and production of instructional media and materials as well as design of learning environments.

Evaluation Services support teaching departments in the evaluation of student and faculty performance and the improvement of course examinations. It serves EDP projects through consultation on evaluation design and analysis of evaluation data.

Operation

The Educational Development Program functions on a project base in much the same manner as other funding agencies. An operating budget from the University general budget is allocated to provide seed money for projects submitted by faculty members. Projects involve development, implementation and evaluation of some component of the undergraduate educational process, such as development of improved instructional procedures, analysis of curriculum, creating new courses and/or modification to existing courses, or review of college/departmental operating procedures. Normally a faculty member works with the EDP office and consultants from the Learning Service and Instructional Media Center in the development of a proposal. After approval by the appropriate department chairman and college dean, the proposal is submitted to the EDP office for evaluation and review by a panel of faculty.

After approval by EDP, the funds are transferred directly to the department or college concerned. Projects are normally supported by EDP during their developmental or experimental phase or until sufficient data have been collected for objective assessment. It is possible to obtain funding for an EDP project for one, two, or rarely, three years. Each year, however, requires a separate proposal and it is expected that the college or department concerned will provide an increased percentage of support in successive years. Upon project completion and a favorable evaluation, EDP recommends that the newly

developed procedures be integrated into the ongoing curriculum.

Project Proposals

Four general criteria have been established against which all proposals are evaluated:

1. Number of students affected: In general, EDP is concerned with those undergraduate courses and departments which serve the largest number of students.

2. Experimental or Innovative Approach: The project must evidence an experimental or innovative approach to curriculum or instruction. EDP does not seek to promulgate traditional procedures but instead seeks new and improved methods of solving instructional problems.

3. Generalizability: The techniques, procedures, or materials developed must seem potentially applicable to other academic areas in the University.

4. Capability for Evaluation: The project must be designed in such a way that outcomes can be evaluated. Procedures for evaluation are built into all projects and faculty are required to submit final reports describing project outcomes.

In general, EDP proposals are addressed to the Director, Educational Development Program, and may take the form of a memorandum, a letter, or a formal proposal. The following outline is suggestive of the information which are normally included in the proposal:

I. Background of the Problem

   A. The subject matter area, department, and/or course number.
   B. Indication of the number and characteristics of students directly or potentially affected.
   C. Description of the nature of the educational problem; e.g., what is wrong with the present system.

II. Proposed Solution to the Problem

   A. Description of the new instructional model, technique, process, or curricula which will be developed to solve the educational problem.
   B. Statement of the rationale or potential advantages of the new instructional model. Highlight the differences between the existing system and the one which will be developed.
   C. The major outcomes expected from the project. What are the major goals or objectives to be achieved?

III. Project Evaluation

A. A general plan for tryout and revision of new materials, processes or techniques.
B. A general plan for determining whether the process, techniques or curricula developed in the project warrant adoption into the ongoing course and/or departmental curriculum. The criteria, possible instruments and faculty or administrators who are the decision makers of interest.

IV. Development Process

A. How new materials, processes, or techniques are to be developed, including project time phasing.
B. What calendar periods will be spent on various activities such as planning, production, implementation, and evaluation.

V. Project Budget

A. The specific resources needed and the dollar cost of each. Expenditures in terms of supplies and services, salaries, and equipment categories derived in consultation with the Instructional Media Center on materials development and equipment costs. (Because of yearly variations in the EDP operating budget, individual project budgets are often negotiated after proposal submission.)

VI. Endorsement (Cover Letter) by Department Chairman and College Dean (to indicate that the Dean and Department Chairman are aware of the proposal and firmly support the project development).

Historical Summary

The EDP functions, organization and operational procedures described above have evolved gradually over the past nine years. Almost a decade ago in March, 1961, Michigan State University committed itself to the establishment of a "Seven Point Program" for the improvement of undergraduate education. One of the key points in that program called upon the University "to put to use discoveries already made concerning the learning process." Two years later in February, 1963, the Educational Development Program (EDP) was established and in July of 1964, EDP received a three-year grant for $440,000 from The Ford Foundation. Simultaneously, the expertise on campus in applied human learning and instructional media was brought together under a second group known as the Instructional Development Service (IDS). Reporting through a single director to the Provost, EDP and IDS have in the past nine years worked closely with the faculty of the University on hundreds of individual projects. The following

summaries of instructional development projects include only those actually funded by EDP or conducted under its auspices from July 1, 1970, to June 30, 1971. No effort has been made to describe the many consulting, teaching, production and media distribution services rendered by IDS to the University at large. EDP and IDS were originally under the direction of Dr. John Dietrich. In 1969, Dr. Dietrich became the Assistant Provost for Academic Planning and Dr. Robert H. Davis became the Director of both the Educational Development Program and the Instructional Development Service.

PART II

PROJECTS FUNDED BY EDP ORGANIZED BY SUBJECT MATTER AREA

PROJECT TOPIC: Accounting

Development of a time sharing CAI program library to augment instruction in accounting

PROJECT DIRECTOR: Dr. James Lampe

BACKGROUND:

Due to the increased use of computers in business and industry, it is an almost universally accepted premise that business graduates of the 70s should possess an increased understanding and capability to use computers in accounting and other related business fields. Ideally, the business students would learn about the computer and specific business disciplines in an integrated fashion. That is, certain aspects of primary subject matter (inventory valuation, depreciation methods, etc.) would be learned by allowing students direct access to and interaction with applicable computer programs and equipment. However, at present, there are few computer programs which can be used for such instructional purposes in accounting. Furthermore, since batch processing is not feasible for in-class "hands on" instructional purposes, a number of on-line time sharing instructional programs must be developed.

To address this instructional problem, Dr. Lampe proposed the development of a time sharing computer program library to augment the accounting curricula. The CAI library would be available to the entire MSU College of Business as well as other off-campus agencies. Individual programs would be adaptations of existing "off the shelf" programs as well as totally new ones, and would be developed using a three-stage process: (1) definition of time sharing applications; (2) development of essential programs and adaptation of existing programs; (3) field test and implementation into the curriculum. Ultimately, it was hoped that a comprehensive (50-60 program) library would be developed so that most, if not all, of the 2,000 to 3,000 accounting students per year would be able to learn a number of accounting principles via computer aided instruction.

PROJECT DESCRIPTION:

In the summer of 1970, Dr. Lampe obtained EDP support for the first two stages of project development. In stage one, a list of over 80 time-sharing applications was compiled with many applications in each of the basic areas in accounting; e.g., financial, managerial, tax, and auditing. It was concluded that an essential "starter set" library must include programs for each of the four basic areas.

In stage two, 22 programs were completed and debugged, while eight to ten more were in progress and will be completed next year. Descriptive titles of some of the programs developed include: (1) "A Computation of the Present Value and Rate of Return for a Series of Cash Flows;" (2) "Computation of an Individual's Tax Liability Upon Entry of Appropriate Line Items;" (3) "A Projection of Financial Statements Based on Alternative Inventory Valuation Techniques;" and

(4) "A Tutorial Program Explaining the Calculation of Standard Cost Variances."

PROJECT STATUS:

Due to the extensive time required for program development and debugging, only a limited number of programs were introduced into the accounting curriculum. Students in AFA 891 used two of the programs for augmenting financial statement analysis. Anecdotal data from this tryout indicate very high student and instructor acceptance of the technique. Four of the programs were used in AFA 203 and received very high ratings on an end-of-course evaluation. There was unanimous agreement that the programs materially increased knowledge of the subject and only two students indicated they did not enjoy the experience.

The project generally used more resources than anticipated in every category (such as faculty time, research assistance, and clerical help) except computer time. Additional computer terminals have been acquired by the MSU College of Business, and it is expected that more extensive use of the programs by both faculty and students will provide a more meaningful base for evaluation of the project. Development of additional programs will also be conducted in the 1971-72 school year.

PROJECT TOPIC: American Thought and Language

Use of full-length feature-film adaptations to stimulate and improve reading of required texts and expository writing

PROJECT DIRECTOR: Dr. Herbert Bergman

BACKGROUND:

Most freshmen entering Michigan State University are required to take a three-term sequence entitled "American Thought and Language" (ATL). These courses emphasize reading, expository writing, and the American cultural and intellectual experience. Usually they are taught through traditional techniques of assigned readings, lectures with class discussions, and expository writing assignments. In an effort to increase student motivation and learning, Dr. Herbert Bergman obtained funds from the MSU Educational Development Program to conduct a pilot study in which full-length feature-film adaptations became an integral part of the ATL instructional model.

It was hypothesized that use of a feature film of a novel or play would enable students to achieve greater retention of the novel or play, more vividly perceive the written document, and more effectively perceive the unique characteristics of the genre of the novel, play, and film. It was further hypothesized that use of feature films would enable students to compare and contrast filmic and literary devices of theme, point of view, plot development, characterization, setting, simile, metaphor, symbolism, irony, humor, cliche, understatement, and economy, and improve their classroom discussion and expository writing.

PROJECT DESCRIPTION:

These hypotheses were tested in the context of several experimental/control group comparisons extending over three terms. The experimental groups were shown the films and did the readings while the control groups did the readings only, but had two additional classroom hours of instruction. The substantive content and teaching techniques for both groups were as similar as possible, save for the use of the films. Both experimental and control groups were taught by the same instructors. Common reading and writing assignments, discussion and study questions, and written examinations were used. The same instructor led the discussion of a particular book and film in both his experimental and control sections. Dependent variables included: (1) performance on twelve expository papers (four each term), and (2) student comments and attitudes assessed at the end of each term. Evaluation of the expository writing was done by two judges (the instructor and a reader who read all papers involved in the experiment) using a special "checklist" for the evaluation of a paper developed for this purpose. A double-blind procedure could not be used; e.g., the judges had to know which paper, experimental or control group, was being read.

Preliminary data were encouraging. Student comments and attitudes were highly favorable, with over 66.3% of the students each term rating the experimental sections excellent or good. Student interest was great and sustained, as evidenced by attitudinal data as well as increased enrollments in the film sections. (The number of film sections rose from six in the Fall, 183 students total, to nine in the Winter, with 283 students total. In the Spring, there was sufficient demand for sixteen sections, totaling 512 students, but it was possible to staff only thirteen sections enrolling 410 students.)

In the Spring term, 68.6% of the students felt that the films helped in their reading, and 67.1% felt that the films helped in their writing. Of 57 students whose papers were read twice and who were in the film sections in all three terms, 60.7% of these students improved their writing grades significantly in both the Winter and Spring terms, the mean improvement being 23.88 points.

Instructors commented that the writing of the students in the film sections was "often fresh and spontaneous," "more fluent and fluid, and less academic," "more inspired in many cases," and "characterized by insight, understanding, and clarity"; they found the quality of the papers "at least equal to, and often superior to," "better than," or "a bit better than" that of the control-group students.

PROJECT STATUS:

During this pilot study, it was impossible to retain the same students in experimental and control groups in three successive terms. Furthermore, experimental section teaching techniques changed over time as the procedures were refined due to experience gained in the use of films. Further, the film-section faculty was not exactly the same each term, because more film sections were added each term to satisfy the student demand.

As a result of these problems encountered during the pilot study, it is hoped the experiment will be replicated in 1972-73. The knowledge and experience gained from the pilot study, the information accumulated from a survey of other courses over the nation using films for a similar purpose, and the input from discussions at film conferences and professional meetings will be used to improve the experimental procedures and refine the experimental treatments.

Nonetheless, the pilot study provided evidence demonstrating the effectiveness of the use of full-length feature film adaptations to stimulate and improve reading and expository writing. As a result, the film course has been made a permanent part of the curriculum of the Department of American Thought and Language and has elicited inquiries from educators over the country because of its uniqueness and innovative approach.

PROJECT TOPIC: American Thought and Language

Development of a reading skills laboratory for freshman comprehensive English courses

PROJECT DIRECTOR: Mrs. Jane Featherstone

BACKGROUND:

Students entering the University who are deficient in reading, writing, grammar, and listening skills are required to start with the first course in the developmental English series, ATL, 101. Until recently, the needs of ATL 101 students could be met through a multi-section conventional course using a small class discussion/lab teaching model. During the last few years, however, entering students have become far more heterogeneous due to an influx of educationally disadvantaged youth from urban areas. These students often lack reading and writing skills and possess non-standard language patterns.

In order to accommodate increasing numbers of more heterogeneous entering students, University College established a learning resources center in which students could develop reading and writing skills on an independent study basis. However, it was felt that extant "off the shelf" materials were inadequate for achieving specific ATL 101 course objectives (reading speed, comprehension, vocabulary, grammar and listening skills, etc.) with the diverse student population. Furthermore, a system was needed for diagnosing student problems, prescribing appropriate instructional treatments and evaluating student progress. Therefore, Mrs. Jane Featherstone obtained funds from EDP over a two-year period to: (1) develop multi-media modules to supplement existing materials; and (2) develop a system for diagnosis, prescription and evaluation of student progress in reading, writing, and listening skills.

PROJECT DESCRIPTION:

Analysis of course objectives revealed that reading skills were the most fundamental. Therefore, in the first year of development, the major effort was devoted to production and acquisition of sets of materials to improve reading speed and comprehension. Commercially available materials were evaluated for applicability in ATL 101 by a reading specialist and several doctoral students in educational technology. Materials which were acceptable, or modifiable, were purchased and developed into instructional modules. Each finished module consisted of 30-45 minutes of instruction and practice presented via audio tapes, filmstrips, and workbooks. Teachers' guides for ATL 101 faculty were also developed. An orientation session for teachers was held Fall Quarter, 1971.

Students' reading difficulties were diagnosed by an overall screening instrument. Students falling below criteria were referred to a reading specialist who performed individual diagnosis and prescribed treatments from the available modules. A total of five new modules were produced to augment commercial materials.

The individual diagnosis and treatment technique was implemented on a limited scale but due to severe time constraints, a formal evaluation of the system was not performed. Anecdotal data from students, lab instructors, and the reading diagnostician indicate that moderate gains in reading speed and comprehension were achieved and students enjoyed not being tied to a formal class structure.

In the second year of development, five activities took place: (1) many of the modules were revised (particularly those concerned with vocabulary building); (2) a tracking system was instituted (ATL 101A and ATL 101B) with students at a lower skill level placed in 101B; (3) the diagnosis and prescription procedures were made more flexible so that students in ATL 101A could select from a "menu" of prescriptions; (4) undergraduate tutors were employed as an alternative means of providing remedial instruction; and (5) the revised system underwent formal evaluation using a pre-post experimental control group comparison. The Nelson-Denny standardized reading speed and comprehension test was used as the criteria measure. Experimental groups used the conventional ATL 101B instruction plus the diagnosis and prescription system and available remedial alternatives including student tutors. Control groups received conventional instruction from ATL 101B faculty, with no use of modules, tutors, etc. Data from this study showed a 5% to 6% difference in total scores favoring the experimental groups on the Nelson-Denny test, although individual groups varied with respect to improvement in vocabulary and comprehension. With very few exceptions, students in experimental groups improved more on reading rate than control groups.

PROJECT STATUS:

After assessing laboratory procedures for several terms and after analysis of the evaluation data, ATL instructors and laboratory staff have reached some tentative conclusions. First, eradicating reading problems at the college level is excruciatingly difficult. By the time a student is 17 or 18 years old, a reading difficulty may be more than a simple reading problem. It may be a symptom of any of a variety of problems, an extreme language deficiency, or a psychological barrier. Second, progress requires more time than the poorly motivated student may be willing to spend, but success seems to be directly proportionate to productive time spent in the laboratory. Third, student progress seemed to take place in direct proportion to the increased experience and availability of laboratory tutors and the one-to-one instruction of a graduate assistant, whose duties were diagnostic, instructional, and evaluative in that she followed many of the 101B and 101A students through these three steps. Fourth, although student tutors have performed admirably, additional training sessions are needed. In addition, a full-time reading teacher is needed to work with all students (ATL 101A and B, Reading Referred, and others) who need assistance. Fifth, a closer liaison with counselors and student personnel is needed to deal more effectively with students as human beings rather than reading problems. Discussions with counseling and residence hall personnel are already in progress for the purpose of opening lines

of communication for next Fall. In sum, the project thus far has revealed the complexity of the problem and that a multi-faceted approach must be taken to achieve project objectives.

PROJECT TOPIC: Animal Husbandry

Development of structured learning and teaching environments to prepare students for live animal laboratories

PROJECT DIRECTOR: Dr. Harold Henneman

BACKGROUND:

Animal Husbandry 111 provides students an overview of livestock producers' problems encompassing beef cattle, sheep, swine and horses. In the laboratory, live animals provide experience in working with livestock as the students study anatomy and conformation. The annual enrollment is approximately 300 students, mainly majors in Animal Husbandry or Veterinary Medicine. Many students have a farm background, but many are from the city. This heterogeneity of background caused problems in action laboratories. It was felt that more meaningful learning would occur in the action labs if students could enter the lab with some minimal level of familiarity with vocabulary and anatomical concepts. Therefore, the decision was made to develop a series of self-instructional AV "prep labs" emphasizing vocabulary and anatomy of the four species. Criterion performance in the prep lab would be prerequisite to attendance at the action lab. The planned instructional model would then include large group lectures, self-instructional prep labs and small group action labs.

PROJECT DESCRIPTION:

The project called for development and evaluation of 20-30 prep labs and installation of 10 carrels over a three-to-four year period. The first year (1967-68) concentrated on specification of objectives and design and production of visuals for 8 prototype lessons. The second year (1968-69) focused on development of visuals for four additional lesson units (for a total of 12), and the design of AV carrels. In 1969-70, six dual carrels were installed and each equipped with three Carousel projectors and tape recorder. The tapes and student workbooks were completed and the SLATE units were used during Spring quarter 1970. In 1970-71, three additional SLATEs were developed and three prototype lessons revised.

PROJECT STATUS:

A total of 17 SLATE units have been completed and integrated into the course. Evaluation has been conducted by using representative students from the AH 111 class to try out the new lessons. Revisions have been incorporated as suggested by students as resources allowed. As a result of these efforts, student performance in the action lab has improved significantly, mean achievement scores on exams covering SLATE material improved from 69.5% to 90.5% and student attitudinal data have shown strong acceptance of the course

and the teaching methodology. A multiple correlation was run to investigate the relationships between several independent variables (students' major, pretest scores, and SLATE or non-SLATE instruction) and the dependent variable of gain scores on a comprehensive course examination. The data showed that of the four variables investigated, SLATE instruction was found to have the highest correlation (R = .82) with gain score. These data provide strong support for continued use of SLATE prep labs in AH 111.

PROJECT TOPIC: Art

Development of a first year core program emphasizing the basic skills, elements, and objectives of visual literacy, changes students' perception of art as a process, and which accommodates up to 500 students per year

PROJECT DIRECTOR: Professor James Adley

BACKGROUND:

In recent years, the concept of visual literacy has been given increased emphasis at all levels of education. As a result of a departmental study, the MSU Art Department determined to: (1) revise the existing first year program to include the basic elements and objectives of visual literacy; and (2) develop a first year program which would accommodate a minimum of 500 students. A core program development committee was formed in order to make recommendations on 1 and 2 above. The committee began deliberations by first establishing an educational philosophy and a conceptual framework for visual education. The philosophy was basically that the first year program should make available to all students, regardless of their major, a set of experiences which will enable students to examine their preconceptions of art; consider ways in which art can affect their personal development; increase their visual literacy; and improve the technical skills requisite to producing works of art. The conceptual framework for visual literacy encompassed 11 key concepts which were then to be included in the core program content. In addition, the core program was to function as a screening or selection experience for potential art majors and at the same time provide a terminal experience for non-majors.

Having developed an educational philosophy and conceptual framework, the core program development committee, coordinated by Professor James Adley, addressed the problems of substantive content, student objectives, teaching strategies, and student enrollment limitations. It was felt that the initial experimental program should be limited to 200-250 students until content, strategies, and resources were clearly delineated.

Furthermore, the scope and magnitude of the program seemed to justify a three year development timetable. The first year would be used for planning, specification of objectives, developing substantive content, teaching materials, etc. The second and third years would be used for implementation and evaluation. Working within these parameters, the core program committee obtained an EDP grant for the first year of development.

PROJECT DESCRIPTION:

The core program committee developed a general set of objectives, teaching strategies, and content based on an estimated enrollment of 200 students (majors and non-majors) and existing departmental resources as augmented by the EDP grant. It was felt, however, that

for valid program development, feedback from students and other concerned faculty was essential. Therefore, a decision was made to use the program development committee as teaching faculty and actually offer an experimental core program during the first year of development. This would enable the committee to collect first hand data upon which revisions could be made the following year--and allow organization, content, objectives, and evaluation to be modified on a try and revise basis immediately. Thus a dynamic, interactive, development process emerged wherein objectives, content and methods were specified for a single term, subdivided by the week, and then adjusted on the basis of input from students and faculty at weekly planning sessions.

As a result of feedback and faculty interaction at planning sessions, the general emphasis and teaching strategies changed over time. In Fall term, the teaching model involved a large group presentation (200 students and 10 instructors) to keynote small group activities (50-60 students and 3-4 instructors) carried out later in the week. The large group presentation involved topical demonstrations, films, video tapes, group activities, etc. The small groups then "interpreted" the weekly topics and organized activities involving the entire group and/or smaller groups (3-7) of students. Work of the group as a whole, smaller sub-groups, and individual students was evaluated by a panel of all 10 members of the core teaching staff. Students rated the Fall term experiences on a special evaluation form.

Based on data collected Fall term, several changes were made in Winter term. For example, a P/N (pass-no grade) grading system was instituted and students rotated by section into studio classes in general drawing and life drawing; films; art history; slide/music; and color/light demonstrations. Evaluation of students' work was performed by individual section leaders.

Spring term emphasized personal projects of the students working under the supervision of instructors. The large group presentations were phased out with small group sessions (25 students and one instructor) and individual work becoming the primary teaching strategy. A formalized review of student work was initiated Spring term in order to screen those wishing to go on into second year work. In order to evaluate the total three-term experience, a special rating form was developed and administered to students during final exam week. A large group discussion was initiated between faculty and students to explore problem areas and alternatives suggested on the evaluation.

PROJECT STATUS:

The core program committee developed a report to EDP and the Art Department faculty outlining the philosophy, conceptual framework, objectives, teaching strategies, and resources needed to continue and improve the first year program. The recommendations contained in the report have been acted upon by the Department and the core program will enter its second year of development. A similar developmental model will be followed with a new core program committee acting

both as teaching faculty and curriculum developers. By rotating core program committee members, it is hoped that a greater number of Art Department faculty will become involved in and committed to the general program developed the first year.

PROJECT TOPIC: Educational Psychology

Application of the "Mastery" model of learning to an intermediate educational psychology course

PROJECT DIRECTOR: Dr. Walter Hapkiewicz

BACKGROUND:

Despite advances in knowledge about student learning, many university courses have not moved very far toward the goal of increased learning for all students. However, recent research on "mastery learning" (Keller, 1968; Sheppard & MacDermot, 1970) have suggested explicit classroom procedures whereby up to 95% of the students have demonstrated superior achievement and reported greater personal satisfaction with the course than students taught by more conventional methods. In order to evaluate the generalizability of the mastery learning strategy for teaching educational psychology to practicing teachers, Dr. Hapkiewicz obtained funds from EDP to conduct a pilot study. The primary objective of the study was to assess the effect of the mastery learning approach on student achievement and attitude toward the course. Secondary objectives were: (1) to enable each student enrolled in the experimental course to achieve at a preselected level of mastery of course concepts; (2) to allow as much instructor-student and student-student personal interaction as possible; and (3) to demonstrate how such a system of mastery testing, with an emphasis on cooperation instead of competition, can be organized in a classroom. Unlike previous studies, however, students were not required to achieve the same level of mastery. Rather, performance standards were specified at the beginning of the course and students selected the level of performance that was satisfactory to them. This approach was then compared to a more traditional lecture-examination course taught by the same instructor.

PROJECT DESCRIPTION:

The study was carried out during the Winter and Spring quarters of 1970. One section per quarter (enrollment was approximately 50 per section) was taught using the mastery strategy while the other was taught in the more traditional mode. Since one section was taught in the morning and one in the evening, instructional modes were counterbalanced across the Winter and Spring quarters (e.g., the mastery strategy was used in the morning during the Winter term and in the evening during the Spring term). In order to define various levels of mastery, normative standards used in the more traditionally taught course in the Fall were used. For example, approximately 10% of the students in the Fall scored 90% or above on the course examinations. Therefore, the 90% standard was subsequently used as the criterion for achieving an "A" under the mastery approach. The mastery learning section was organized as follows: (1) the course material was divided into 10 units (chapters 1-10 of the Psychology of Learning and Instruction: Educational Psychology by John DeCecco), (2) instructional objectives accompanied each unit

of material, (3) two parallel forms of multiple choice quizzes, ranging from 10-17 items, were available for each unit, (4) before attempting this quiz the student was required to participate in a conference conducted by a proctor (the student-proctor ratio was approximately 10 to 1), (5) several essay questions were available for each unit, (6) a final examination and an attitude scale were administered at the completion of the course (all students were told that the purpose of the final was to evaluate the course and would, therefore, not affect their grade), and (7) students progressed through the course at their own pace.

The following procedure was typical of the manner in which students progressed through the course. Upon completing his study of each unit, the student participated in a conference with a proctor in order to give the student practice in discussing the material and diagnose difficulties before the student attempted the quiz. This was particularly important since there were only two forms of each quiz. Proctors asked questions, which were standardized for each unit, at the beginning of each conference and provided tutoring as needed. The conferences were approximately 5 to 15 minutes in length. Proctors could make recommendations for further study but the student ultimately decided when he was ready for the quiz. The various forms of quizzes were administered randomly to obtain exposure to all test items and reduce the probability of student cheating by memorizing a limited number of items. Proctors graded quizzes immediately after the student completed them and provided remedial discussion of points misunderstood. At this point the student was eligible to move on or retake the alternative form of the quiz. Once satisfied with his performance on the multiple choice items, he was required to answer one essay question covering that unit. A separate record was kept for each student which indicated: (1) the proctor he had conferred with, (2) the form of the quiz he was taking or had completed, and (3) his score on each quiz. All records were kept by a graduate assistant. Since these procedures were generally conducted during class time the instructor was always available to discuss problems on an individual basis with students and to provide lectures and films.

The section which was taught in a conventional manner received the same lectures and films and sat for three examinations. The same items were used for both groups by simply combining the quizzes used in the mastery section. Once again, both forms of the quizzes were used and were randomly distributed to the students. The class following the examination was used to provide feedback and discussion of test items.

In comparing the test results of the two groups only the quiz scores achieved by the mastery group on the first attempt were used. These quiz scores for each individual on each unit were summed to make them comparable to the examinations administered to the traditional group (e.g., units 1-4 comprised test 1). Results indicated that there were large and significant differences between groups on all three tests ($p < .0001$). Students taking the more extensive examinations averaged about 77% on each exam while students enrolled in

the mastery section averaged 90%. The mastery group performed better on the final, although not significantly so ($p < .20$).

On an attitude questionnaire students taught by the mastery learning method were more likely to view the course as superior compared to others they had taken in college ($p < .0001$), recommends the course to other students ($p < .0001$), pursue additional work in educational psychology ($p < .05$), and reported that the course would have more effect on their own teaching ($p < .01$). In addition, when compared to the ratings of the traditional group, students in the mastery section reported a significant decrease in test anxiety as they progressed through the course ($p < .0002$). When asked if they would be willing to help another student learn the course material, students in the mastery section were significantly more cooperative ($p < .02$). Finally, students in the mastery section reported spending significantly more time studying than students in the other group ($p < .07$). This would account, at least in part, for their superior test performance. However, when asked to rate the course requirements, the results from both groups were practically identical.

Results from the two evening courses (one conventional and one taught on the mastery model with proctors) were then compared to the results obtained in a previous term (also taught in the evening) in which no proctors were available. This latter course was organized in the same manner as the experimental mastery course previously described except for the fact that students interviewed one another instead of being interviewed by a proctor. Both achievement and affective results from this course and the other experimental course were practically identical. This indicated that proctor-conducted interviews were unnecessary and that their time could be spent more efficiently in scoring mastery tests and tutoring.

These results indicate that more students can achieve at high levels if the appropriate instructional conditions are provided. These conditions plus more study time appear to account for the superior performance and attitude of students taught by the mastery method. Importantly, this was accomplished without requiring a specific level of mastery. The knowledge gained from this pilot study indicated several areas in which gains in efficiency were needed. Therefore, Dr. Hapkiewicz is conducting a follow-on study in the 1971-72 school year to further refine this adaptation of the mastery learning strategy.

PROJECT TOPIC: Elementary Education: Reading

Development of a competency based reading instruction course

PROJECT DIRECTOR: Dr. Gerald G. Duffy

BACKGROUND:

Education 325A is the course through which 300 prospective teachers per term are to obtain skills in teaching reading. Prior to Fall, 1970, ED 325A was conducted within a framework of a two-hour large group lecture and a one-hour recitation session per week. At that time, course activities normally consisted of passive listening to lectures and completion of midterm and final examinations. Reports from many student teachers indicated a dissatisfaction with their abilities to teach reading. Therefore, in 1968, a model reading methods course was proposed as a part of the U.S. Office of Education sponsored Behavioral Science Teacher Education Program (BSTEP). This model emphasized competency based instruction, innovative and relevant utilization of media and provision for student options according to interest and career aspirations. When federal funds were not forthcoming, the proposal was submitted to EDP and approved. This proposal stressed three major goals: (1) development of a competency based course; (2) development of a post student teaching course with opportunities to pursue special problems in reading instruction; and (3) assessment of the feasibility of competency based instruction in undergraduate reading methods courses enrolling 300 students per term.

PROJECT DESCRIPTION:

The pre-student teaching course (ED 325A) developed in this project is unique in three ways: (1) it models instructional principles to be used by elementary teachers; (2) it is performance-based; and (3) it offers numerous options for pursuing individual needs and interests.

The modeling aspect of the course is essentially a matter of the teacher educator "practicing what he preaches." The major principles being modeled include instructor accountability, competency-based instruction, application of the principles of learning theory, and the development of humanistic relationships between instructor and student.

The performance-based aspect of the course specifies sixty teaching behaviors needed by reading teachers and provides a range of experiences in which the student must demonstrate these behaviors in simulated teaching situations. The emphasis is on demonstrated performance, student activity, and mastery of each objective as opposed to the practice of listening to a lecture and completing a final examination.

Students demonstrating mastery on the above objectives are eligible to participate in optional enrichment activities. Students can choose the activity each week which most suits their interests and

career aspirations. These activities are practical in nature and emphasize the development of behaviors and materials needed to teach reading effectively.

The elective, post-student teaching course (ED 483) has been developed to provide prospective teachers with the opportunity to solve problems of reading instruction encountered in the reality of student teaching. Each student, with the advice of the instructor, designs his own program for the course based on his needs and the available options. These options include additional field experiences, independent library study, problem seminars, workshops, and service as assistant instructors and tutors for the pre-student teachers enrolled in Education 325A.

In addition to the above major goals, efforts have also been made to improve instruction in other ways. For instance, the means for allowing students to pace themselves through Education 325A has been developed and piloted; videotaped samples of real teaching situations have been collected and used as a source for adding reality to the course; presentations by persons having expertise in a particular area have been videotaped for repeated use in future terms; and situations have been structured to determine more precisely the effect of instructor attitude and behavior on student performance.

PROJECT STATUS:

Considerable evaluative data were collected during the first year of the project. These data provided information regarding student response to the course, achievement of reading instructional skills, student self-confidence, effectiveness of self-pacing, and the effect of various feedback techniques. The results of these evaluations were very encouraging. In general, students clearly indicated a high degree of enthusiasm for the competency-based instructional model. Further, students demonstrated far greater achievement of course objectives and much greater self-confidence than previously. It was determined that the concept of a mastery-based instructional system was feasible within the context of a 300 student course; however, further development was warranted. Therefore, a second year of development is under way emphasizing refinement of simulation materials, student workbooks and management procedures.

PROJECT TOPIC: German

Development of audio-visual materials to improve instruction in undergraduate German courses

PROJECT DIRECTOR: Dr. Udo A. Munnich

BACKGROUND:

Many undergraduate language courses are taught in a traditional way; e.g., by means of conventional language textbooks and use of the blackboard in addition to the spoken word. In an attempt to improve students' spoken and written fluency, as well as to improve attitudes towards the language course, Dr. Udo Munnich obtained EDP funds to develop a number of prototype audiovisual stimuli and strategies for using these stimuli. The AV techniques were developed for undergraduate courses with the most successful techniques to be included in a graduate seminar on teaching methods. The graduate seminar would enable the techniques to generalize to a large number of courses. The major objective of the project was to enable students to express themselves more effectively in the foreign language by means of visual and verbal stimuli.

PROJECT DESCRIPTION:

Several types of instructional media were developed including: (1) transparencies for the overhead projector presenting visual concepts with printed vocabulary for oral description and discussion of the picture; (2) 35mm slides illustrating a short story which students would describe both orally or in writing; (3) silent movies so students could describe orally or in writing the plot, characters and actions portrayed; (4) sound movies (newsreels from Germany) used two ways: (a) with the sound track on so students can obtain translation practice and restate the plot, dialogue, etc.; and (b) sound track off so students can invent a dialogue of their own which can be compared to the original; (5) cartoon fill-ins in which the dialogue from popular comic strips are filled in by the students in writing, after which the students describe and discuss the various responses; (6) overhead projector acetate rolls to provide written and oral practice on longer grammar drills.

Preliminary tryout of the AV materials and techniques showed a very high acceptance on the part of the students and, in general, a considerable increase in verbal and written fluency. On end-of-term evaluations, 91.5% of all students sampled indicated their preference for courses conducted using the AV techniques. Anecdotal data collected from instructors indicate that classes using the AV techniques were superior to conventional classes in terms of spoken and written language fluency. Some techniques, however, were found to be better for advanced students and appropriate changes were made in the teaching strategies.

PROJECT STATUS:

The data collected thus far indicate a large potential for improving student learning of foreign language by means of audiovisual stimuli which augment the traditional spoken and written instruction. However, additional development is needed to identify the specific techniques most appropriate to the student's skill level. For example, some kinds of visual stimuli appeared too complex while others were too simple for optimal learning. Additional study is needed to refine the techniques themselves and at the same time determine principles of optimal utilization. Dr. Munnich has included many of these techniques in a graduate seminar on teaching methods and as a result the best techniques are being used by increased numbers of departmental instructors. Current plans call for continuing the project in the 1971-72 school year to refine the techniques developed thus far.

PROJECT TOPIC: Humanities

Development of self-instructional slide/tape modules to improve the art lessons in the Humanities course framework

PROJECT DIRECTOR: Dr. Roy T. Matthews

BACKGROUND:

Students entering the basic Humanities course are very heterogeneous in their previous experience in this field. This is particularly true with respect to art. It was hypothesized that instructors were spending an inordinate amount of class time teaching very basic concepts which, if they were in the students' repertoire, would allow the class to move on to more advanced concepts and allow the class to operate at a much higher level.

PROJECT DESCRIPTION:

To test the above hypothesis, Dr. Roy Matthews organized a development team which concentrated on producing a series of five self-instructional slide/tape modules. These modules were to provide basic information and familiarity with art concepts prior to class meetings. The development group conducted the project in three stages: (1) objectives for the basic skills and knowledge in Humanities 241 and 242 would be abstracted from past common term-end examinations and a set of objectives would be generated for each of the five art lessons; (2) a slide/tape presentation for each art lesson was produced to assist students in achieving the stated objectives; and (3) each slide/tape presentation would be pretested and revised based on data from a small sample of representative students.

Slide/tape modules were produced on the following: (1) Romanesque and Gothic; (2) Early Renaissance; (3) High Renaissance; (4) Reformation Art and Genre Work of the 16th Century; and (5) Art of the Baroque and Rococo. A pre-post experimental/control group comparison was conducted in which control groups were not allowed to use the five modules, while experimental groups used the modules. The criterion measures were: (a) final exam scores; (b) attitude towards the course; and (c) gain score between pre and post tests. Data reveal that the experimental group showed much greater gain scores but little difference between the experimental and control groups on the common term-end final. However, the attitude of the experimental group was much more positive towards the course and art than the control group.

PROJECT STATUS:

The data from the experiment were interpreted as substantiating the hypothesis that students can learn as effectively through mediated lessons as through conventional instruction--thus freeing the instructor to move on to higher level concepts in the class. Further

work is planned for the following year as the number of modules will be expanded and a greater number of instructors will be involved. In effect, a replication of the experiment will be conducted with an expanded set of modules.

PROJECT TOPIC: Human Potential Seminars

Development of seminars in human potential and training of resident hall advisory staff to facilitate such seminars

PROJECT DIRECTOR: Ms. Carolyn E. Jakobsen

BACKGROUND:

As part of the co-curricular educational program of East McDonel Residence Hall, a series of seminars emphasizing human potential are provided for hall residents. The purpose of these small group experiences is to facilitate students' growth and maturation through positive self-examination and awareness of a broader range of personal goals, strengths, achievements, and value systems. Thus, the seminars are intended to induce constructive self-evaluation, with the ultimate goals of greater self-determination, self-motivation, and an increase in self-worth and self-confidence. It is hoped that if such goals are achieved, students participating in the seminars would tend to use more of their capabilities, be more effective in their interpersonal relationships and, in general, lead healthier, more meaningful lives.

The format of the seminars limits enrollment to eight participants and one leader. Therefore, to make the seminar available to a greater number of McDonel residents, it became necessary to train a number of group leaders. Group leaders were selected from among those who had completed the seminar and who wished to lead other groups. An important component of the training process was feedback to the trainee on the appropriateness of their interactions with seminar participants. It was determined that such feedback could be obtained by means of tape recording the actual sessions handled by trainees and debriefing the trainee after the session. To facilitate this training function, Ms. Jakobsen obtained an EDP grant for the purchase of the necessary tape and rental of the tape recorders.

PROJECT DESCRIPTION:

The basic format of the seminars was developed at Kendall College, Evanston, Illinois, and involves six to eight participants in interaction for approximately 20 hours. In the first phase, each person in the group is encouraged, by the leader's example, to share those experiences (and the peak experience) which he feels have contributed to his being the person he is now. After this personal unfoldment phase comes the goal setting process, which is continued throughout the seminar. Initially, each person is to set a goal to be achieved by the next meeting. Goals must meet certain stringent criteria such as: achievable, believable, measurable, non-injurious, voluntary, etc. The next phase deals with personal achievements, successes, satisfactions, and value clarification focusing on identification of personal motivational principles and clarification of what is important to a person. The final session emphasizes long range goal setting or life style planning.

Initially, six resident advisors of McDonel Hall were selected for training in human potential group leadership. The trainees themselves first participated in a human potential seminar, then each conducted a seminar for McDonel residents. All told, ten resident assistants and thirty-three residents experienced Human Potential Seminars during this project. The leader trainees were supervised, via the tape recordings of group meetings by Ms. Jakobsen or other experienced personnel from the MSU Counseling Center. It was planned to evaluate the training program through use of Shostrom's Personal Orientation Inventory as a posttest. However, budgetary constraints precluded its use and a substitute inventory was developed by Ms. Jakobsen in conjunction with the MSU Learning Service.

PROJECT STATUS:

The general response by students to the Human Potential Seminar experience was very positive and encouraged continuation of the program. Students indicated major gains in the areas of value recognition and goal setting. A number of specific suggestions were made which should improve seminar effectiveness and which will be incorporated into the training program for next year.

It was determined, however, that a video tape recording of seminar interactions would provide a far more useful tool for leader training than audio recordings. Much of the communication in the seminar is non-verbal and hence is lost on the audio tape. Therefore, Ms. Jakobsen is developing a new training program to be organized around video taped examples and feedback. It is probable that the new training program will be developed under a second EDP grant during the 1972-73 school year.

PROJECT TOPIC: Mathematics (Calculus)

Development of teaching materials, techniques and homework assignments to improve social science students' efficiency and effectiveness in learning Calculus

PROJECT DIRECTOR: Dr. John E. Hunter

BACKGROUND:

A two-term course in Calculus is offered to students in social science to provide competencies related to research design and interpretation as well as mathematical theory building. Typically, however, students in social science are apprehensive regarding a course in calculus due to previous failures in algebra and geometry. To overcome student apprehension regarding quantitative concepts and to enable students to learn the desired competencies, Dr. John Hunter developed a course structured differently from a conventional calculus course. Instead of first presenting theorems and definitions followed by examples, the students first work with examples drawn from social science and through class discussion are guided into discovery of the appropriate quantitative concepts. Using this strategy reduced apprehension but, nevertheless, many quantitative concepts still proved very difficult to learn. In an effort to improve student learning in the more complex areas of the course, Dr. Hunter obtained an EDP grant to develop appropriate materials and strategies.

PROJECT DESCRIPTION:

Project objectives fell into two categories: short range and long range. The short range objective was to improve learning in certain areas of the course where previous student performance on exams was not up to the desired standard. Primarily this included problems with contour curves of functions of two variables and the derivative applications such as the geometry of phase space solutions to differential equations. The long range objectives were twofold: (a) develop an instructional model which might accommodate up to 1000 students per term and (b) improve student learning to the point where after two terms, students would have the necessary prerequisites for a third term course in matrix algebra.

Achievement of the short range objective was addressed by development of three components: (1) specific in-class handout materials; (2) films, overhead transparencies and three dimensional materials explicating the difficult concepts; and (3) specific homework assignments emphasizing the difficult concepts. Approximately 550 pages of mimeographed materials were designed, produced, and tried out with students. Formative evaluation (tryout and revision) of these materials was attempted through informal feedback as well as through the use of a specially constructed evaluation instrument administered before each lesson. The intent was to use the evaluation instrument to organize a discussion to remediate difficulties in

the handouts at the beginning of each lecture/discussion. Unfortunately, the evaluation instrument was too time consuming and required so often that after a while many students deliberately came late to lecture so as to avoid discussion related to the materials. Nevertheless, the data collected were sufficient to identify the major problems in the new materials. Extensive analysis was conducted and a number of revisions made.

PROJECT STATUS:

To assess the effect of the materials developed, a comparison was made between final examinations scores (on similar items) of a control group (1969-70 class) and an experimental group (1970-71 class). The results showed no statistically significant difference, although the experimental group did achieve a number of "higher level" objectives for which control group data were not available. In other words, there was no difference between the groups on identical concepts, but the experimental group was able, within the two term period, to master a greater number of concepts. Furthermore, with the experimental group the dropout rate was reduced, the failure rate was reduced, there were far fewer students requiring remedial instruction, and students generally appeared to have fewer frustrations and spend less time studying the materials than previously. Thus, the project appeared to facilitate some gains in efficiency of student learning.

Unfortunately, during the first year, development and revision of the handout and homework materials was so time consuming that development of visual materials was precluded. Dr. Hunter, therefore, obtained a second EDP grant to continue development of handouts and obtain or produce the necessary AV materials. The long term goal of accommodating a much larger number of students will probably be addressed when the course materials and AV techniques become sufficiently refined so student achievement in the smaller sections (N=50) reaches the desired standard.

PROJECT TOPIC: Mathematics (Remedial)

Development of self-instructional audio-visual tutorial modules for remediation of basic mathematics skills

PROJECT DIRECTOR: Dr. William M. Fitzgerald

BACKGROUND:

Students entering MSU who require mathematics in their curricular programs and who score below a certain point on the MSU entrance examination in mathematics are required to take the remedial mathematics course, Math 082. Often enrolling over 500 students per term, Math 082 has traditionally been taught using large lectures supplemented by small recitation sections plus daily homework assignments. The recitation section instructors were obtained from volunteer pre-service mathematics teachers enrolled in the College of Education secondary mathematics methods course, ED 327-N. Since math skills and the motivation of the students in the remedial math course were predominantly low, and since the recitation group instructors were relatively inexperienced, the failure rate of Math 082 often exceeded 50%. After extended study of the complex of problems surrounding 082, a committee of Math Department faculty, working with the MSU Learning Service, recommended development of a series of 10 modules programed to provide a self-paced, auto-tutorial learning environment as a strategy for reducing the failure rate. It was further recommended that a standardized series of lectures be developed for presentation to 082 students. These lectures would focus on the basic arithmetic concepts requisite for students to progress on to more advanced mathematics courses. In addition, it was recommended that 082 students be allowed to take either a six week or a ten week version of the course to allow for individual differences in aptitude.

To implement the recommendations of the departmental 082 committee, Dr. William Fitzgerald obtained an EDP grant, whose major objectives were: (1) to develop a series of 10 self-instructional modules; (2) to develop a series of 10 lectures; (3) compare the effectiveness of offering the course in a 10 week and 6 week format; and (4) in general, reduce the failure rate in Math 082.

PROJECT DESCRIPTION:

During the summer of 1970, Professor John Hocking of the Mathematics Department reviewed the content of 082 and developed a series of ten lectures which would provide the most appropriate content for the course. These lectures were used throughout the Fall, Winter, and Spring terms for all lecture sections of the course.

A research study was conducted by Dr. John H. Jones to investigate the effects of time of instruction (6 weeks versus 10 weeks), entering achievement scores, and their interaction with respect to:

(1) the final examination scores obtained in 082 and (2) a follow-up study of student success in the next math course. Five of the twenty 082 sections were chosen to be the experimental groups and take the course in six weeks. The results of this study showed that student achievement in the six week period was not significantly different from achievement during the conventional ten week term. However, those who failed at the end of six weeks were given individual prescriptions for study and asked to continue the course for another four weeks and take a second final exam. The MTA showed that the failure rate of the extended experimental group was improved over the control group.

Development of 10 self-instructional audio-tutorial modules was conducted by Dr. Carl G. Arendsen. Each module consisted of a set of slides, an audio tape, a list of objectives, a worksheet of problems, a pre and post test, and answers to the pre and post test and worksheet problems. These modules covered the basic operations of arithmetic using whole numbers, decimals and fractions, square root, percent, and the use of formulas to find areas and volumes. Each module was designed so students could achieve from two to four objectives. Students were given diagnostic tests to determine which, if any, modules should be used. The modules were tested in Spring term, 1971. Math 082 students were randomly assigned to experimental (used modules) or control groups (did not use modules). Using the Arithmetic Pretest score as a co-variable and the Arithmetic Posttest score as the dependent variable in a one-way analysis of co-variance, Arendsen found significant differences favoring the experimental groups.

PROJECT STATUS:

The development of improved lectures and alterations in length of time of instruction appeared to have little effect on reducing the failure rate in 082. In Fall term, 1971, the failure rate was 55% and in Winter term the failure rate was 63%. However, those students who failed the six week course but continued on for another four weeks of prescribed study ultimately showed a 45% failure rate; a moderate improvement. With respect to the use of audio-tutorial modules, data indicated that students using the modules scored higher on achievement tests than their counterparts who did not use the modules. Unfortunately, the achievement test used in this experiment was not the standard departmental final exam, so it was not possible to compare the failure rates of the experimental and control groups with the failure rate of previous terms.

As a result of this project, several conclusions were drawn: (1) due to great variability of student entry skills in mathematics, no simple, uniform course can be appropriate; (2) the lectures should be regarded as a means of presenting major ideas around which the specifics of the course are focused; and (3) the audio-tutorial mode developed by Arendsen seems to be very effective in dealing with specific deficiencies among students. It, therefore, appeared justifiable to extend this work so that the AVT mode can be available for the full range of concepts dealt with in 082. To serve

this end, the Math Department proposed development of a Mathematics Learning Center which would make available to students a full range of instructional techniques including audio-tutorial devices, programed texts, workbooks, diagnostic tests, terminal tests, and human tutors. Work in developing the Mathematics Learning Center will be started in 1971-72 under a second EDP grant.

PROJECT TOPIC: MSU Library Orientation

A mediated, self-instructional walking tour of the library for orientation purposes

PROJECT DIRECTOR: Robert Williams, Reference Librarian

BACKGROUND:

The MSU library has a continuing need to orient students and faculty to the library physical facilities and procedures. To meet this need, the library staff conducts orientation tours twice a day for six weeks each term. Such tours are useful; however, they require a member of the professional library staff to serve as guide and therefore represent a continual drain on the limited human resources. Moreover, the large number of faculty and students who do not avail themselves of this service, or who have special interests, require continuing assistance from the professional staff. It was hypothesized that a large part of the time consuming drain on library personnel might be alleviated through the use of a self-instructional mediated walking tour consisting of audio information on tape cassettes and visual information on flat pictures in a notebook. The self-instructional AV materials and the portable cassette player would be checked out and returned at the reference desk.

PROJECT DESCRIPTION:

To test the feasibility of a mediated self-instructional orientation tour, Mr. Robert Williams obtained an EDP grant to develop the necessary materials and procedures. A script was developed by transcribing a tape recording of an actual tour of the library. Following recording of the audio track, 5X7 color prints were made of the various points of interest mentioned on the tape. Students checked out a portable tape player and appropriately bound maps and flat pictures, and followed the instructions on the tape. The audio information is only 12 minutes in length, but typically students take from 45 minutes to two hours to complete the tour as they are encouraged to browse and investigate on their own during the tour.

PROJECT STATUS:

A total of six sets of materials were developed and used during Fall term, 1971. Total uses of the materials were over 900, but the number of students affected was far more as students often organized themselves into ad hoc groups and conducted a group tour instead of an individual tour. It was estimated that approximately 1,500 students participated in the walking tour and 2,000 others in the standard group tours. The reaction to the new mediated technique was almost unanimously positive. Anecdotal data collected at the end of each tour indicated students were most pleased with the self-instructional procedures. However, one hypothesized result of the project--that of reducing library staff time--was not achieved. This was due to the fact that the total number of students served dramatically increased. Approximately 2,000 more students participated in

either group or individualized library orientations than ever before. Much of the increased orientation activity was due to word of mouth; e.g., students would tell one another about the new cassette tour of the library. Thus while staff workload has remained constant, far greater numbers of students are now able to become thoroughly oriented with the MSU library. This innovation will, therefore, be permanently adopted by the library to augment their live orientation program.

PROJECT TOPIC: Music Education

Development of a four component instructional model (programed instruction, lecture, laboratory, and video taped demonstrations) to achieve cognitive, affective and performance skills objectives in a music education course for pre-service elementary teachers.

PROJECT DIRECTOR: Dr. Robert G. Sidnell

BACKGROUND:

Music 135 is a 4 credit hour service course teaching basic music concepts to pre-service elementary teacher trainees. Critical music skills involving performance, listening, and integrating music into the elementary school curriculum were difficult to achieve in the context of a traditionally taught lecture course involving 350 students per term. In 1969-70, Dr. Sidnell developed, with EDP support, a four component instructional model revising both content and methods to reflect a performance orientation. The four new instructional components included: (1) 27 audio tapes and a 370 page workbook/listening guide to develop individual listening skills in discriminating timbre, pitch, duration and musical form; (2) performance laboratories using self-administered evaluations to help students assess their own progress towards the desired skill level on a variety of instruments (piano, ukelele, guitar, marimba, singing, etc.); (3) a 470 frame programed text used to teach music fundamentals; and (4) large group presentations designed to improve skills in integrating music into the elementary school curriculum.

After one year of development, most of the music education faculty were very pleased with the changes made in the course content and methods. Sizable improvements in student examination performance on cognitive as well as music performance objectives were noted. Student attitudinal data were consistently positive. However, three problems emerged which indicated the need for further course development: (1) the programed text materials in music fundamentals needed revision; (2) there was need for development of programed drill tapes and song books for achievement of competencies in sight singing and dictation; and (3) there was a need to demonstrate an effective music curricula in the elementary schools. It was felt that producing a series of video tapes illustrating an outstanding elementary music program and a number of music learning activities directed by a "master teacher" would provide the needed stimuli. Therefore, in 1970-71, Dr. Sidnell obtained a second EDP grant to continue development of Music 135 in the three remaining problem areas.

PROJECT DESCRIPTION:

An elementary school in Michigan with an outstanding music program was located and 14 hours of video tape were produced on location. These tapes were edited into six 30-minute vignettes. A "checklist"

of critical behaviors was developed to aid students viewing the tapes to identify the important behaviors of the master teacher on the video tape. In addition, a set of behavioral objectives was developed for each tape specifying the viewer skills to be obtained. The tapes were shown in music laboratory sections enrolling 25-30 students. After each viewing, the group engaged in a discussion of the critical behaviors demonstrated by the master teacher. The entire programed text on music fundamentals was revised and tested, with the revised version being adopted into the course structure.

PROJECT STATUS:

The video tapes, the "checklist" of teaching behaviors, the revised programed text and the sight singing book were each evaluated on the basis of student achievement and attitudinal data. With respect to the video tapes and checklist, the results were very positive. Student attitude, understanding, and appreciation of music teaching and curriculum development were improved. Another experimental comparison between sections using the programed music fundamental text and a section taught conventionally showed no significant differences. Learners who had little background in music made significantly greater gains with programed material than without. A study was also conducted to assess the effect of behaviorally stated objectives on student achievement. No significant difference was found. The best explanation, that offered by students, was a lack of understanding regarding musical jargon in the objectives. Achievement is much greater if objectives are identified in a step-by-step manner paralleling musical understanding.

In sum, the effect of two years development in Music 135 has been to dramatically improve student learning (skill acquisition and attitude) as well as increase instructional efficiency to the point where 2-1/2 to 3 full time equivalent faculty, formerly required in Music 135, are able to teach other courses in the Department.

PROJECT TOPIC: Music: Form Analysis

Development of a programed text in music form and analysis

PROJECT DIRECTOR: Dr. Jere Hutcheson

BACKGROUND:

A two year sequence of courses in written theory is required of all music majors. An earlier EDP grant had provided funds for development of a programed textbook in music harmony which was used in the first year courses in the basic sequence. The text was extremely successful and received national acclaim. This initial success prompted Dr. Hutcheson to apply the programed instruction technique to the difficult area of music form and analysis. It was planned that the newly developed programed materials would be used primarily to augment instruction in the Music 180 and 280 basic sequence in written theory. Because of the self-instructional nature of the programed format, 50% more objectives were included in these courses than previously possible.

PROJECT DESCRIPTION:

Development of the programed text in music form and analysis and changes in course organization and content to accommodate the new text extended over several years. A total of three EDP grants were provided to pay for reproduction costs and secretarial assistance during development and validation of the text. The total content is over 800 pages (19 chapters). Emphasis is given to the interaction of tension and relaxation in the basic musical elements of rhythm, melody, and harmony, the motivic structure of music, and the most usual formal patterns characterizing the common practice period in music (c. 1650-1900). During validation, all chapters were distributed to students and revised several times based on student feedback and item analysis of achievement data.

PROJECT STATUS:

The final version has been published by Allyn and Bacon, Inc. in two volumes and integrated into the Music 180 and 280 curriculum. Student attitudinal and achievement data indicate very positive reaction to the text and considerably better performance of music form analysis skills than previously.

PROJECT TOPIC: Music Theory

Development of a semi-programed text in twentieth-century music emphasizing the transition from tonal to non-tonal harmony

PROJECT DIRECTOR: Dr. Paul Harder

BACKGROUND:

A two year sequence (six courses) in written theory of music is required of all music majors. The first year of this sequence underwent extensive development under earlier EDP grants. Having participated in this earlier developmental activity, Dr. Harder was convinced that much of the second year material could be reconstituted into a semi-programed text format which would then facilitate the teaching of difficult concepts to large groups of students. The specific areas most in need of development were the styles and techniques of twentieth century music emphasizing the evolution from tonal to non-tonal harmony. Because of the technical difficulties connected with this evolution and the fact that no suitable text was available, many students suggested that they were disadvantaged in learning these important concepts. Furthermore, the size of class (N=175 or more) precluded any substantial amount of individual guidance. Therefore, Dr. Harder obtained EDP funds to support the development and validation of a programed text for the second year sequence in music theory.

PROJECT DESCRIPTION:

Dr. Harder developed and tested the programed text over a period of two years. After each chapter was finished, it was tried out on representative students and revised based on their feedback. After all chapters had been revised once, the entire book was used with Dr. Harder's second year class in music theory. At the completion of each chapter, the students completed a questionnaire indicating their likes and dislikes in the chapter. In addition, frequent achievement tests were given to determine whether or not students were learning from the programed text.

The book itself was unique in that it combined expository prose, programed instruction, illustrations of art and cultural artifacts, and sheet music. The book's focus is on today's music incorporating both western and non-western music as well as relating the transition in music to fields outside of music (art, literature, etc.)

PROJECT STATUS:

Based on student achievement and attitudinal data, the book has facilitated notable gains in student achievement in conceptually difficult areas and brought about an increased appreciation of the evolution of twentieth century music theory. Specifically, students are now achieving a greater number of higher level objectives than previously. Instructors are able to interact with students on a

higher conceptual level because basic concepts are obtained through the programed text. In sum, the development of the semi-programed text has resulted in demonstrable gains in instructional efficiency and student learning.

PROJECT TOPIC: Music: Voice

Task analysis of the teaching of voice with major revision of traditional 1-1 tutorial model

PROJECT DIRECTORS: Mr. Gean Greenwell and
Mr. J. Loren Jones

BACKGROUND:

A three term sequence in teaching of voice has traditionally used a 1-1 tutorial model. In 1967, the Music Department determined that due to increased enrollments, this model would have to be changed to a more cost/effective model. An earlier EDP grant provided funds for tape playback equipment so that students could be guided through certain skills in singing. However, this model was not satisfactory because students were not able to diagnose their own problems concerning the skills. As a result of this effort, Mr. Greenwell, Mr. Jones, and other voice faculty analyzed the task of teaching singing and determined that many elements could be "lifted" out of the 1-1 tutorial model and placed in a group model. Initially, groups of four were used. This was very successful and, after further task analysis of teaching voice, the present model was evolved. This model used group lectures, large laboratory (30-40 students) and individual one-half hour laboratory (1-1 tutorial).

The 30-50 students enrolled in the three term voice sequence are voice majors who presumably will become choral directors or professional singers. Course objectives include breathing, Italian diction, stage demeanor, phonation, etc. Evaluation at the end of each term is provided by a "jury" of music faculty who listen to the live performance of the students. Considerable improvement in student performance has been noted since the new model has been adopted. However, it was determined that further gains in efficiency could be achieved if students had mastered certain prerequisite concepts prior to the laboratory and tutorial sessions. Thus, Mr. Greenwell decided to structure a number of preparatory experiences for the voice course.

PROJECT DESCRIPTION:

The presently funded EDP project was for the revision and validation of a programed text "class manual" for each of the specific units in the freshman course. These units include "Italian Diction " "phonetic alphabet," "anatomical parts of the voice mechanism," etc. Use of prototype version of this programed text allowed reduction of the formal teaching time required in lectures and allowed greater time spent in the voice laboratories where student performance can be monitored and improved. However, a number of problems arose indicating the need for revision of parts of the programed class manual.

PROJECT STATUS:

All revisions to the programed chapters in the manual have now been completed and the manual has been published and integrated into the structure of the freshman voice course. Formal evaluation of the text indicated satisfactory achievement of programed objectives, with a consequent reallocation of class time into the voice lab. The net result of the new teaching model and programed text has been a dramatic improvement in the voice skills and overall proficiency achieved by students while at the same time more students were accommodated with fewer resources.

PROJECT TOPIC: Psychology

Development of lesson objectives and tape recorded lectures to facilitate learning in two large psychology courses

PROJECT DIRECTOR: Dr. Andrew M. Barclay

BACKGROUND:

Psychology 225 (Introductory Personality) and Psychology 335 (Social Psychology) are both large lecture courses, each enrolling over 400 students each term. In both of these courses, there appeared to be a need to supplement the live lectures with tape recorded information. In the personality course, for example, some students seemed to get blocked in class by a psychologically shocking point and needed some means of reviewing the information missed in class. In the social psychology course, a number of students indicated their preference for listening to tape recorded presentations rather than live lectures. When tried on a pilot basis, other students reported that it was very useful to attend class, not take notes, then go to the tape listening center in the Library and listen to the tapes for review and careful notetaking.

To meet the needs of students in both of these classes, Dr. Barclay obtained EDP funds to support development of audio tapes of all lectures and to develop learning objectives to accompany the audio tapes.

PROJECT DESCRIPTION:

All lectures in both courses were tape recorded with technical assistance provided by the Instructional Media Center. Tapes were duplicated and placed on file in the audio listening center in the MSU Library. Objectives for each lecture were developed and distributed to students as they checked out the tapes.

PROJECT STATUS:

Anecdotal data and information on the end-of-term course evaluation forms indicated a very positive student reaction to the use of the learning objectives and tape recorded lectures. Tape utilization data indicated a steady 10-15% of the students used the tapes regularly, with a dramatic increase in use noted prior to exams. No formal assessment was conducted to determine the degree to which the use of tapes/objectives improved student achievement of course objectives. Due to the strong student demand for this learning alternative, however, it is likely that the use of tapes and objectives will be integrated into the instructional models for PSY 225 and PSY 335.

PROJECT TOPIC: Psychology

Development of optional non-graded quizzes and immediate feedback to improve student learning in a large lecture course

PROJECT DIRECTORS: Dr. M. Ray Denny and
Dr. Stanley C. Ratner

BACKGROUND:

The most widely used teaching method at Michigan State University combines lectures, text, and recitation experiences. This method is often used because of economic or administrative constraints rather than learning or pedagogical considerations. An example was Psychology 200, a large enrollment course (approximately 350 students per term) noted for its high informational content and demanding nature. Student motivation and morale was sometimes a problem because of the large lecture-text-recitation format. In an attempt to rectify these problems and improve student learning, Drs. Ratner and Denny obtained EDP funds in order to introduce experimentally three innovations into the course: (1) offering optional non-graded, self-scored "Friday quizzes" providing questions and feedback on the week's lecture and text assignments; (2) permitting students receiving a mid-term grade below 2.0 to take the exam again (with a maximum grade of 2.0 awarded); and (3) tape recording all lectures and making these tapes available to students in the main Michigan State University library.

PROJECT DESCRIPTION:

Ten sets of quizzes were developed to encourage studying, to provide feedback on the adequacy of the previous week's learning, and to help students identify important course concepts. It was assumed that by offering optional quizzes throughout the term, students would be able to estimate their mastery of specified blocks of subject matter and could thereby assume greater responsibility for their own learning. Each quiz was 20-26 items in length, typically requiring students to fill in key words in paragraphs describing important concepts. Answers were given immediately after the end of quiz so feedback was immediate. Answers that were questioned by the students were discussed by a qualified Graduate Teaching Assistant, thus providing additional instruction in the more difficult concepts. Students who did not score at least 80% correct were encouraged to take a second equivalent form exam over the same topics. If they achieved less than the 80% criterion on the second try, they could take a third quiz. In no case was it obligatory to take any quiz, and whatever the score, it did not count towards the student's final course grade.

RESULTS:

To evaluate the quizzes and the other devices used, records were kept on tape utilization, midterm retakes, percent of students participating in quizzes, and quiz scores. Informal attitudinal measures were taken and correlations run to determine the relationship between quiz participation, quiz scores and final course grades.

Student utilization of tapes and quizzes steadily increased throughout the year, often achieving 80% participation in the taking of optional quizzes. Approximately 30% of the students chose to retake the midterm exam as a source of additional practice and a way to improve learning. The most rewarding result, however, was the positive correlation between achievement on optional quizzes (non-graded) and final course grades (based on midterm and final exam scores). In other words, the more students participated appropriately in the quiz program, the better they did on medterm and final exams.

In addition, several unplanned benefits occurred from the use of optional quizzes. For example, the student/faculty interpersonal relationships improved and a sense of teamwork evolved.

CONCLUSIONS:

In this study, there was some evidence that providing students feedback on the adequacy of their learning will allow students to better organize their learning activities, take greater responsibility for their own learning, and hence increase learning. Drs. Denny and Ratner have shown that the relatively inexpensive techniques of tape recording lectures, allowing retakes, and providing optional quizzes can facilitate the learning process in courses using the familiar lecture/text format.

PROJECT TOPIC: Psychology

Development and validation of a test item pool designed to stimulate and measure creative thinking in psychology

PROJECT DIRECTOR: Dr. Donald M. Johnson

BACKGROUND:

Critics of college teaching frequently claim that student achievement is usually evaluated by measuring the degree to which students can regurgitate what they have been forced to swallow. Such achievement is evaluated most often by test items having one "best" or "right" answer and which for convenience are scored mechanically. Creative thinking, on the other hand, must be evaluated by performance on test items which have many acceptable solutions and which must be rated by experienced judges. Many students and faculty have asserted that creative thinking should be an integral part of the educational process in high school and college, but aside from occasional term reports and individual projects, the evaluation of achievement in most courses does not include measures of creativity.

To redress the imbalance between content regurgitation and creative thinking, EDP funds were provided to Dr. Johnson to develop a pool of validated test items which both stimulated and measured creative thinking in psychology courses. Psychology was chosen for convenience; the methods and materials can be generalized to other courses.

PROJECT DESCRIPTION:

The overall goal of the project was to develop a pool of test items which reliably measured creative thinking. These items were then to be made available to instructors in psychology for inclusion in regular course examinations. The development process included: (1) determination of criteria for acceptable test items; (2) development of item writing and item grading procedures; and (3) validation through five field experiments of various sets of items.

Two criteria were identified as critical to test item development: (a) items must be short, (b) items should measure the degree to which students were able to generate unique applications or implications of the psychological facts and principles derived from the course. Training procedures for item writing and grading were developed after five item types were identified: (1) write titles for graphs or tables; (2) draw conclusions from graphs or tables; (3) state imaginative hypotheses; (4) write imaginative sentences; and (5) state consequences. After a short training period involving demonstrations and supervised practice on each item type, Dr. Johnson found that seniors and graduate students were able to write satisfactory items. Rating guides and training procedures were then developed for test graders. Rating all test answers on a scale of 1-7, two judges working independently could score test items.

The measure of accuracy of grading was the inter-judge agreement,

measured after training, of the grades given by two judges working independently. All test answers were rated on a scale of 1-7. With the aid of rating guides for each item type, seniors and graduate students learned to grade two answers per minute with an inter-judge agreement ranging from 75% to 95%. It was concluded that adequate skills in both item writing and item grading can be acquired as easily for tests of creativity as for conventional achievement tests.

Dr. Johnson developed four 10 item tests and six 15 item tests which systematically sampled the content of several basic psychology courses. These test items were then validated through five field studies. Statistical analyses of these data disclose a small correlation between conventional achievement tests and tests of creative thinking. Students scoring higher on conventional tests appear able to combine course concepts in unique ways slightly better than students whose conventional test achievement is lower.

PROJECT STATUS:

As a result of this project, tests of creative thinking in psychology and rating guides for scoring the responses are currently available. It was concluded that adequate skills in both item writing and item grading can be acquired as easily for tests of creative thinking as for conventional achievement tests. Thus it appears that similar testing procedures and materials can be developed for other courses without great difficulty. The chief advantage of using tests of creative thinking is that they, in combination with conventional achievement tests, yield more valid information about students' intellectual performance than scores on either type of test alone.

PROJECT TOPIC: Social Work

Self-instructional slide-tape presentations to replace field trips in introducing social work students to social services and community agencies

PROJECT DIRECTOR: Dr. Clayton T. Shorkey

BACKGROUND:

Social Work 367 is a course which prepares students for placement in community agencies by introducing them to the social welfare system and selected community agencies. The teaching model used lectures, small discussion groups (led by GTAs) and field trips to individual agencies. This model became inadequate due to larger enrollments and the difficulty of coordinating student visits to a given agency either preceding or after a class discussion. Due to scheduling difficulties and the lack of control over the content of the briefings students received on the field trips, a decision was made to eliminate the field trips and accomplish these learning experiences through self-instructional slide/tape presentations in carrels.

PROJECT DESCRIPTION:

The project involved the development of seven slide/tape lessons including child welfare, mental retardation, school social work, mental health, corrections, medical social work, and family services. The project objectives were: (1) to save student and faculty time, (2) to improve overall learning (since all students will "visit" all agencies in the slide/tape model), and (3) to provide coordination and common objectives for small group discussion sections or selection of topics for term papers.

Five slide/tape units were completed for use in S.W. 367 for Fall term, 1970. The objectives of these units were: (1) to familiarize the student with information related to the network of public and private welfare services available to community residents, (2) to acquaint the student with the organization, function, and development of major social agencies, (3) to teach the student relevant information concerning the characteristics of the client population served by the agencies such as sex, age, income, race, disability, eligibility, and referral sources, and (4) to provide the student with a basic knowledge of the types of services presently available to clients such as foster care for children, aid to the disabled, rehabilitation programs, vocational training, family counseling, day care services, crisis intervention and individual social treatment.

Five slide/tape units were completed to the prototype stage and used Fall 1970, Winter and Spring 1971 with 60 students each term. The students completed the units in the carrel lab and met with a teaching assistant in one of three groups for discussion of the material. The units were evaluated for teaching effectiveness using a sample

of 85 students. Ninety-eight percent of the students were able to complete each unit in less than one hour and scored 90% or above on the posttest.

Eighty-three percent of the students rated the units as educationally useful as part of their education in social work. Seventeen percent of the students felt the information was not useful, either because they knew it before entering the course or it was not detailed enough.

All five units were revised during Summer term 1971 to reduce redundant information and to increase the amount of new information presented. Two additional units (S.W. in Corrections and Family Social Work) were completed to the prototype stage.

PROJECT STATUS:

A major change in the project began Fall 1971 as the School faculty decided to eliminate S.W. 367 as a course and to use the slide/tape materials in S.W. 205 (Introduction to Social Work). S.W. 205 is open to freshmen and sophomores in all units of the College and has a total enrollment of 1,000 students each year.

The self-instruction units were used with two sections of S.W. 205 Fall term, 1971 (enrollment 180 students). A sample of 98 students were asked to evaluate the units using a 7 point rating scale concerning familiarity and usefulness of the information contained in the units. The mean rating for all units on the familiarity scale was 2.8 (1.0 indicating no knowledge of the material). The mean rating of the usefulness scale was 5.5 (1.0 indicating not useful). Analysis of the five units independently showed that familiarity and usefulness were related variables. Students consistently rated the units more useful if their familiarity with the material was low. Since some of the students entering social work have previous experience in the field through employment or volunteer work, it can be expected that these students will have knowledge of social work in one of the five areas. Therefore, the mean rating 5.5 (usefulness) was considered satisfactory.

Recently, the number of carrels in the lab has increased from 10 to 20 and a Social Work 205 resource office has been added. Following the completion of a unit, the students may now talk with a graduate assistant in the resource office concerning the material, read current material concerning social welfare programs, employment possibilities, and volunteer positions. In general, it appears that the slide/tape experience provides students with a better conceptual grasp of the whole system of interrelated social agencies, as opposed to first hand knowledge of one or two agencies. Therefore, the use of mediated field trips and the S.W. 205 resource office will be continued in the Department.

PROJECT TOPIC: Survey of Undergraduate Student Attitudes

An exploratory study of student attitudes towards the undergraduate education program at Michigan State University

PROJECT DIRECTORS: Dr. Philip M. Marcus and Mr. George F. Bishop

BACKGROUND:

The Educational Development Program is a division of the Provost's Office responsible for development and implementation of procedures which preserve and/or improve undergraduate educational experiences in spite of increasing enrollments, limited financial resources and continual increases in the amount and complexity of knowledge. To discharge this responsibility, it is necessary to identify major problems in the areas of the curriculum, the learning-teaching process, and the utilization of the faculty, students, financial and physical resources of the University. In an effort to systematically identify the major problems students face in obtaining the quality and quantity of education they desire, EDP commissioned Dr. Marcus and Mr. Bishop of the Urban Survey Research Unit to conduct a pilot study. The purpose of this study was to explore various dimensions of the undergraduate education problem at MSU and, on the basis of the pilot study, to suggest (1) topics needing further research, and (2) curriculum, teaching-learning, or resource utilization areas in need of increased emphasis by EDP.

PROJECT DESCRIPTION:

The general topics examined in the present study included: (1) the major problems encountered in undergraduate education; (2) the major goals (as perceived by students) of undergraduate education; (3) the meaning of good teaching; (4) problems in improving undergraduate teaching; (5) experiences with closed sections or classes; (6) experiences with closed curricula; (7) perceived size(s) of large and small classes; (8) advantages and disadvantages of large classes; (9) preferences for large and small classes; and (10) the teaching responsibilities of the university faculty. The choice of the above areas for study was determined by sampling the current data needs of faculty on the Instructional Development Service staff.

The data for the present study were obtained from a set of 100 cross sectional personal interviews of MSU undergraduates, conducted by the Urban Survey Research Center during the Spring and Summer quarters of the 1970-71 academic year. Two hundred and fifty undergraduates, 125 originals and 125 alternates, were systematically sampled from the Spring term 1971 files of the Registrar's Office at MSU. An interview questionnaire, consisting of both open-ended and closed items, was constructed to cover the previously listed topics. Ninety students, 52 originals and 38 alternates, were obtained for personal interviews (through a systematic telephoning procedure). Ten additional students were solicited in a University dormitory for a total of 100 completed interviews.

PROJECT STATUS:

The project was completed and a full report has been published: "An Exploratory Study of Student Attitudes at Michigan State University." The most salient data will be reported to the MSU faculty by means of an EDP Report to be published in Fall term, 1972. In addition, EDP will attempt to facilitate improvement in those areas reporting the greatest student dissatisfaction.

PROJECT TOPIC: Teacher Education

Three year development of a competency based instructional system for beginning teacher trainees to achieve competency in: (1) assessment; (2) objectives; (3) strategies; and (4) evaluation through self-study modules, simulations, large group activities and small group interactions

PROJECT DIRECTOR: Dr. Judith E. Henderson

BACKGROUND:

Education 200 is the first and largest of four "core" courses in the professional training program in education. It provides an introduction to the major concepts, principles, skills, and demands inherent in the teaching task. Formerly the course was taught using a large lecture (N=600) and "small" discussion group (N=40) format. Rapid turnover of six guest lecturers and difficulty of coordinating graduate student small group instructors resulted in a discontinuity between the course objectives, examinations, and what was taught.

In recognition of this problem, a development group headed by Dr. Henderson was formed in 1969. Using a systems approach, the group analyzed the task and personal demands of teaching, drawing on job sampling techniques as well as descriptive and theoretic works on teaching. Emerging from this work was a conceptual framework relating the variables of instruction (human, curricular, environmental), to the skills relevant to the task demands of teaching (assessment, goal setting, strategy planning and implementation, and evaluation), and the personal demands of teaching (self-perception, interpersonal communication, value clarification and career decision making). The focus of the project then became to teach prospective teachers to understand and apply the skills found in the conceptual framework.

PROJECT DESCRIPTION:

The first year of activity (1969-1970) enabled the staff to develop a systematic conceptual base for instructional and curricular revision. During this time, the course primarily continued its large lecture (two groups of 600 students meeting three times a week) and recitation format (34 groups of 36 students meeting twice a week), although a number of significant improvements were undertaken. Course objectives were specified in behavioral terms and several types of instructional materials were produced; e.g., an in-basket simulation, a student handbook, four self-instructional slide/tape lessons, and a three screen multi-media extravaganza. Twelve carrels were equipped and an experimental section (N=100) was formed to validate the instructional materials and evaluate the feasibility of a small group/independent study/simulation instructional strategy. Data from the experimental section supported the hypothesis that the new instructional model increased student learning and motivation.

The second year (1970-1971) of development introduced additional substantive changes in teaching methods and materials. Eleven new self-instructional slide/tape/workbook lessons were produced and validated. Lectures, per se, were completely eliminated. All students (900 per term) received one-half of their formal course instruction (task demands of teaching) through free access to individual study modules in carrels; the other one-half of course instruction (personal demands of teaching) was obtained through small interaction groups (N=15) led by faculty and graduate assistants and through six large group presentations. The large group meetings were not for information dissemination, but were aimed at helping achieve a number of affective course objectives. Actors from the Theater Department produced a series of mini plays illustrating a number of potentially explosive and/or emotional school situations; films and slide presentations were also shown. A "mastery" model of achievement was also instituted this year. All students were evaluated on the basis of their mastery of stipulated course objectives and could not progress to later objectives until mastery of earlier ones was obtained. A remediation team of instructors tutored students who failed to achieve mastery through normal use of the self-instructional materials and group interactions. Equivalent forms of mastery exams could be taken until mastery was achieved. Procedures for training graduate assistants to lead the interaction groups were developed and tested. A handbook for small group instructors was produced. The student handbook was revised each term, based on student and instructor responses to the exercises contained therein. In addition, the Education 200 staff obtained a $50,000 federal grant and produced a series of ten five-minute films (with student and instructor workbooks) which provided instruction in the application of learning theory to teaching strategies.

PROJECT STATUS:

The project is entering the third phase of implementation. Additional self-instructional units and large group presentations are being produced. Another United States Office of Education (USOE) grant was obtained ($70,000) for production of eight more single concept film clips. Existing instructional modules are being revised and course content is being reduced to fit into the ten week term time constraint. Data on each instructional activity are being systematically collected and analyzed. Thus far, the data conclusively show a rather overwhelming acceptance on the part of students of the competency based instructional model.

PROJECT TOPIC: Television Production

Development of a prototype self-instructional laboratory designed to help students achieve skills prerequisite to the basic television production course

PROJECT DIRECTOR: Dr. Robert Schlater

BACKGROUND:

All television-radio majors are required to take the basic TV production course, TR 202. Traditionally, the course has been structured so that three sections of 20 students each met together once a week for a combined lecture presentation and then separately twice a week for two-hour laboratory production sessions supervised by GTAs. The laboratory sessions are particularly critical since their function is to give students practical "hands on" experience in operating studio equipment and allow them to put production theory into practice. The teaching format used in the laboratories was to produce a series of exercises or vignettes with students filling the various production crew positions for each exercise. Several exercises were produced so that each student was able to rotate through all of the various crew positions (camera, sound, switcher, performer, etc.).

While the course was moderately effective, student learning was often below the desired level for a variety of reasons. For example, the Department has no TV studio facilities of its own, so TR 202 has traditionally been sandwiched into the very busy production schedule of the University's Closed Circuit TV system and the University's broadcast station, WMSB. Thus, TR 202 laboratory time has been severely limited. In addition, students entering the course were very heterogeneous in their background and abilities to learn TV production skills. Furthermore, because of the highly interdependent nature of all the various crew member positions, a difficulty or skill deficiency experienced by any one student in the production laboratory reduced the quality of the learning experience of all other student crew members participating in that exercise. Stopping the exercise while the instructor took time to help one student improve a specific skill further decreased the amount of time left for the other students to complete the exercise. Departmental constraints precluded changing the student-faculty ratio (1 faculty and 3 GTAs to 60 students) so there was a need to develop more efficient and effective instructional strategies to improve learning in light of the stringent constraints operating.

Previously, the Television-Radio Department had developed a set of self-instructional materials which had greatly improved the efficiency of the laboratory component of the basic radio broadcasting course. It seemed logical, therefore, to try to apply a similar systems analysis to development of a self-instructional laboratory and subsequent restructuring of TR 202. A proposal was submitted and EDP funds were authorized to provide two 1/2 time GTAs to: (1) perform a task description and analysis of the laboratory component of

TR 202; (2) develop self-instructional materials for the key items of equipment; and (3) develop a self-instructional laboratory for TR 202 where prerequisite equipment operating skills could be acquired prior to the students participating in the TR 202 laboratory sessions.

PROJECT DESCRIPTION:

The process used by the development team in the project was as follows: (1) identify and describe the necessary skills; (2) develop specific behavioral objectives for each skill; (3) develop pre and post tests to measure achievement of these objectives; and (4) plan a self-instructional laboratory which would provide students the minimum prerequisite equipment operation skills required for the TR 202 laboratories.

Reviewing textbooks in the field and consulting with the Department faculty, the development team identified over 300 individual skills as possible project objectives. These were reduced to 30 major behavioral objectives representing six areas of concern including camera, switcher, audio, film chain operation, studio lighting and floor director. Data relative to student entry skills were collected by means of survey instruments, interviews, and observation of laboratory sections.

Based on analysis of the behavioral objectives, flow chart descriptions of the tasks to be performed and assessment of students' entry behavior, scripts for two prototype self-instructional modules were developed. These modules will use video taped instruction in conjunction with a written "guidebook." After watching the video taped instruction, students will answer questions in the guidebook and then practice on actual studio equipment. Feedback on their performance will be obtained by comparing the TV picture produced by their efforts with the TV picture shown on the instructional video tape. A pre and post test was developed which will be combined with interviews to determine: (1) which students already possess the prerequisite competencies and need not participate in the self-instructional lab and (2) when students taking the self-instructional lab have actually achieved the desired skills levels. The tests will be scored on a pass-fail basis, wherein all criteria must be met completely by each student before he enters TR 202. If a student does not pass a test on his first attempt, he will be allowed to repeat the instructional sequence as often as necessary for him to master the particular skill. The design of the self-instructional lab should allow each student to proceed at his own pace with the end result that all students entering TR 202 will have achieved the same minimal level of competency in all prerequisite skills.

PROJECT STATUS:

At the present time, development of behavioral objectives and task analysis have been completed for four major modules and production scripts have been completed for the overview and camera operation modules. Present plans call for producing six prototype instructional

modules from the scripts using portable one-half inch video tape equipment. These pilot tapes will then be tested with representative students and modified as required before being produced using professional two inch videotape equipment. In addition, the instructional system will include six instant feedback mini-tests, a student guidebook and unit pre and post tests.

Recently, the TR Department acquired space in the Student Union Building for a television production laboratory. However, the exact equipment which may be available for use in this lab is not yet known. It is anticipated that as appropriate equipment and studio facilities become available, the development of the TR 202 self-instructional laboratory will continue.

PROJECT TOPIC: Zoology: Developmental Biology

Structured learning and teaching environments with self-administered examinations for a laboratory course in developmental biology

PROJECT DIRECTOR: Dr. John R. Shaver

BACKGROUND:

The introductory laboratory in developmental biology deals with the morphogenesis of vertebrates (frog, chick, and pig). Because of limited lab facilities and large enrollment (175 per term), the Department of Zoology developed 13 SLATEs (slides, tapes, and workbook) and a complete lab manual which provided a standardized "prep lab" for each laboratory period. The SLATE program was evaluated experimentally several times, and in each case both attitudinal and learning data favored the SLATE treatment.

Although the SLATE prep labs were successful, it was believed that further improvement in the course could be realized by modifying the examinations to allow a self-administered format. The conventional type of examination in biology courses often consists of identification of structures, in addition to questions relating to functions or relationships. The format usually involves use of microscope slides of organisms or parts of organisms with particular structures to be identified in some manner. Alternatively, 35mm photo micrographs or drawings may be projected, so an instructor may point out the particular structure to be identified. Predetermined time periods are allowed for answering questions.

This method of examination is unsatisfactory for a number of reasons. The pressure of time limits does not give the student an opportunity to consider his responses carefully and possibilities for confusion as to exactly which structure is to be identified are compounded. There is no opportunity to go back to review questions for reconsideration. If photo micrographs present organisms as a number of disarticulated parts, there is no opportunity for utilizing correlatives or landmarks, which a student may have used when studying the material originally. Finally, opportunities for cheating are plentiful in the darkened room in which the projected slide method of presenting the examination material is usually used.

PROJECT DESCRIPTION:

In order to obviate some of the difficulties described above, Dr. Shaver obtained an EDP grant to develop a format for testing in which the student administered the examination to himself. This was accomplished by developing 35mm slides on which structures to be identified were indicated by arrows. These slides were projected in individual study carrels in which the student takes the examination. Each examination item consists of identifying the specified structure and by answering a question concerning the functional significance or structural correlates of the object in question.

The slides are photo micrographs of materials the student has previously studied, showing actual embryonic stages, rather than diagrams or sketches. The student is also supplied with the microscope slides from which the structure is to be identified. The student is informed as to the total time allowed for the examination which, in most cases, has proved more than sufficient for answering all the questions.

In constructing items for the examinations, a pool of 200 questions was developed. These questions were categorized in terms of content area and item difficulty. Fifty different examinations of 40 items each were developed in such a way that no test contained a significant number of questions used on other tests; each test emphasized material from each of the instructional units equally and they were all approximately equal in difficulty.

The examinations were graded by the teaching assistant who instructs the discussion section which the student has been attending. This method has the advantage of providing some flexibility of interpretation of answers, particularly those relating to the second part of the test item on functional significance or correlations. Data were collected on missed items, item difficulty, and test reliability.

The self-administered format allowed great flexibility in terms of the times when students elected to take the examinations. Several alternative times were posted well in advance so students who felt prepared took the test earlier and proceeded to the next unit of instruction while other students took the examination when they felt fully prepared.

PROJECT STATUS:

After the examination was completed, each student was asked to fill out a questionnaire concerning the examination format. These data showed student reaction to the self-administered format was very favorable. Students cited the advantages of this format as: (1) being able to work at their own rate; (2) being able to return to difficult questions; (3) added clarity of the structure about which the question was being asked; and (4) being able to take the examination when they felt fully prepared. It seems clear that the large majority of students were very pleased with the self-administered format and, as a result, the Department of Zoology is currently preparing two other examinations for this course so that all of the course material can be examined in the same way

# PART III

## PROJECTS NOT FUNDED BY EDP

## BUT WHICH AFFECT EDUCATIONAL DEVELOPMENT

PROJECT TOPIC: Conference on Educational Development

An ESSO Foundation sponsored conference of instructional development agencies meeting to discuss common problems, organizational patterns, and development strategies

PROJECT DIRECTORS: Drs. Lawrence T. Alexander and Stephen L. Yelon

BACKGROUND:

During the past several years, a number of colleges and universities have created unique agencies whose function is to assist college faculty to improve instruction. The instructional development (ID) agencies function as catalysts in affecting change. Their staffs consist mainly of behavioral scientists who work closely with faculty members. They assist faculty in analyzing and solving instructional problems and help faculty apply principles of learning and motivation to the planning and practice of instruction. The ID agencies conduct research studies of teaching and learning processes and help faculty to develop improved instructional procedures by applying the results of these studies. Thus, instructional development agencies seek to contribute to the improvement of undergraduate education by raising the instructional capabilities of individual faculty members.

Several colleges and universities, both in the United States and abroad, have expressed interest in organizing instructional development agencies and are actively seeking information on how to proceed. But as yet such information exists in scattered form and is not generally available. Consequently, there is a real need to provide a comprehensive description of these agencies.

Since ID agencies appear to differ with respect to their organization, funding, scope of activities, problems encountered and degree of success, it was felt that an opportunity for communication between the various agencies would facilitate improving the effectiveness and/or efficiency of these agencies. Therefore, an ESSO Foundation proposal was developed by the MSU Learning Service to sponsor a conference of instructional development agencies.

PROJECT DESCRIPTION:

Convening in May, 1971, the Conference was attended by representatives of instructional development agencies from sixteen colleges and universities throughout the United States and Canada, and was organized to enable the participants to discuss mutual problems, share experiences, and explore means of increasing the effectiveness of their operations. The primary purpose of the conference was to enable the participants to share experiences and explore ways of increasing the effectiveness of their respective agencies through improved communication and mutual cooperation. Conference discussions focused on three major topics: (1) problems that confront faculty members who wish to improve their teaching; (2) the variety of programs and procedures that instructional development agencies

have developed to assist them; and (3) methods of improving instructional development activities.

PROJECT STATUS:

A complete report of the Conference proceedings and summary of the issues discussed has been published and is available from: Dr. Lawrence T. Alexander, Director, Learning Service, Michigan State University, East Lansing, Michigan 48823.

PROJECT TOPIC: Experimental Classroom Facility

Development of an experimental classroom laboratory to facilitate research on the teaching and learning process

PROJECT DIRECTORS: Dr. Lawrence T. Alexander and
Dr. Stephen L. Yelon

BACKGROUND:

A major function of the Educational Development Program is to stimulate and conduct research on learning and teaching system processes, directed at improving individual and group instruction. However, an actual classroom is often an inappropriate environment for conducting educational research. Too many uncontrolled variables may influence the instructional treatment under investigation and experimental equipment is often unavailable. Therefore, an Experimental Classroom Facility (ECF) was conceived and designed by the Learning Service to conduct research on learning and teaching. This facility was established and modified under several Educational Development Program grants, the last one occurring in 1970-71. The ECF is also available for use by any MSU faculty member who wishes to improve his instruction or experiment with new instructional materials or procedures.

PROJECT DESCRIPTION:

The ECF consists of three components: (1) a classroom for group instruction; (2) a seminar room; and (3) a control/observation room. The classroom seats 40 students. The furniture is movable and can be arranged in a wide variety of configurations. In addition to the chalkboards, the classroom is equipped for projection of photographic slides, motion pictures, and overhead transparencies. The seminar room has two conference tables and 20 armchairs. It, too, is equipped for employing a wide variety of instructional audio and visual media.

The Experimental Classroom Facility has its own closed circuit television system with two video cameras in both rooms. Using a split-screen technique, video recordings of both the instructor and the class may be made simultaneously. Facilities for private and group viewing of videotape recordings are available.

The control/observation room is separated from the classrooms by one-way vision windows. The control room contains all the video and audio recording, switching, editing, and playback equipment and affords the capability of unobtrusive direct observation as well as remotely controlled TV monitoring and recording. Thus, the total physical configuration and equipment of the ECF provides the capability for precise input control, extensive observational access to all behavior in the classroom and seminar room, and recording and immediate feedback of performance data. Technicians are available to set up and operate the equipment. A lab director is available to assist users of the ECF.

In addition, the entire Experimental Classroom Facility is air-conditioned.

PROJECT STATUS:

The Experimental Classroom Facility is operational and is open from 8 o'clock in the morning until 10 o'clock in the evening, five days a week. The ECF represents an addition to the consultative services currently being provided by the Learning Service to faculty wishing to improve their instruction. To inquire about the use of the ECF, call Dr. Lawrence Alexander, Director of the Learning Service. The Learning Service staff is available to discuss with any instructor how the ECF may be used most effectively to meet his particular requirements.

A wide range of projects have been conducted in the ECF in the past several years, and utilization continues to increase as more faculty become aware of the facility. The following sample of ECF projects illustrates the range of activities which have been conducted.

| USER | PROJECT FUNCTION |
|---|---|
| Speech | Developed and tested methods of providing feedback in training students to apply principles of persuasive speech. |
| Music | Developed and tested new methods of training breathing techniques in wind instrument playing. |
| Speech | Development of techniques for training role playing and other discussion experimental techniques. |
| Learning Service | Development and test of training program for graduate teaching assistants. |
| U.S. Army Reserve R & D Unit | Demonstration and use of A/V equipment in training. |
| Nursing | Development and test of methods of using videotape in curriculum development. |
| Educational Psychology | Use of VTR in developing instructional materials. |
| Psychology | Experimental investigation of new teaching models (learner control of instruction). |
| Learning Service | Development of procedures for teaching design of simulation games. |
| Speech | Training debate team. |
| Communications | Test and analysis of student groups as instructional model. |

| USER | PROJECT FUNCTION |
|---|---|
| Communications | Test and analysis of feedback techniques. |
| Learning Service | Development and test of student debriefing as a device for providing feedback to instructors. |
| Mathematics | Development and test of training program for GTAs. |
| Communications | Experimental study of small group interaction. |
| English Language Center | Training program for GTAs. |
| Cooperative Extension Service | Development of procedures to teach individual and group communication skills. |
| Psychology | Study of VTR as a feedback process for instructors. |
| Psychology | Development of new procedures for teaching interviewing techniques. |
| Psychology | Experimental study of effect of VTR scenes on sexual arousal. |
| Teacher Education | Development and test of course and curriculum procedures. |
| Education | Counselor training. |
| Psychology | Experimental study of VTR to influence attitudes. |
| Psychology | Experimental study of small group interaction. |
| Education | Teacher training (methods of instruction). |

PROJECT TOPIC: Regulation of Course Offerings and Standards for the Number of Class Sections

A study of legislative guidelines, expansion of course offerings, increases in programs and cost models which resulted in development of new policies regarding minimum course and section size

PROJECT DIRECTOR: Dr. John E. Dietrich
Assistant Provost for
Academic Analysis and Planning

BACKGROUND:

One very expensive instructional problem within the University is the continuation of class sections of inadequate size. In 1965, the University Curriculum Committee prepared and distributed a series of guidelines dealing with regulation of course offerings and minimum section size (e.g., minimum number of students in a given course section). Unfortunately, these policies appeared to have limited effect on the system as there was no satisfactory way of enforcing them.

In 1970, a report by Freeman and Gabel of the Office of Institutional Research on the subject of "Possible Savings by the Elimination of Unnecessary Courses and Hours" indicated that by changing the existing policies a savings of possibly one million dollars a year might accrue. At this time, the Office of the Provost began an intensive investigation into this area.

PROJECT DESCRIPTION:

Data relevant to this problem were carefully analyzed and a proposed policy statement developed by the Office of the Assistant Provost for Academic Analysis and Planning. The proposed regulations included the following:

1. The basic fixed credit course section size was established as 15 students in one and two hundred (freshman and sophomore) courses; 10 students in three to six hundred (junior, senior, and master's) courses; and 5 students in graduate courses.

2. Regulations regarding frequency of offering courses were introduced.

3. Time consuming Curriculum Committee review of all course offerings was eliminated and replaced by a formula which is subject to appeal.

4. Standards for minimum student enrollment in courses having multiple sections were proposed.

PROJECT STATUS:

The study was completed in the Fall, 1970, and recommendations made to the Provost. It was anticipated that use of the new set of standards would bring about a significant decrease in the number of sections offered, which would, in turn, have specific implications for faculty position control and reallocation of resources. It was determined that the introduction of this policy would be considered an administrative-management device, since it did not affect curricular content and was exclusively a productivity tool with heavy fiscal implications. The new class section size policy was implemented in Spring, 1972.

PROJECT TOPIC: Resource Analysis: School of Criminal Justice

Analytic study of all aspects of the School's function and operation

PROJECT DIRECTOR: EDP Committee

BACKGROUND:

Resource analyses have been conducted under the general auspices of the Educational Development Program for the past six years. These studies are normally conducted at the request of the college or department concerned and seek to analyze all aspects of the unit's operations, addressing such topics as leadership, budgets, curriculum, teaching models, advisement, etc. Normally a committee is formed to conduct the study. The committee includes key faculty members, the Chairman of the Department and/or Dean of the College, one or more representatives from the Office of the Provost, and other selected faculty. The study normally requires at least one year to conduct and is based on factual information and data supplied by Institutional Research, outside consultants, and interviews with faculty and students. The product of the study is a series of recommendations to the University which becomes the planning base for the unit being studied and the Office of the Provost.

PROJECT DESCRIPTION:

A study of the School of Criminal Justice was conducted during the 1970-71 school year. After the committee was selected, fourteen assumptions were developed (regarding budget, enrollments, program quality, etc.) which guided the data collection and analysis process. An operating description of the School was developed which included School goals and objectives, description of curriculum, and degree requirements. Requirements for objective data were established and data collected from various sources including Institutional Research and selected faculty and students.

Three types of analyses were used in the study. The first of these was an Academic Specialty Analysis. This analysis provided a partial description of the present program in the School of Criminal Justice and attempted to identify some of its strengths and weaknesses. In particular, the analysis focused on the relationship of the program at Michigan State University to other similar programs in the state and tried to identify the unique role which Michigan State ought to play in the area of criminal justice.

The second type of analysis was a Course and Staff Load Analysis. In this analysis, past data were used to help define section sizes and full time equivalent faculty requirements of the School under one or more sets of assumptions.

The third type of analysis consisted of a set of Criteria for Identifying Professional Programs. In this analysis, a series of questions was asked which enabled the School of Criminal Justice to apply specific criteria to their program.

In addition to the basic analyses, a productivity model was developed:

$$\text{B.S. Degrees} \\ \text{M.S. Degrees} = \frac{\text{Total Student Credit Hours - Service Credit Hours}}{\text{Required Hours for a Major X Loss Factor}}$$

The most difficult value to estimate in this model is the loss factor. Since the number of majors graduating will depend upon whether the degree is a B.S. or M.S., the loss factor figure was allowed to fluctuate depending on the degree. The loss factor would, also, decrease as the service course load increases, since service course credits require on the average less effort than credits for majors. For graduate programs, the loss factor was assumed to be 1.0. An important point concerning this model is that it is experimental and has not been tested in other resource analyses conducted by the Educational Development Program. Consequently, it may be necessary to adjust enrollment figures later to reflect the experience of the School.

PROJECT STATUS:

The resource analysis was completed in Fall, 1971, and contained 20 recommendations concerning various aspects of the School's operation. The following recommendations are illustrative of those contained in the completed study:

1. Every effort should be made to reduce the faculty teaching load of the School of Criminal Justice to an average of 900 student credit hours per FTEF.

2. Total enrollments in the School of Criminal Justice should be limited to 572 undergraduate majors and 80 graduate students.

3. The School of Criminal Justice should focus most of its teaching efforts on majors and reduce significantly the number of non-major student credit hours produced. Specifically, the committee feels that the service load should be reduced to approximately 10% of the student credit hours produced rather than the 39% (Fall 1970) which is now the case.

4. Given a reduction in the required courses for majors and a limitation on the student credit hours offered to non-majors, the School should increase the number of B.S. graduates/year from an average of 121 over the past five years to 150 and M.S. graduates from an average of 36 over the past five years to 40.

5. The College of Social Science should move immediately to establish interdisciplinary courses in the criminal justice area capable of meeting the demand by non-majors for work in this area. These interdisciplinary courses should utilize the most economical and effective teaching models available.

6. The School of Criminal Justice should develop as a "center of excellence." In addition to its instructional programs, a major focus of the School should be one featuring applied research leading to a better understanding of the social causes of crime and its prevention.

PROJECT TOPIC: Study of Closed Circuit TV

A feasibility study and cost analysis of alternative CCTV distribution systems

PROJECT DIRECTOR: Dr. Erling S. Jorgensen

BACKGROUND:

The MSU Closed Circuit Television (CCTV) distribution network is one of the largest such systems in United States higher education. Consisting of 386 outlets in 158 offices and classrooms in 22 buildings, the present distribution network is leased from the Michigan Bell Telephone Company. Each year, as the system has expanded to meet increasing demands, the lease costs have increased. In addition, it recently has become apparent that additional costs may result from new telephone company interpretations of the tariff structure.

At various times over the past three years, it has been suggested that in addition to classroom instruction, the CCTV system could be used for such purposes as: (1) student affairs programing, (2) administration-to-student informational programing, (3) registration information, (4) audio instructional programming, or (5) broadcast television and radio distribution.

In light of the continually increasing rate structure under the present lease arrangement and in light of the possibility of greatly expanded services as outlined above, it seemed desirable to study the feasibility of MSU building its own CCTV distribution system to replace the leased system. Therefore, Dr. Jorgensen obtained an EDP grant to hire a consulting firm to conduct a feasibility study and cost analysis of alternative CCTV distribution systems.

PROJECT DESCRIPTION:

A series of three questions and a number of assumptions were developed to form the basis for the study conducted by the consulting firm. The three questions were: (1) can the University replace the existing leased CCTV services and reduce the costs?; (2) at what cost can the University replace the existing CCTV capacity including the services presently leased and all the additional capacity of the existing system?; and (3) at what cost can the University build a broadband communications system on campus capable of instructional, administrative, informational and entertainment functions for all students, faculty and administrative offices? The consultants made two on-site visits and compiled reports relating to each of the three questions posed.

PROJECT STATUS:

The study was completed in June, 1971, and may be summarized as follows: (1) MSU can replace the existing leased CCTV services at approximately one-half the present cost over an eight year

period or at the present budget in approximately four and one-half years including continuing replacement; (2) MSU can build and operate a 12 channel system (expandable to 26 channels) extended to four times as many classrooms at approximately the same cost as its present charges in eight years; and (3) MSU can build a broadband, 48-channel, two-way audio, video, and telemetry system to all campus buildings including dormitories for $433,000 plus duct construction as needed. In addition, the study suggested three alternatives regarding construction of a broadband communications system. The results of this study are currently under review by the Office of the Provost.

PART IV

ANALYSIS OF THE SLATE INSTRUCTIONAL MODEL

PROJECT TOPIC: Analysis of the SLATE Instructional Model

A six part analysis of SLATEs (Structured Learning And Teaching Environments) to enable readers to determine the viability of structured independent study as an instructional alternative

Over the past several years, the Educational Development Program has supported a large number of experiments in the design, management and improvement of instruction. Since any new process or instructional strategy represents a tradeoff between educational goals, learner differences, institutional constraints and teacher predispositions, it is clear that no one method is clearly superior in terms of improving the learning-teaching process. If at all possible, a variety of instructional strategies should be used.

One instructional strategy made possible by current developments in educational technology is structured independent study in a multi-media learning carrel. This instructional strategy has been used extensively at Michigan State and provides several unique advantages and disadvantages of interest to those concerned with the improvement of the teaching-learning process. Therefore, this section of the 1972 EDP Compendium of Reports presents a six part analysis of structured independent study to enable readers to assess the viability of this instructional alternative in their own development efforts. The analysis is organized as follows: (1) description; (2) rationale; (3) alternative ways of integrating independent study; (4) discussion of efficiency, effectiveness and cost; (5) the design process; and (6) concluding remarks.

The analysis includes a number of observations, rules of thumb, and results of various projects which represent our best judgments regarding the development process rather than the results of carefully controlled experimental studies. Therefore, the reader should use caution in generalizing these remarks to situations much different than Michigan State University.

Description

Here at Michigan State, we use an acronym--SLATEs--to identify structured independent study environments. SLATEs are essentially individual lessons designed to accomplish specific learning objectives without live instructors. SLATEs are literally structured Learning and Teaching Environments which present information to students in carrels via 35MM slides, film loops, audio tapes, workbooks models, and related equipment. SLATEs are programed in the sense that their design seeks to optimize student learning of specific objectives by application of certain principles of instructional design (e.g., precise specification of learning objectives; multi-modality presentation of information; cueing students' responses; providing feedback/knowledge of results; self-pacing; and hierarchal sequencing of concepts and principles to be learned). Thus SLATEs are designed to be structured independent learning experiences. That is, the materials and environments are designed to allow students to achieve specified

competencies independent of live instructors and other students. Most often, students study alone and progress at their own rate from one programed learning experience to the next. However, if interaction with other students is desirable, SLATEs may be designed for two or more participants learning simultaneously.

Rationale

A SLATE is a learning system that uses several kinds of media programed to communicate information to the student and allow him to practice. The basic rationale for using SLATEs is one of improving efficiency and/or effectiveness of student learning. That is, to accomplish equal learning with less student/faculty effort or to achieve greater learning with similar student/faculty effort. While it is recognized that no one instructional strategy is "best" for improving efficiency and/or effectiveness for all student learning in all subject areas, it has been suggested that independent study is a viable response to the problems of: (1) improved efficiency of student and faculty time; (2) individual differences in student's capability; and (3) student satiation with conventional lecture/recitation/text models of instruction.

It is now a matter of record both at MSU and other institutions using the structured independent study mode that in general: (a) students prefer the SLATE mode to conventional modes of instruction; (b) as a result of using SLATEs, students often exhibit a positive attitudinal shift with respect to the subject matter itself (as well as the mode of instruction); (c) learning is equal to or exceeds conventional instructional techniques; (d) SLATEs provide a more efficient use of expensive resources (faculty, facilities, student time); (e) SLATEs provide increased flexibility in scheduling and allow for individual differences in rate of learning; (f) SLATEs provide greater control over student's study habits and learning behavior; and (g) SLATEs facilitate greater personalization and student/faculty interaction because faculty are freed up from repetitive teaching tasks.

Alternative Ways of Integrating Independent Study

Over the past nine years, SLATEs have been used in several different ways at Michigan State University because of: (1) variance in subject matter; (2) faculty predisposition; and (3) economic or time constraints. Thus, within a given course or instructional system, SLATEs have been used as: (a) the total instruction for the course; (b) integrated with or adjunct to other instruction; or (c) as a substitute, or vicarious, learning experience not attainable through conventional instruction.

Total Instruction. A SLATE or series of SLATEs may be designed which provide virtually all of the formal instruction in a given course. Typically, the students interact with a "mediated" teacher who presents all essential information through slides, tape and film; directs appropriate student response and evaluates performance. The student can control the rate of presentation by stopping, reversing, and restarting the AV equipment. Criterion performance tests are

"built in" to insure the student has mastered prerequisite concepts before more complex material is presented.

This particular type of SLATE is very useful when the performance to be learned depends on visual or auditory cues which are difficult to discriminate. For example, the School of Nursing at MSU has developed a series of SLATEs on temperature, pulse, and respiration. Students learn underlying theory and then are trained to recognize the critical audio and visual cues in measuring these body functions. During the SLATE, conceptual information is presented. Then students are directed to work on models, then take each other's pulse, temperature, and observe respiration. In this way, conceptual information, as well as technical skills, may be learned by the student at his own rate, up to a specified criterion performance.

Adjunct/Integrated SLATEs. This type of SLATE is designed to be integrated with other learning experiences such as lecture, recitation, laboratory, field trips, etc. Here, a discrete part of the course content is identified and transformed into a structured AV presentation. Having certain information "prepackaged", the faculty is freed to a certain extent from the necessity of transmitting low level factual information and can concentrate greater effort on integrating the material and establishing relationships in the course content.

Thus, SLATEs can be used to teach technical vocabulary, basic facts or concepts, equipment operation, or other mandatory information. This information is then synthesized through the other learning experiences in the course.

For example, at MSU a series of SLATEs in Physiology serve as preparation for a large number of formal laboratory experiments. These SLATEs provide students with necessary concepts and equipment familiarization before they undertake complex experimental procedures. In another case (Soil Science), SLATEs are used both to supplement the lab experiences and replace some of the lectures. In Biochemistry, a SLATE series has completely replaced the normal lecture and are integrated with laboratory work. A few lectures are given, but these are optional and essentially for motivation and enrichment.

While there are no "norms", the instructional model which evolves from integration of SLATEs often approximates 30% lab/small group, 30% lecture, 30% SLATEs, and 10% exams.

Substitute/Vicarious Experience. Often we find that resources are simply not available to provide the first hand laboratory or field experiences which are desirable in a certain discipline. For example, medical, dental, or nursing students simply cannot physically visit hospitals and clinics in order to learn "first hand" special techniques required by the profession. Social workers may not be able to make "on site" visits to the agencies or the social groups with whom they are being trained to work. Educators cannot visit model projects which are long distances from their institution. Therefore, wide use is being made of SLATEs to substitute for or

provide vicarious representations of real life experiences which are unattainable because of logistical constraints. Moreover, this type of SLATE can be used as an introduction or review of field experiences which are actually performed. Key facets are highlighted beforehand and reviewed afterward. This technique has proven consistently to improve learning.

At MSU a professional course in Social Work has developed a series of SLATEs which provide the learner "on site" visits to ten social agencies both at the state and national level. Students learn the agency rationale, function, funding, constituency, etc. Lecture and recitation sections of the course are organized to analyze the activities of these agencies in light of national and state policy.

The College of Human Medicine has developed a SLATE which will be used to teach the diagnosis and treatment of a rare neurological disease. This SLATE will be used in the training of medical students as well as upgrading practicing physicians.

Discussion of Efficiency, Effectiveness and Cost

SLATEs can often contribute to making more efficient and/or effective use of instructor time, student time, and facilities. For example, many instructors find that their presentations are in large part devoted to discussing relatively low-level factual material rather than high-level concepts and principles to which they would prefer to devote their time. A SLATE may therefore be designed to teach students new vocabulary, basic concepts and principles, and to introduce them to new equipment. Thereafter, the instructor in lecture or laboratory can concentrate on integrating the material that they have learned in the SLATEs with a new gain in instructional efficiency.

SLATEs can often facilitate more efficient use of student time. Since SLATE equipment can be operated by the students themselves, and since they can go to the SLATE laboratory at any time that is convenient to them, a SLATE is an effective method for allowing students to proceed at a rate that is comfortable for them and, consequently, adapts to individual learning styles and capabilities.

SLATEs can also permit more efficient use of equipment or facilities. Currently, the number of students in schools is increasing at a more rapid rate than educational facilities. Furthermore, there are fewer per capita instructional dollars after adjustments for inflation than ever before. Many instructors find that a laboratory experience, for example, must be abbreviated beyond the point where optimal learning can occur. Students are often rushed in and out because there is insufficient time, space, or equipment. It has been found that by carefully analyzing the subject matter by means of task analysis techniques, those parts of the course which involve applications or manipulations can be identified and taught in the laboratory. The remainder of the course can be taught in SLATEs or by other methods.

SLATEs can also serve to alleviate a problem that is found everywhere; heterogeniety of students. Most instructors are not permitted

to restrict student entry into their courses. Consequently, they are faced with a wide range of student competence and must compromise on the level of their instruction. In these situations, SLATEs are valuable as a method for providing remedial instruction to students, allowing them to learn or review the subject matter prerequisite to the course. In addition, SLATEs allow students to review course material on their own time, thus permitting the instructor to proceed at a more rapid pace with a concomitant gain in efficiency.

While no formulas have been developed which precisely quantify gains in efficiency and/or effectiveness, some gross measures may be discussed. For example, through use of SLATE "preparation laboratories," student time spent in expensive laboratories has been reduced from 10% to 50% with equal or better learning of laboratory procedures. In a number of cases the number of graduate teaching assistants required in laboratories has been reduced as has the breakage of expensive equipment. Since faculty are freed of the odious task of repetitive teaching of basic concepts and principles, course objectives are expanded to include both higher level and greater number of objectives than ever before. Furthermore, in all cases where comparisons were made, student learning was equal to or greater than traditional instructional modes (lecture/lab/recitation, text). As a final measure of efficiency and effectiveness, one might discuss the student failure rate. In many cases where SLATEs have been used, the failure rate has been reduced far below previous norms. This course reflects the SLATE capability to adapt to individual differences in learning rate and modality.

There are, in addition, several intangible factors which bear on the issue of efficiency and effectiveness from an all university perspective. First, the training effect resulting from the process of SLATE development often affects the overall instruction in a given course and in other courses within a given department. Similarly, SLATE development may seed additional outside funds and improve department morale. It is our impression that this sequence occurred with the School of Nursing at MSU. In addition, SLATE development often results in a clarification and/or revision of course objectives and in several cases a reevaluation and revision of departmental curriculum. Such factors, while difficult to measure objectively, certainly make a contribution to the effectiveness and/or efficiency of the departmental teaching efforts and hence to the university teaching function as a whole.

Costs. Questions of cost require that we ask, "Compared to what?" In 1968 a formula was developed which listed a number of key variables so that cost comparisons could be made between modes of instruction. One analysis was made comparing SLATEs, computer assisted instruction, and closed circuit television. Since SLATEs and CAI are individualized modes of instruction and CCTV is normally a group mode, any comparison on the basis of cost per individual student necessarily favors CCTV. The range of factors influencing cost are extensive and the formula below is intended to be suggestive of one way of computing costs.

Basic Formula

$$C^TM = \frac{f\left(\frac{E}{A_1}\right) + f\left(\frac{F}{A_2}\right) + f(M) + f(U) + f(O) + f\left(\frac{S}{A_3}\right) + (C)}{L_H}$$

$C^TM$ = Cost ($) of a training medium for one year/learner hour produced
E = Total Equipment Cost
F = Cost of Facility
$A_1$ = Years Amortized
$A_2$ = Years Amortized
$A_3$ = Years Amortized
M = Maintenance for one year
U = Utilities for one year
O = Operating Personnel for one year
S = Software Costs (total including personnel)
C = Prepare Software for Computer
$L_H$ = Learner Hours Produced

SLATE development costs may be broken out as either (1) capital investment; or (2) software development. Capital investment costs are one-time expenditures required to purchase and set up the necessary carrels and associated AV equipment. Extrapolating capital investment figures from a number of carrel installations at MSU, one comes up with an average cost of $500.00 per student station for a carrel, installed, equipped with a slide projector and tape player. (Carrels and associated AV equipment range from $100 to over $700 per student station).

The number of carrels required by a given course depends on the student enrollment, length of the SLATEs, number of SLATEs required per week, and number of hours the carrel facility will remain open. Thus, for example, a course enrolling 240 students, requiring one 40 minute SLATE per student per week, requires a carrel facility capable of accommodating 240 student use hours per week. Assuming the facility will remain open for 40 hours per week, and optimum scheduling is possible, a minimum of six carrels will be needed to generate the 240 student hours required. Thus, it can be seen that in planning for SLATE development in the hypothetical course above, approximately $3,000.00 (6 X $500.00) will be required for capital investment.

Software development costs, on the other hand, are much more difficult to break out because of the number of variables involved for which direct cost data are not readily available (faculty and consultant salary, for example) and because of differences in instructional design, and resultant differences in software production costs. Nevertheless, experience has shown that an "average" 30-45 minute program prototype with 5 to 10 duplicates of slides, tape and workbook, costs approximately $500.00 to produce exclusive of faculty and consultant costs. Thus, a course requiring 10 SLATE lessons and

six copies of each lesson would require approximately $5,000.00 for software development.

The Design Process

When one views the final product of the development process, the smooth flow of slides, tape, and student activities in the carrel room, it tends to make the development process appear deceptively simple. Experience at MSU has shown that a SLATE is a complex learning environment requiring a high degree of skill for effective design and a large support base for production and implementation. For example, faculty designing SLATEs for the first time require considerable assistance from consultants in learning, evaluation, and media design. Furthermore, after the design is completed, an extensive media support capability is required to produce the necessary instructional programs (software) and purchase set up the necessary carrels and associated hardware. Thus, SLATEs by their very nature involve high development costs both in terms of hardware and software as well as faculty and consultant time.

Some data on the time and effort required to produce a hypothetical set of five 30 minute SLATE units is shown in Figure 1. These data were extrapolated from interviews with seven faculty who developed SLATEs with no previous experience. As experience is gained, time required for development was reduced.

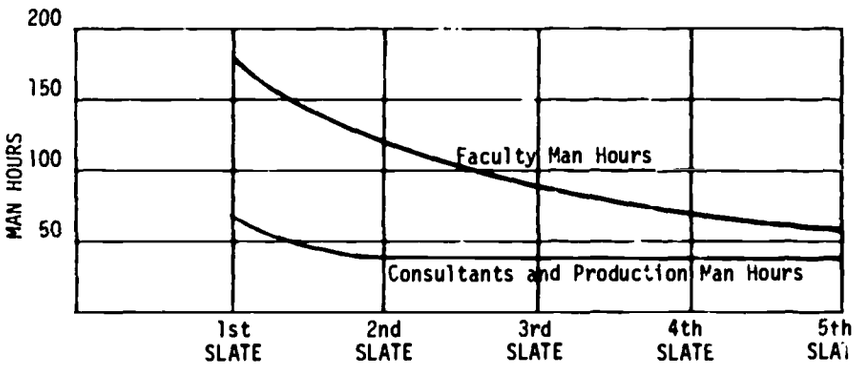


Figure 1. Approximate man hours/per 30 minute SLATE unit.

Unless the proper design process is used, there is a danger that the resultant product will simply be an illustrated lecture. While there is nothing inherently wrong with illustrated lectures, they do not, in general, optimize conditions for presentation of information, student practice and feedback so that achievement of specific learning objectives will result. Experience at MSU has shown that the following design process can most often result in an effective SLATE.

1. Determine SLATE Feasibility. The SLATE developer must determine at the outset: (1) if structured independent study is the optimal instructional strategy for improving learning in one or more parts of the existing or planned instructional system; and (2) if sufficient resources including dollars, consultants and production facilities are available. To make this determination, it is useful for faculty to observe an operational SLATE in another discipline; then apply the following feasibility criteria: What portions of the course content (a) can be structured hierarchically (programed)?, (b) are difficult or time consuming to teach "conventionally"?, (c) do students show wide variability in rate of acquisition and could use individualized instruction?, (d) would not necessarily require face-to-face verbal interaction for learning?, and (e) can potentially be presented and practiced in 30 minutes? (In general, our formative evaluations indicate that a 30 minute viewing time is about optimal.) Then, for those portions of the course which fit the criteria above, a rough approximation can be made as to how many 30 minute SLATE lessons will be needed. Following this, preliminary cost estimates can be developed to determine if sufficient resources are, or can be, made available. For all portions of the course where SLATEs are feasible from a pedagogical and resource availability standpoint, planning may continue by determining lesson objectives.

2. Write Behavioral Objectives and/or Evaluation Instruments. SLATEs are designed to achieve specific changes in student capability. The logical starting point in the design process is to determine exactly what those changes are and how to measure them. For the units selected (considered feasible) the designer must determine what students are to learn and where or how students will apply this knowledge (will the knowledge be used in the next course, on a job, in the next unit in the present course, etc.?). Often, however, writing objectives is perceived as a very odious task by faculty. Hence it may be equally effective to begin with an analysis of the subject matter content, its organization, sequence principles and concepts. Having determined what content is to be learned, attention may be turned to development of appropriate measures of achievement of the content. These measures, in turn, may be "turned around" into statements of behavioral objectives and faculty asked to assess and/or revise these objectives.

3. Write an Outline of the Subject Matter Content. Assuming the terminal performance objectives and/or evaluation instruments are constructed, the developer can turn his attention to identifying and sequencing the subject matter content relevant to achievement of the objectives. Underlying most subject matters is a psychological system of organizing or sequencing. For example, if the student is to learn how to apply a principle he must first learn to identify the concepts which make up the principle. And, previous to concept learning, he must learn the names and definitions of the terms which compose the concepts. Thus, one psychological basis for organizing subject matter is simple to complex. This organizational schema should be reflected in the outline of the subject matter content developed at this time.

4. Write a Script and Student Workbook. The content outline developed earlier must now be expanded into a 30 minute (approximately) verbal presentation. This verbal presentation must include three components:

(A) A unit overview or "advanced organizer" telling the student what he is expected to learn, why this is important to him, how the lesson is organized and presented, and what his tasks are during and after the lesson.

(B) Instructions to the student regarding use of the AV equipment and teaching materials (when to change slides, start and stop tape or respond in the workbook, etc.).

(C) Exposition relative to the subject matter content involved in each SLATE objective which is organized as follows: (1) introduction; state the objective and justify it; (2) review; stimulate recall or previous learning prerequisite to the present lesson; (3) present new information; (4) give examples; (5) provide practice (questions to answer, operations to perform, etc.); (6) provide feedback or knowledge of results; (7) test acquisition of the objective before moving on to the next objective.

Since the SLATE instructional strategy requires active student response followed by feedback and objective tests measuring acquisition of each objective, it is highly desirable to provide students with a workbook to record their responses. The workbook may thus be developed at the same time as the 30 minute script and may contain definitions, diagrams, graphs, and other information to augment the verbal narrative, as well as information pertaining to the student responses and feedback.

5. Develop Storyboard. A storyboard is a pictorial display of all the visual and audio stimuli to be used in the SLATE lesson. In many storyboards, the audio script is typed on one half of a sheet of paper while directly opposite the audio is a drawing illustrating the visual which goes with the audio and/or workbook exercise. A storyboard helps the designer conceptualize the design of the visual materials and how the audio and visual stimuli will be integrated. A storyboard is thus essential in coordinating and designing the audio, visual, workbook, and other instructional components of the SLATE lesson.

To develop a storyboard, one must determine where, in the script, a picture would be likely to facilitate any of the "expository format" steps stated in step 4. For each visual, the designer must ask: "What is the intent of the picture?" "What is its subject, and what assertion, proposition, or question is the picture to communicate to the viewer about the subject?" Visuals, of course, may contain verbal or symbolic information as well as pictorial information. After determining the content of a given visual, a rough drawing should be constructed opposite the verbal information on the storyboard sheet. This technique will thus indicate precisely where, in

the presentation, a given visual will occur, what audio is to accompany the visual, and what workbook or other practice exercises will be taking place at any given time.

6. Produce Instructional Materials. Using the finished script on the storyboard, the SLATE developer should make a tape recording of the entire presentation. Several re-recordings may be necessary until proper content and pacing are achieved. In order to attain proper content, timing and pacing during tape recording, many faculty find it desirable to observe the same slides that the students will be watching and to actually perform the practice exercises the students will do in the workbook. Also, it is difficult to omit important instructions or a slide change signal when using this technique. If this technique is used, it will be necessary to develop the visuals and student workbook prior to the tape recording session. Experience at MSU and elsewhere has shown that a "professional" voice on the tape is not necessary or even desirable. Students tend to identify with the faculty teaching the course and prefer to hear his voice on the tape.

To produce the necessary visuals, it is often necessary to provide a graphic artist and/or photographer with the storyboard illustrating the various pictorial stimuli. Satisfactory visuals may be produced with felt tip pen and photographed using a 35MM camera. These simple visuals are probably about as effective from a learning point of view as those created by graphic artists.

The student workbook is likely to be produced by the SLATE faculty and should include the following: (a) lesson identification and objectives; (b) general information and directions for using the SLATE materials; check in and out, special equipment needed, etc.; (c) specific subject matter information and directions which supplement or repeat important information contained on the audio tape; (d) questions and/or other exercises relevant to the subject matter; (e) correct answers to the questions/exercises; and (f) a posttest on the entire SLATE with correct answers included. (A pretest may also be included to assess student acquisition of lesson prerequisites.)

7. Tryout Prototype, Evaluate and Revise. The prototype slides, audio tapes, and workbooks should be placed in a carrel and reviewed for proper content, sequence, omissions, technical problems, etc. When satisfied, the SLATE developer should select a small pilot group of six to nine students to try out the SLATE, and, if possible, review with them where they encountered difficulties and obtain their suggestions for revisions. The prototype SLATE is thus revised as necessary; then sufficient copies of all materials should be produced for the number of carrels to be used in the course.

8. Develop Management and Achievement Monitoring System. After prototype SLATEs have been developed, a management system for operating the carrel room and keeping track of student achievement must be developed. Often, the use of sign-in cards is mandatory to obtain data on student achievement, carrel down time and effectiveness of individual SLATE lessons (e.g., if students take an inordinate

amount of time on a given lesson, it may be the SLATE is not effective).

Concluding Remarks

As an instructional strategy, the SLATE represents one alternative in the inventory of possible alternatives. Assuming equal numbers of students served and the present state of technology in higher education, SLATEs are probably somewhat more expensive than the large lecture and CCTV in some cases, but cheaper than CAI, motion pictures, small group discussions, and similar relatively expensive modes of teaching. The development process is time consuming and requires considerable expertise in instructional design. The carrel facility is relatively expensive but is a one time capital investment.

Counterbalancing the development cost is the fact that students prefer this mode of instruction. On numerous occasions when student reaction to this way of presenting instructional content has been assessed, it has been very positive. At MSU, when, for experimental purposes, the SLATE mode has been denied to control groups and given to experimental groups, the control groups have protested in the most emphatic terms. It is possible that students prefer this mode because of two factors: (1) satiation with lecture/recitations and conventional textbooks; and (2) preference for a highly visual, responsive, self-paced and intensive mode of instruction where students perceive a great deal is learned per unit of time.

Furthermore, it has been shown at MSU that learning is usually improved in the sense of either achieving more objectives per term or achieving at a considerably higher level of conceptualization.

In the broadest sense, a SLATE is an environment carefully designed to take fullest advantage of the state of the art in learning theory and educational technology. The function of the SLATE is to facilitate independent learning by systematically structuring and presenting the information to be learned. Just as the student can learn without an instructor, he can also learn without a SLATE. But, few students know how to learn effectively entirely on their own. Hopefully, SLATEs will make the process easier, more enjoyable for the student, and more cost/effective for the university.