



TIPS - - A CMI SYSTEM FOR HIGHER EDUCATION

by

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The Teaching Information Processing System -- TIPS, for short -- is a recently developed teaching tool that utilizes the computer in a CMI mode to provide each student an individualized course of instruction. This approach can be utilized in most disciplines where subject matter objectives are reliably measured by well-formulated, objective-type questions. TIPS is economical, provides rapid student feedback, and complements the teaching techniques employed in most large classes.

TIPS is presently used at around seventy universities in some sixteen disciplines, including, for example, accounting, biology, chemistry, economics, geology, pathology, and sociology. TIPS probably represents the fastest growing CMI system in higher education today.

Why TIPS? In the large class, indicators of class progress are scarce, while measures of the individual student's progress are virtually non-existent. The relatively small number of professor-student and teaching assistant-student contacts do not give an overall picture. And midterm exams are usually a concluding device for sections of the course.

Even as these sources may give some indication of class progress, they generally come too late to remedy student learning problems. Concepts missed early in the term may be the foundations for subsequent learning: once the student has a poor grasp of an early concept he may well have difficulty with those coming later.

With this lack of adequate and timely information, the professor may be proceeding too fast or too slow for most of the class. Even if the pace is satisfactory for the

majority, students at the extremes -- those experiencing difficulties, those remaining unchallenged -- may be participating less than optimally.

TIPS A Solution? TIPS enables the professor to prepare, administer and process short (around 10 minute) multiple-choice or objective-type "surveys" of student progress throughout the semester. Typically TIPS "surveys" are optional and are not used for formulating course grades, and therefore are not called "quizzes".

Based on the survey results, and combined with previously prepared instructions provided by the professor, a series of instructional reports is generated by the computer.

A Student Report provides individualized assignments for each student based on his or her measured proficiency in the various concepts covered by the TIPS survey. A student performing well on one concept may receive an enrichment or optional assignment; on another concept, where deficiency is revealed, the student may receive a lower-level required assignment.

TIPS survey results, stored over several weeks, permit the identification of those students who are failing the course well before examinations. Individual tutorials and compensatory instruction may then be arranged.

High-achieving students, also identified before examinations, may, for example, be provided the option of writing papers, undertaking special projects, or tutoring low-achieving students in lieu of taking the exam.

The degree of individualized instruction facilitated by TIPS is largely unaffected by class size. This approach can be utilized in most disciplines where subject matter objectives are reliably measured by well-formulated, objective-type questions.

The Student and Professor Reports. The various instructional reports are the key outputs of the TIPS system. Below I have provided examples of two student reports, and one professor report. A careful consideration of these reports reveals the flexibility of the TIPS system from a pedagogical point of view.

Some Feedback on TIPS. TIPS has been evaluated using experimental and control groups, and preliminary scientific results are beginning to emerge. Over 1,000 economics students have participated in a large scale research program. Based on these specific experiments, several results are now established.

1. TIPS increases student achievement, as measured by course examination scores, by an average of 15 percent. (For example, normalized average scores in the control and experimental groups were 50 and 57.5, respectively.)
2. The impact of TIPS varies by type of student. High-achieving students increase their performance by less (around 13 percent); low-achieving students increase their performance by more (around 19 percent).
3. The impact of TIPS on student examination performance is largely unaffected by the type of examination question. Approximately equal gains were identified on multiple-choice, short-answer, problem, and essay questions.
4. Student evaluations of their course and their professor are uninfluenced by TIPS.
5. TIPS attracts 23 percent more majors (measured two years later). later).
6. TIPS' positive impact on course achievement is retained over time (measured one year later).

While one cannot generalize from these specific results, similar findings are beginning to merge by numerous users of TIPS around the country. The most recent research findings have appeared in the fields of chemistry, geology, philosophy and sociology.

Information on TIPS can be obtained from Professor Allen C. Kelley, Educational Systems Project, P.O. Box 4747, Duke Station, Durham, North Carolina 27706. A fifteen minute 16mm sound movie, recently produced as a part of the Exxon Education Foundation's IMPACT program, is also available, and information on its use can be obtained by writing the ESP Project.

Assignment based on several TIPS surveys.

NOTICE: AN ALL UNIVERSITY LECTURE BY PROFESSOR MILTON FRIEDMAN (PAST PRESIDENT OF THE AMERICAN ECONOMIC ASSOCIATION) WILL BE HELD IN 236 SOCIAL SCIENCE AT 7:30 P.M. ON 11/03/72.

An example of the TA Report. The Professor Report is similar, but applies to the entire class.

TIPS

SECTION LEADER SUMMARY OF STUDENT SURVEY PERFORMANCE

PRINCIPLES OF ECONOMICS (103)

PROFESSOR ALLEN C. KELLEY

SECTION LEADER: MR. SCHMIDT

SECTION NUMBER AND TIME: 39, 7:00 PM TUESDAY

DATE OF SURVEY: 10/23/72

STUDENT NAME	1	2	3	4	5	6			
1. AMMEN, GERALD	---	OPT	---	---	REQ	---			
2. BRADFORD, JAMES T	---	OPT	---	---	REQ	---			
3. BROCKRETT, JEAN A	---	OPT	---	---	REQ	---			
4. CROMLEY, MICHAEL	---	OPT	---	---	REQ	---			
5. DINTON, MARY JANE	---	OPT	---	---	REQ	---			
6. EAMES, JOE	---	OPT	---	---	REQ	---			
7. FALANDER, WILLIAM F	---	OPT	---	---	REQ	---			
8. NEUMANN, WILLIAM	---	OPT	---	---	REQ	---			
9. PECK, RICHARD M	---	OPT	---	---	REQ	---			
10. STILES, HAROLD	---	OPT	---	---	REQ	---			
11. TILLISON, JOEL C	---	OPT	---	---	REQ	---			
12. TODD, DENNIS G	---	OPT	---	---	REQ	---			
13. THEEDALE, LEON W	---	OPT	---	---	REQ	---			
14. WAGNER, RICHARD	---	OPT	---	---	REQ	---			
15. WAGNELL, RICHARD	---	OPT	---	---	REQ	---			
16. O'BRIEN, BRUCE N	---	OPT	---	---	REQ	---			
DID NOT TAKE SURVEY									
DID NOT TAKE SURVEY									

THE ASSIGNMENTS ARE DUE DURING THE WEEK OF 10/28/72

AVERAGE SURVEY SCORES

THIS SECTION 63

ENTIRE CLASS 69

AVERAGE SCORE ON GROUPINGS

GROUPING 1 -- QUESTIONS 1-5

83

40

64

GROUPING 2 -- QUESTIONS 6-10

40

43

50

RESULTS OF SURVEY BY QUESTION

NO. ANS.	PERCENT CORRECT	PERCENT OF SECTION SELECTING ALTERNATIVES							
CLASS SECTION		A	B	C	D	E	F	NO RESP.	
1	65	71	0	7	6	14	71	0	
2	74	79	7	79	7	0	7	0	
3	69	71	14	71	0	7	0	0	
4	83	100	0	0	100	0	0	0	
5	75	33	7	0	0	93	0	0	
6	36	50	15	79	0	0	0	0	
7	73	57	57	14	0	43	0	50	
8	77	43	0	7	43	14	7	0	
9	65	36	0	36	43	14	0	0	
10									

The individual assignments are recorded for the teaching assistant. The student's numerical results are generally not reported.

Analysis of TIPS surveys is based on section and class averages — both on broad concepts (question groupings) and on individual questions. Analysis of incorrect responses often proves crucial. (Note results on grouping 2 and questions 6, 9 and 10.)

The decision rules and assignments as specified by the professor, vary considerably.

A message to the consistently high performing student.

A message to the consistently low performing student.

ASSIGNMENTS FOR THE FORTHCOMING WEEK, WITH DECISION RULES:

1. WORKBOOK, PP. 37-38; HANDOUT 2A; PROBLEMS 3 AND 2 (STANDARD ASSIGNMENT); STUDENTS SCORING 40-79, WITH AT LEAST 3 CORRECT ANSWERS IN GROUPING 2)
2. WORKBOOK, PP. 37-38; HANDOUT 2A; PROBLEMS 3 AND 4 (STANDARD ASSIGNMENT); STUDENTS SCORING 40-79, WITH LESS THAN 3 CORRECT ANSWERS IN GROUPING 2)
3. HANDOUT 2B; PROBLEMS 3-4; LIND LECTURE ON 10/27/72 (STUDENTS SCORING ABOVE 79, LESS THAN ONE SEMESTER OF CALCULUS)
4. ATTEND A SPECIAL MATHEMATICAL-ECONOMICS SECTION, 7:30 PM, 10/28/72; IN 235 SOCIAL SCIENCE (STUDENTS SCORING ABOVE 79, AT LEAST ONE SEMESTER OF CALCULUS)
5. HANDOUT 2C; PROBLEMS 1, 3, AND 4; PROGRAMMED UNIT, MICROECONOMICS BY LIND (STUDENTS SCORING ABOVE 79, LESS THAN ONE SEMESTER OF CALCULUS)
6. HANDOUT 2C; PROBLEMS 1, 3, AND 4; OUTLINE LECTURES OF 10/23/72 AND 10/25/72 (STUDENTS SCORING LESS THAN 39; VERBAL APTITUDE LESS THAN 48)

SPECIAL MESSAGES AND DECISION RULES:

1. YOUR RECORD ON THE TIPS SURVEYS TO DATE INDICATES THAT YOU APPEAR TO HAVE A FIRM GRASP OF THE BASIC CONCEPTS OF THIS COURSE. IN VIEW OF THIS, YOU MAY ELECT ONE OF THE FOLLOWING 3 OPTIONS:
2. TAKE THE MIDTERM EXAMINATION AS SCHEDULED ON 11/03/72; OR
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THE FOLLOWING STUDENTS RECEIVED THIS MESSAGE:

1. TILLISON, JOEL C
2. WAGNER, RICHARD

YOUR RECORD ON THE TIPS SURVEYS FOR THE LAST FEW WEEKS INDICATES THAT YOU APPEAR TO BE HAVING DIFFICULTY WITH THE COURSE. ACCORDINGLY,

1. WE ARE ARRANGING TUTORIAL SESSIONS FOR YOU WITH A FELLOW STUDENT. CHECK WITH THE DEPARTMENTAL SECRETARY (ROOM 205 SOCIAL SCIENCE) FOR DETAILS OF 11/23/72 AND 11/27/72.
2. YOU SHOULD ATTEND THE OPENING OF 11/23/72 AND 11/27/72 FOR SPECIAL COURSE REVIEW (SMALL GROUP) TO BE LED BY PROFESSOR KELLEY.

THE FOLLOWING STUDENTS RECEIVED THIS MESSAGE:

1. AMMEN, GERALD