Computer-Assisted Instructional Management for Teachers[1]

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Computer-managed instruction (CMI) has been getting about as much attention lately as computer-administered instruction (CAI). In addition to the usual objectives of CMI, the reader's attention is directed toward looking at the instructional management situation as an interactional system quite different from the kind investigated by Flanders, Smith, Bellack, et al., who concern themselves with the interactions built into the interface between student and teacher. In fact, the type of interaction analysis popularized by Flanders is frequently inapplicable or inappropriate in reference to classroom teacher behavior when the instructional management system is based on technology. Expected teacher behavior in these latter situations is of an entirely different order.—Editor

About three years ago System Development Corporation began development of a computer-based Instructional Management

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System, called IMS, under a contract from the Southwest Regional Laboratory for Educational Research and Development. Since then, we have had two years of experience in applying IMS on a small scale in several Los Angeles elementary schools. This is a report on some of our successes and failures, with special emphasis on our efforts to train teachers in the use of this new system.

IMS is not a teaching system as such, but rather is designed to aid teachers in managing their regular classroom instruction. IMS serves both diagnostic and prescriptive functions. That is, it helps to monitor every student's performance on behaviorally defined learning objectives, and it also recommends remedial or prescriptive activities for students who demonstrate inadequate mastery of specific objectives. Operationally, this means that each student is tested at frequent intervals, approximately once a week on each subject area; the test results are read into a computer by means of an optical scanning device; and the computer produces performance reports that are returned to the teachers on the following day.

Figure 1 shows the type of report returned to a teacher after each test is administered. Part A of the report shows group performance (average percentage correct) on each learning objective covered by the test. It also recommends remedial activities (units of exercise materials) for children falling below a prespecified criterion level. Part B shows performance and prescribes remediation by individual child. Under Lori Matthews' name, for example, the left-most number indicates that she has failed to meet criterion level on specific objective 203. Her score on that objective was 70 percent. It is recommended that she be given an exercise assignment using materials in folder R28-0203.

Approximately once a week teachers also receive summary reports showing cumulative performance over all tests taken up to that point. In addition, they can request at any time a breakdown of any specified child's performance on designated tests. Figure 2 shows an example of such a report, in which Cathy Wilton's reading behavior is analyzed at a very detailed level.

We have operated IMS in nine different first-grade classrooms in three Los Angeles schools. Students in the classes ranged from disadvantaged to highly advantaged socioeconomic status. The first year we worked with two teachers from each of

FIGURE 1

Report of a Reading Group's Performance on a Single Test

TEACHER 53 DATE 05/22/68 TEST 9928, WHITEHOUSE, REVIEW
GRADE B1 SUBJECT READING GROUP 1

A. GROUP REPORT

GENERAL OBJECTIVES	SCORE	ACTIVITIES RECOMMENDED
2 WORD RECOGNITION	87	
9 PARAGRAPH COMPREHENSION	94	R28-0203 R28-0204
TOTAL SCORE	88	

B. INDIVIDUAL REPORT

STUDENT NAME	TOTAL SCORE	GENERAL OBJECTIVES***SCORE THIS TEST 2	9
RUTH STERLING	97	96	100
CARLA REECE	97	96	100
DONNA PRENTICE	94	92	100
CATHY WILTON	91	89	100
LORI MATTHEWS	89	85	100
203 (70) R28-0203			
DANIEL LARSON	86	85	88
DALE SCHULTZ	81	78	88
204 (62) R28-0204			
MICHAEL ROLLINS	72	71	77
203 (60) R28-0203			
204 (62) R28-0204			
902 (66) R28-0902			

FIGURE 2
Detailed Analysis of an Individual's Reading Performance

BUILDING FRAZIER
TEACHER JANICE YATES
STUDENT CATHY WILTON
SUBJECT BI READING TESTS 9914-9928

OBJECTIVE 2 WORD RECOGNITION

SPECIFIC OBJECTIVE	POSSIBLE ATTAIN.	STUDENT ATTAIN.	PERCENT
SAME LENGTH WORDS	4	3	75
INITIAL LETTER DISTRACTOR	47	41	87
FINAL LETTER DISTRACTOR	37	33	89
MANY LETTER DISTRACTORS	30	25	83

OBJECTIVE 3 PHONICS, INITIAL SOUNDS

SPECIFIC OBJECTIVE	POSSIBLE ATTAIN.	STUDENT ATTAIN.	PERCENT
INITIAL CONSONANT F	4	4	100
INITIAL CONSONANT B	4	4	100
INITIAL CONSONANT N	4	3	75
INITIAL CONSONANT W	4	4	100
INITIAL CONSONANT P	4	3	75
INITIAL CONSONANT L	4	2	50
VARIED CONSONANTS	12	12	100

OBJECTIVE 4 PHONICS, FINAL SOUNDS

SPECIFIC OBJECTIVE	POSSIBLE ATTAIN.	STUDENT ATTAIN.	PERCENT
RHYMING WORDS	12	10	83
SINGLE CONSONANT SOUNDS	18	14	77

OBJECTIVE 5 PHONICS, MEDIAL VOWELS

SPECIFIC OBJECTIVE	POSSIBLE ATTAIN.	STUDENT ATTAIN.	PERCENT
MEDIAL VOWELS	12	9	75

two schools. Because this was a period in which we were still feeling our own way, it provided a joint learning experience for us and the teachers. We involved the teachers from the start in defining the learning objectives and in preparing criterion-referenced tests. Two of the teachers also spent a summer helping us prepare supplementary exercise materials that could be prescribed by IMS.

By the end of the first year we had a stable set of procedures, and the entire management system appeared to be functioning

fairly well. At that point we decided to move to a new school, to find out how well and how quickly the procedures could be transferred to a new set of teachers who had not worked with us in the early development of IMS. In this new school we worked with all five first-grade teachers. We also involved the principal in regular meetings with the teachers and with an SDC representative. We felt that the principal's involvement would make the teachers perceive the project as one supported by the school itself, and not simply an experiment conducted by outsiders. We worked for a year in this third school, during which we processed approximately 5000 tests and returned about 1500 reports to the teachers.

Before I discuss some of our findings, I want to describe one important characteristic of the schools in which we worked. In all three schools each first-grade reading class is divided into three groups: a fast group, a medium group, and a slow group. The teacher typically works face-to-face with one group at any given time, while the remaining two groups work with exercise materials or other activities. Thus the instruction is basically a three-track system, and individualization within a group is limited by the time a teacher can spare to work with individual children.

In evaluating the effectiveness of IMS, we placed considerable emphasis on the teachers' classroom behavior and how that behavior was affected by the availability of the IMS data. If IMS is helping the teachers to manage their instruction, then those teachers should behave differently *with* IMS than they do *without* IMS. We looked very closely at three specific kinds of teacher behavior. First, we hypothesized that teachers would use the IMS data to aid them in pacing their instruction. That is, we anticipated that when a group of children made many errors on a test, the teacher would give more remedial instruction before moving to a new objective. Thus, we expected the interval between tests to *increase* after *low* IMS scores and to *decrease* after *high* scores. In actual practice, we found that only about half the teachers behaved as expected. For several of the teachers there were evidently other factors more potent than the IMS test scores in determining the pacing of the tests. For example, the interval between tests for the group rated "least capable" by the teachers was consistently greater than the spacing for the group rated "most capable." The teachers apparently paced their instruction

and provided remedial exercises more on the basis of *group membership* than on the basis of the pupils' scores on specific tests.

This finding seems to support the common contention that the traditional classroom organization into ostensibly homogeneous groupings can blind teachers to what might be more relevant information about specific pupil needs. It also tends to bear out Robert Rosenthal's contention that a teacher's expectancy (as reflected here by her placement of children into groups) may heavily influence her perception of the pupils' performance (Rosenthal & Jacobson, 1968). It seems very likely that the full benefits of an information system such as IMS can be realized only in a school that has the organizational flexibility and the depth of instructional resources to allow individuals to move at their own rates through the sequences of learning objectives.

A related finding of interest in the first year's operation of IMS was that the pupils of teachers who paced their groups according to IMS data showed higher gain scores than pupils of teachers who did not pace according to the IMS data.

A second form of teacher behavior we observed was the reassignment of pupils from one of the three groups to another group. We reasoned that teachers using the IMS performance data would take a child who was consistently surpassing the other children in a medium or slow group and reassign him to a faster group. We also anticipated that a child who consistently occupied the cellar position in a group would be moved to a slower group. This expectation was borne out by the findings. In the second year's operation, for example, there were 94 changes of group assignment, and 80 of the 94 were directly related to the children's performances as reported by IMS.

Finally, we kept records of the teachers' use of the remedial exercise materials. In about 70 to 80 percent of the cases, teachers gave the *group* remedial instruction prescribed by IMS. However, the teachers were much less consistent in administering the *individually* prescribed exercises, probably because they lacked time to devote to individual children.

In addition to recording the teachers' overt behavior in managing their instruction, we also tested their attitudes toward different aspects of IMS by means of questionnaires. In general, the teachers were highly favorable toward IMS and felt that the performance information provided by IMS helped them do a better

job of teaching. They especially liked the fact that remedial exercise materials were made available and that these materials were keyed to the specific learning objectives.

Of the various forms of data provided by IMS, the teachers regarded as most useful the regular progress reports that gave results on a single test. Furthermore, they found the group averages more useful than the individual reports. This probably reflects their feeling of inadequate time to do anything to remedy individual learning problems.

Teachers also liked the cumulative reports summarizing mean performance for each student on each learning objective. However, we found that this information was not used primarily for classroom management but for teacher-parent interviews. Teachers were delighted to find that they could very effectively "snow" a complaining parent by showing her a computer printout indicating that her child got, say, only 58 percent correct on phonic analysis skills. Needless to say, this was not the use we had intended for the data.

We found that the teachers' enthusiasm for IMS was directly proportional to the amount of work done for them by the computer, and inversely related to the amount of new work levied on them. Some teachers complained, for example, about the necessity of keeping manual records of remedial exercise materials they used. This complaint seems justified when one considers the busy schedule of a teacher, and it is probably unrealistic to expect the typical teacher to undertake any significant new duties in addition to her normal load. Any new teaching approach such as individualized instruction had better include built-in resources for doing the extra record keeping and retrieval. Alternatively, it had better free the teacher from some major existing chores such as administering and grading tests, correcting homework assignments, or presenting drill-and-practice work. Many of these chores lend themselves to technological solutions.

I would like to say a few words about the special workshops we conducted to train teachers in the use of IMS. We found that the second-year teachers learned the mechanics of using IMS quite well in just the two-day training session. We had little trouble in transferring to the new school, and we feel that any new group of teachers could be trained in an equal period of time. However, it is important to distinguish between the teach-

ers' learning the basic operations and their internalizing the new system so that its design goals are being fully realized. Although our teachers could go through all the motions in only a few days, it was months before they began to take any great advantage of the information the system provided, and one or two of them never did reach this stage.

The problem is that IMS subsumes an underlying framework, or philosophy, that is strange to some teachers and perhaps even aversive to a few. I refer to the built-in assumption that educational objectives can be defined in terms of observable student behaviors, and that teachers should hold themselves accountable for the students' mastery of those objectives. Faulty assimilation of these concepts can lead to such distortions as the teachers' use of computer printouts to "snow" parents. Another misuse we observed was that one teacher administered each test twice and reported only data from the second administration. According to the teacher, the first administration was a "warm-up," but it was evident that she was actually trying to avoid the embarrassment of having her students perform poorly.

Over a period of months, most of the teachers began to use IMS much more as it was designed to be used: for making classroom management decisions. This did not occur automatically, however, but required frequent interactions between teachers and SDC staff members. The inference to be drawn is that it is easy to be misled in the early stages of a really innovative project by superficial signs that the new system is being properly utilized, when, in fact, the teachers may be misusing it badly. Any new project that plans to make significant changes in the teachers' customary way of doing business should allow for an extended period of inservice training—well beyond the point where the teachers appear to be handling the day-to-day mechanical operations effectively. Otherwise the innovation may be prematurely abandoned before it has had a fair chance to prove its value.

REFERENCES

Rosenthal, R., & Jacobson, L. *Pygmalion in the classroom.* New York: Holt, Rinehart and Winston, 1968.