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ABSTRACT

A number of instructional variables and their relationship to educational goals is discussed. This relationship is not always readily apparent, particularly when complex learning and many educational goals are involved. Experimentation is often needed to determine the most efficient set of instructional variables to achieve the desired educational goals. An example of this experimental evaluation is reported in a study involving a teacher training course, where instructional variables were constructed not only to cover development, statistics, measurement, and classroom management, but also to influence the trainee's attitude toward himself, the students, and teaching. The course was divided into units, with grading based on units completed rather than percentage of materials learned within each unit. Thus emphasis was shifted from obtaining grades to mastering the material. Results of the evaluation showed that none of the instructional variables considered by itself was significantly related to the educational goal. (AG)

INSTRUCTIONAL VARIABLES RELATED TO EDUCATIONAL GOALS

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Instructional variables assume importance not in and of themselves but only as they relate to the educational goals that they serve. There are many ways in which teaching activities can be varied or manipulated and much effort has been devoted in recent times to increasing the number of available instructional options. In the quest for innovative and alternative approaches to instruction there has been a tendency to overemphasize methodology. The excitment of developing a new educational method makes easy the tacit assumption that here is the answer to all our educational ills. This overemphasis on methodology, regardless of the educational setting in which it is applied, inhibits awareness of the diversity of educational goals. The manipulation of instructional variables and the methodology employed takes on meaning only in relationship to the educational goals. How you do it is meaningless without consideration of what you want to do.

What are some of the instructional variables that can be manipulated in the educational process? It should be noted that

instructional variables are only part of the educational process, the other part being learner variables, which can also be manipulated. Learner variables are not the concern of the present paper, which is in no way intended to minimize their importance. The most obvious instructional variable is the teaching method. The options available in this area are quite varied, and include the traditional lecture method, demonstrations, discussion techniques, programmed instruction, team teaching, discovery methods, etc. Individual versus group instruction might also be subsumed under this variable or could be conceptualized as an independent variable on its own.

Another instructional variable is the frequency and duration of the exposure of the learner to the instructional method. Relatively little attention has been given to this variable, particularly in higher education. In a university we usually assume that any educational goal in any area of study can be met through the use of 50-minute exposures three times a week for 15 weeks. The constraints of the semester or quarter system and traditional scheduling have made manipulation of this variable difficult in the usual educational setting.

There are other instructional variables such as the extent of use of teaching aids, e.g., audio-visual equipment, and the amount of practice or practical applications on the part of the learner. Another instructional variable that at first glance may not appear to be an instructional variable is the

method of evaluation. Superficially, the evaluation may be seen only as a way of determining the extent to which the educational goal has been met and not as a part in the educational process. More careful consideration, however, reveals that the expectancies created in the learner by the method of evaluation are differentially related to learning. Therefore, evaluation can be considered as an instructional variable. A student preparing for an essay examination may proceed quite differently from a student preparing for a true-false examination.

Educational goals tend to be taken for granted. We want the student to learn, and, in the overemphasis on methodology, have frequently been somewhat less than specific in terms of what it is exactly that we want the student to learn. Our educational goal for the learner may simply be the acquisition of a skill, such as typing or shorthand. Our educational goal may be for the learner to commit to memory a certain body of knowledge, such as the Periodic Table. Or we may wish the learner to master a certain area of content, such as Shakespeare's plays. Another educational goal is the understanding of concepts, such as statistics. At other times our educational goals may be directed toward attitudinal learning, for example, parent-child relationships. As these examples suggest, educational goals may be quite varied and at times quite complex.

The specification of the educational goal is the first step in planning the educational program. Once the goal is

specified, then it is possible to manipulate and combine the instructional variables in such a way as to create the optimal condition for achieving the educational goal. In many instances, once the educational goal is specified, common sense is sufficient to tell us what instructional variables are of importance and how they should be manipulated. In learning a skill, for example, typing, instructional variables such as frequent exposure, practice, and teaching aids come into play, while others, such as discussion techniques, would be less relevant. If, however, our goal is to change teachers' attitudes toward children we may be far more concerned with instructional methods that provide the learner with opportunities for participation and involvement in the educational process, such as might be provided by discussion techniques.

The relationship between educational goals and instructional variables is not always so readily apparent as in these examples. This is particularly true when complex learning is involved and when there is a plurality of educational goals. When this is the case, experimentation is needed to determine the most efficient set of instructional variables to achieve the desired educational goal. Factorial designs are ideally suited for this kind of experimentation since it is frequently desirable to manipulate several variables simultaneously in order to determine the most desirable combination.

An example of this kind of experimental evaluation of instructional variables in relation to educational goals is the

research recently completed at the University of Texas at Austin involving the junior level course in educational psychology in the teacher training sequence.[1] Over a period of some three years a number of innovations were introduced into this course, titled the Psychological Foundations of Secondary Education. The educational goal that prompted these innovations concerned the impact of the course on the students in terms of awareness of self and others and commitment to and understanding of the teacher's role. It was the consensus of the instructional staff that the educational psychology course for teachers-in-training should do more than provide the traditional content.

A set of instructional materials was constructed[2] not only to cover development, statistics, measurement, classroom management, etc., but also to influence the student's attitude toward himself and toward children and toward teaching. Annother innovation was the division of the course into units, with grades based on units completed rather than percentage of materials learned within each unit. That is, mastery of each unit was a necessary condition for proceeding to the next unit. When all units were completed the student was given a B. If all units were not completed, a grade of incomplete was given. A student who had completed all units was given the option of completing a project to raise his grade to A. Thus, there way no way a student could receive a low grade or fail

the course. The purpose of this innovation was to focus the attention on learning as opposed to "grade getting."

Another innovation was the use of "proctoring." Students who had previously taken the course were assigned to proctor, or tutor, the students currently enrolled. The student would read the unit and then discuss it, either individually or in a small group, with his proctor before being evaluated to determine if he was ready to move ahead to the next unit.

Still another innovation was self-pacing, that is, the student moved through the units and proctoring sessions at his own pace, i.e., as rapidly or as slowly as he wished. The only constraint was that if he had not finished all of the units by the end of the semester he was given an incomplete instead of a grade.

The method of evaluation was also changed from the traditional test. After reading his unit and discussing the material with his proctor, the student took a "readiness test," that is, "ready to proceed" to the next unit. These tests were graded by the instructor, who did not assign a grade but marked them satisfactory or unsatisfactory. If satisfactory, the student moved on to the next unit. If unsatisfactory, he reviewed the material once more, discussed it again with his proctor, and took an alternate form of the same test. The purpose of this method of evaluation was to emphasize mastery of the material rather than obtaining a satisfactory grade.

In order to determine which of the variables or which combination of variables most affected the impact of the course on attitude toward self, others, and teaching, a 2x2x2 factorial replacement design was used. Of the five instructional variables described, the first two, materials designed for the course and the grading system used, were held constant for administrative reasons. The self-paced variable was replaced in the design with paced instruction, that is, there was a specific amount of time alloted to each unit and a deadline set for its completion. The proctor variable was replaced with pre-recorded tapes of a discussion of the material covered by the unit. These tapes were of the approximate length of the average proctoring session. Tests were replaced with "guided reactions." These "guided reactions" were structured exercises designed to give the student an opportunity to use the concepts he had been studying in the unit in a creative and meaningful fashion. These exercises were not graded; the instructor simply determined whether they were satisfactory or unsatisfactory. If satisfactory, the student moved ahead to the next unit. If unsatisfactory, the guided reaction was redone.

The study consisted of eight experimental sections of the course with approximately 30 students in each section, each with a different combination of the three instructional variables under consideration. There was no bias in the subject selection of students for the various sections since the

conditions for each section were not made known until after registration was completed.

The educational goal was measured in terms of scores on an inventory constructed to assess the extent to which students perceived the course as having had personal and professional impact. Personal impact included such considerations as increased awareness of self and sensitivity to the needs and feelings of other people. Professional impact involved the effects of the course on strength of commitment to and interest in teaching, as well as the extent to which the course stimulated serious thought about teaching.

The analysis of variance showed no significant main effect, that is, none of the three variables considered by itself was significantly related to the educational goal. Neither was the three-way interaction anong the variables significant. There was one significant two-way interaction, that between the proctor/non-proctor variable and the method of evaluation. The table of means showed that the sections receiving proctoring and using the guided reactions for evaluation showed the greatest impact. Nearly as great was the impact on the group listening to tapes and taking tests. The groups receiving proctoring and tests, which was the way the course was actually designed prior to the study, showed the least amount of impact in the direction of the educational goal.

Since there was very little difference between the conditions of proctoring combined with guided reactions and tapes with tests, the decision as to which set of instructional variables to use could be made on a basis other than attaining the educational goals. Although tapes were easier to handle administratively than proctors, it was felt that the value the proctors themselves received from this experience outweighed the administrative ease of using tapes. Therefore, the course is currently using proctors and guided reactions.

Since the pacing of the course was in no way related to the educational goal, this decision could also be made on another basis. Self-pacing caused tremendous administrative difficulties since students tended to procrastinate, causing an extremely heavy workload on proctors and instructors toward the end of the semester. Also, significantly more students in self-paced sections received incompletes than those in the paced sections, which also created serious administrative problems. Therefore, the course is currently being conducted in a paced manner.

The use of the factorial design permitted us to conduct the course using the instructional variables of proctoring, guided reactions, and pacing with some assurance of maximizing the student's chance of achieving the desired educational goal.

FOOTNOTES

[1]This research was carried out by Susan J. McFarland as part of the requirement for her doctoral degree. The actual research was more extensive than is reported here.

[2]Hereford, C.F., Natalicio, L., and Martin, R., The Teacher as a Person, Kendall-Hunt, Dubuque, Iowa, 1969.

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