Supplementing Traditional Instruction with Objectives-based Instructional Development

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Abstract. A teacher guide incorporating objectives, learner practice, and assessment was developed for use with an existing instructional booklet on electricity. Eight classes of fourth graders were randomly assigned by class to one of two conditions: the booklet taught by teachers using their own teaching styles or using the objectives-based guide. Mean pretest scores of the two groups were comparable. Posttest means were 15.28 (76 percent) for objectives-based subjects and 10.29 (51 percent) for those under the more traditional instruction, $t(126) = 8.11$, $p < .0001$. The objectives-based program took longer to complete but yielded a faster learning rate and more favorable student attitudes.

Introduction.

Most instructional development models and several models of teaching stress an objectives-instruction-assessment approach in which the latter two components are closely tied to the objectives (e.g., Gagne & Briggs, 1979; Popham, 1973; Sullivan & Higgins, 1983). Yet, well-designed instructional programs using this approach are not common in the schools. Textbooks rarely incorporate tightly integrated objectives, instruction, and assessment. Nor do school curriculum guides. Teacher-directed instruction based on the textbook and the teacher's own teaching style remains the dominant form of classroom instruction.

Factors limiting use of the objectives-based approach are not hard to identify. Many educators reject it out of hand. They oppose the notion of instructional objectives and of objective, as contrasted with subjective, assessment of students. Among textbook publishers and authors, the tradition is to produce works that are packed with information but lack carefully thought-out objectives and assessment. Further, development of effective objectives-based instruction requires hard work and specialized knowledge and skills that many educational professionals do not yet possess.

Still another limiting factor may be the scarcity of research evidence that objectives-based instruction really makes a difference. Evaluation in systematic instructional development focuses mainly on field testing a program during its development. Investigations of the effects of a program using an objectives-instruction-assessment approach with those of a non-objectives-based program that covers identical learning content are rare. Instruction over precisely the same content seldom exists in both forms.

The present study was a comparative evaluation of the effects of traditional and objectives-based instruction. The learning content, which was identical for both groups, was contained in a 24-page commercially developed instructional booklet on electricity. Under traditional instruction, teachers received a booklet for each student and taught its content according to their individual styles without further guidance. Under objectives-based procedures, teachers were given the student booklets as well as a teacher guide developed to enable them to teach the learning content of the booklets using an integrated objectives-instruction assessment approach.

Student learning was assessed with a 20-item pretest and separate 20-item posttest keyed to the instructional objectives derived from the booklet. Data were also collected on student and teacher attitudes and on instructionnal time.

Method

Subjects

Eight fourth-grade classes, four from each of two schools in separate school districts in the Phoenix, Arizona, metropolitan area participated in the study. One school is located in a low socioeconomic area; the other in a lower-middle area. Two classes within each school were randomly assigned to each treatment, to control for possible school effects.

A total of 128 students who were present for the entire instructional period, including the pretest and posttest, constituted the final sample. Students absent for one or more days continued in the instructional program but were not included in the data analyses.

Materials

The instructional material for the classes receiving traditional instruction was a 24-page colorfully illustrated, professionally printed, 8 1/2" × 11" booklet entitled *Faster than an eyeblink: How electricity gets to you* (Anders and Lindstrom, 1982). The *Eyeblink* booklet was written for a large electric utility company in the Midwest. In 1984 it was being used by more than 30,000 fourth graders in the utility's service area.

No teacher guide was prepared for *Eyeblink* at the time it was written, nor were instructional objectives written for it. However, the booklet is organized into four major topics (What Is Electricity?; How Do We Get Electricity?; How Does The Electricity Get to My House?; Electric Safety) with straightforward textual instruction covering each topic. The booklet also includes a vocabulary list and three pages of experiments, activities, and written exercises related to its textual content.

Four readability levels, each computed using a different readability formula, are reported in *Eyeblink*. They range from 3.0 to 4.0.

The materials for the objectives-based classes consisted of the *Eyeblink* booklet and a teacher guide written in 1984 to accompany *Eyeblink* and to provide an objectives-instruction-assessment approach for teaching it. The utility company sponsored the development of the guide in response to requests from teachers using the booklet. Four instructional objectives were inferred from *Eyeblink* as the basis for the objectives-based approach, one for each of its four major topics. Each objective encompassed the majority of the text and learning content for its section.

Five printed exercises providing student practice on the four objectives, one for each of the first three objectives and two for the more complex final objective that requires application of rules to new situations, were developed and incorporated into the teacher guide. A 20-item pretest, containing five items assessing performance on each of the four objectives, and a parallel 20-item posttest were also developed and included in the guide. Only a single copy each of the tests and exercises is in the guide, but the teacher can reproduce them for students. For purposes of this study, each teacher was supplied with enough copies for his/her class.

The teacher guide also includes a lesson sequence that organizes the instruction into the pretest, five lessons (one per exercise), and the posttest. This section contains teacher-directed oral practice and feedback to supplement the written exercises and an answer key to provide feedback for each exercise.

In summary, the teacher guide used by the teachers of objectives-based classes contained the information, directions, and materials for an objectives-instruction-assessment system for use with the *Eyeblink* booklet. The booklet was the core instructional content for both groups, but only the teachers of the objectives-based group received the teacher guide.

Procedures

Preliminary orientation meetings were held by the experimenters with the teachers from both groups at their respective schools to introduce them to the procedures and materials for the study.

Teachers in the traditional instruction group were given copies of the *Eyeblink* booklet, pretest, and posttest for all of their students. They were oriented to the booklet and were instructed to teach its content according to their own judgments and individual teaching styles. They also were asked to administer the pretest and posttest at the appropriate times.

Teachers in the objectives-based group were given copies of the *Eyeblink* booklet, pretest and posttest, and the five practice exercises from the teacher guide for all of their students, as well as a copy of the teacher guide. They were oriented to the booklet and guide, and were instructed to follow the teaching procedures and sequence described in the guide.

Teachers from both groups were asked to complete the unit within two weeks. All teachers were given copies of the student and teacher attitude surveys to administer upon completion of the unit. Teachers were also asked to keep a simple log on which they recorded the time and content covered for each session.

All instruction was carried out by the classroom teachers under their normal teaching schedules. The fourth-grade science curriculum in both districts includes the study of electricity, and the unit was taught as a part of regular science instruction.

Data Sources

Student learning under the two conditions was assessed with the unit pretest and posttest. Each test consists of 20 items: five items covering each of the four objectives derived from the four major topics in the *Eyeblink* booklet. The pretest and posttest are parallel forms that are identical in number and type of items, but the individual items themselves are different across the two tests. Both tests were administered by the classroom teachers as a part of the unit.

Student attitudes were assessed with a seven-item questionnaire with three response choices. The classroom teachers administered the questionnaires at the end of the unit. Teacher attitudes were assessed with a nine-item questionnaire containing five response choices.

Data related to time on program and progress through it were obtained from a brief daily log provided by the experimenters and completed by each teacher. Individual experimenters also observed selected lessons in each classroom during the study.

All tests and questionnaires were scored by the experimenters.

Design and Data Analyses

The evaluation design was a Pretest-Posttest-Control Group Design (Campbell & Stanley, 1966). According to Fitzgibbon & Morris (1978), this is a strong evaluation design that permits a powerful test to be made between alternative programs.

The data on student learning were analyzed by means of a two-tailed *t*-test of the means of independent samples. Student attitude data were analyzed by a chi-square test of the difference in response choices between groups on each attitude item.

Table 1

Means and Percentage Values on Pretest and Posttest

Instruction	*N*	Pretest	Posttest	Pre-to-Post Gain
Traditional	61	6.23 31%	10.29 51%	4.06
Objectives-based	67	6.58 33%	15.28 76%	8.70

Results

Student Learning

The means and percentage scores on the 20-item pretest and posttest are shown in Table 1 for both groups.

It can be seen that the traditional instruction group averaged 6.23 and the

objectives-based group 6.58 on the pretest, a difference between groups of only .35 of an item. Mean posttest scores were 10.29 (51 percent) for the traditional group and 15.28 (76 percent) for objectives-based subjects, a between-group difference of 4.99 items. Mean scores improved 4.06 items from pretest to posttest for traditional instruction and 8.70 items for objectives-based instruction.

The *t*-test of the difference between means on the posttest revealed a highly significant difference favoring objectives-based instruction, $t(126)=8.11$, $p<.0001$. The *t*-value of .91 for the difference between pretest means was not statistically significant.

Student Attitudes

Student attitudes and judgments about the unit, as reported on the seven-item questionnaire, were generally favorable. Seventy-nine percent of the objectives-based subjects and 72 percent of the traditional subjects reported that they learned a lot, and 63 percent of objectives-based and 49 percent of traditional subjects responded that they liked the unit a lot.

Attitudes of objectives-based students were more favorable than those of traditional subjects on six of the seven items, but the chi-square analyses yielded a statistically significant difference on only one of the items: "How much did you share the activities with your family or friends?" Non-significant differences favored the objectives-based approach on test difficulty, liking for the unit, amount learned, helpfulness of the exercises, and amount students thought they would remember. The non-significant difference on ease of reading favored the traditional approach.

Teacher Attitudes

The ratings of the teachers on the nine-item teacher questionnaire were favorable and were similar across the two groups. On a five-point scale with one representing "agree strongly" with positive statements and five representing "disagree strongly", the overall mean ratings were 1.63 for objectives-based teachers and 1.80 for those using traditional instruction. All teachers in the objectives-based classes either agreed strongly or agreed with all nine positive statements about the unit. All teachers in the traditional classes, as well as in the objectives-based ones, agreed strongly or agreed that the skills taught were important, the unit was effective, the students liked it, and they (the teachers) would use it as a regular part of their curriculum.

Time in Program

The objectives-based groups spent considerably more time on the unit than those under traditional instruction. Mean times computed from the individual lesson times reported by teachers on their daily logs were 232 minutes (3 hours 52 minutes) for objectives-based classes and 157 (2 hours 37 minutes) for traditional instruction classes.

Analysis of gain scores per unit of time reveals a faster learning rate for the objectives-based group than for traditional subjects. The 8.70 item gain from pretest to posttest for objectives-based students represents an improvement of one correct answer every 27 minutes for their 232 minutes of time. This contrasts with one additional correct response every 39 minutes for the traditional group's gain score of 4.06 in 157 minutes.

Discussion

The overall evidence from the study favors the objectives-instruction-assessment approach incorporated through development of the objectives-based teacher guide over traditional teacher-directed instruction relying on the *Eyeblink* booklet and individual teaching styles. Not only did students learn more under objectives-based instruction, their overall attitudes and judgments were also more positive about the unit.

Despite their greater time on the unit, the learning-rate data also favored the objectives-based subjects. Their faster learning rate is particularly impressive because the more typical finding is a slower rate for groups spending considerably longer on a learning task. With extended time it is not uncommon to encounter a ceiling effect or simply to experience diminishing returns on more difficult learning content and test items.

The most feasible explanation for the better performance of the students who received the objectives-based instruction is their greater amount of practice and associated feedback on the learning task. The daily logs and classroom observations revealed that objectives-based teachers did in fact consistently follow the lesson sequence as described in the guide. This sequence provided specified oral practice and feedback led by the teacher, plus written practice and feedback in the form of the prepared learning exercises.

Under traditional instruction the typical pattern was for classes to read and discuss the booklet with no strong focus or structure to the discussion or to learning activities introduced by the teachers. Consequently, while both groups read the same basic learning content, those under traditional instruction spent a much lower amount and proportion of time receiving direct practice and feedback over this content. Reading and discussing textual information, with little related practice, simply are not enough to produce mastery of most learning content.

A potential problem in basing instruction and assessment on a set of instructional objectives relates to possible differential learning of the other content of the unit or program. That is, an objectives-based approach may result in a heavier focus and better learning related to the content subsumed under the objectives, whereas non-objectives-based instruction may yield greater learning of the other, more incidental, content of the unit. This study did not investigate that issue directly by identifying and assessing performance on non-objectives-related content from the booklet and classroom activities. However, it appeared unlikely from careful examination of the *Eyeblink* booklet that differential incidental learning favoring the traditional group would have occurred. The content of the booklet is centered heavily on its four major topics, and the instructional objectives are quite comprehensive in subsuming this content.

Teachers had positive attitudes toward both forms of the program. They rated traditional instruction favorably even though it resulted in low posttest scores. Further, their responses reflected none of the negative attitudes that teachers sometimes express toward instructional objectives. On the contrary, all four teachers using the objectives-based approach responded positively to all nine items about the unit, and their overall ratings were slightly more favorable than those of teachers using traditional instruction.

Student attitudes were also positive toward both approaches but more favorable toward the objectives-based one. Support for objectives-based instruction was reflected in the statistically significant finding that students shared the activities more with their family or friends and in non-significant differences

favoring this approach on five of the other six items.

The study suggests at least two avenues of further research. One would involve assessment of both objectives-based and non-objectives-based instruction to determine whether incidental learning may be greater under the latter approach. A second would include a detailed, minute-to-minute observation and recording of activities under the two methods in an attempt to isolate the factors most responsible for improved student learning. Research along these lines should provide greater insight into the overall effects of objectives-based and traditional instruction and the reasons for these effects.

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