Long-Term Instructional Development: A 20-year ID and Implementation Project

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This article describes the development and implementation in the schools over a 20-year period of the Energy Source Program, a comprehensive K–12 energy education curriculum. The program was developed beginning in 1980 using state-of-the-art development procedures for that time and has been used to date by more than 12 million American students to learn about energy and energy issues. End-of-unit posttest scores for the elementary and high school units averaged above 80% for their field tests. Data obtained from a large sample during the first three years of installation of the program in the schools indicated that posttest scores remained at a level during installation similar to that during the field-test phase. A study conducted in the early 1990s by an independent research organization to assess the program's long-term effects revealed that grade 6 students who had used one or more units from the program had significantly greater energy knowledge and better energy conservation habits than students who had not used any units. A set of 10 guidelines are offered for long-term instructional development and implementation projects.

☐ The literature on instructional development (ID) typically deals with relatively short-term processes. Most ID models describe procedures for use until a program is field tested and revised or until it is implemented. Case-study reports of ID projects also normally describe the projects only through the field-test and revision stages or the initial implementation phase. Thus, the ID field contains little professional literature about programs developed using well-accepted ID procedures and used over an extended time period.

The purpose of this article is to describe a development-and-implementation project now in its 20th year and to delineate a set of guidelines for long-term ID derived from the project. The project involved development of a K–12 energy education curriculum, called the Energy Source Program, and implementation of the program on a nationwide basis. The authors, operating under the company name Educational Development Specialists (EDS), were the developers of the program and have worked collaboratively on its implementation throughout its 20-year history.

Development of the Energy Source Program began in 1980. The program was developed using systematic ID procedures (Dick and Carey, 1978; Sullivan, 1971) that were state-of-the art during its development period and are similar to the procedures in many ID models today. These procedures included formulation of the program (also known as analysis), design, development, field testing, revision, and implementation.

The seven original instructional units in the Energy Source Program were released for use in

the schools from 1982 through 1984 after a multiyear development period and field testing in more than 100 classrooms in six states located in different regions of the country. Since their release, more than 12 million American students have used the Energy Source Program to learn about energy, energy conservation, and energy and the environment.

BACKGROUND

Americans faced serious oil crises twice in the 1970s because of actions taken by oil-exporting countries in the Middle East. Oil and gasoline prices skyrocketed as a result. The cost of a barrel of unrefined imported oil jumped from $3 a barrel to $30 a barrel during the decade. Cars waited in lines that sometimes reached a block long to buy gasoline at gas stations during the oil shortages. By the end of the decade, their owners paid nearly $18 for a 15-gallon tankful of gas that had cost them only $5.40 in 1972 (*Monthly Energy Review*, 1983).

As energy took on greater economic and political importance in the United States, the need for better energy education in our schools became apparent. A nationwide survey conducted for the National Assessment of Educational Progress (*Energy: Knowledge and Attitudes*, 1978) revealed that American students were very poorly informed about energy. More than 90% of the high school and college students participating in the survey reported that they wanted more information about energy and believed that energy should be a part of every school's curriculum.

It was in this context of oil shortages, high energy prices, and a school population that was poorly educated about energy that the authors of the present article submitted a proposal to a small group of energy companies in late 1979 to develop a comprehensive nationwide K–12 energy education curriculum. The proposal was funded by these companies, providing the financial means to begin development of the Energy Source Program early in 1980. Several other energy companies subsequently joined the founding sponsors as contributors to the development of the program.

PROGRAM DESIGN

The Energy Source Program was designed as a comprehensive energy education curriculum for kindergarten through high school. Seven instructional units comprised the original program, with four spanning kindergarten through grade 6, two at the junior high school level, and one for high school. An eighth unit, for use at the grade 5 level, was added in 1993 to provide additional concentrated instruction on energy conservation and the environment. Each unit takes approximately 10 class periods to complete, but may be extended through numerous optional enrichment activities.

The program was designed to promote student attainment of an overall set of goals and a set of instructional objectives for each unit. The goals relate to development of long-term values that call for learners to believe that energy is important in our society, to conserve energy, to stay informed about it, and to take an active interest in energy issues. At the elementary school level, the instructional objectives deal with such topics as energy safety, where and how we get our energy, present and future energy sources and the trade-offs among them, energy conservation, and energy and the environment. Objectives at the high school level deal with changing patterns of U.S. energy use, economic and political influences on our energy supplies and demand, the need for energy conservation and protection of the environment, and major energy issues in our country.

The Energy Source units typically have a total of four or five instructional objectives per unit. Figure 1 shows one objective for each of four units in the program, accompanied by a test item or item description for the objective. It can be seen from the figure that these example objectives and test items cover a variety of types of learning. These include factual learning, concept learning, decision-making, problem solving, and behavior change. The types of learning vary within each unit in the program as well as across units. The objectives for grades 1–2 and 5–6 are stated in a more technically correct form in Figure 1 than in the unit teacher guides in order to communicate the objectives more clearly here with instructional developers and technologists than with classroom teachers.

Figure 1 ☐ Instructional Objective and Sample Item by Unit.

The grade level and unit name, one objective per unit, and a sample test item or item description for the objective are shown below for four Energy Source units. Answer keys in the teacher guide include scoring guidelines for multiple-point items such as those shown for grades 3–4 and for high school.

Grades 1–2. Unit name: *Brightland*

Objective: Given the name of an energy source and illustrations of supply routes for three sources, students will identify the supply route for the named source.

Sample item: Mark the box under the picture that shows how natural gas gets to us.

a. Illustration showing the supply route for heating oil.	b. Illustration showing the supply route for gasoline.	c. Illustration showing the supply route for natural gas.

Grades 3–4. Unit name: *Fossil Fuel Junction*

Objective: Each student will list three energy conservation practices s/he will try to use everyday and will keep a one-week record showing their daily use.

Sample item: The teacher has all students write their individual choices of three conservation practices that they will try hard to use. Each student keeps a record for a week showing his/her daily use (or non-use) of each practice. A suggested format is provided.

Grades 5–6. Unit name: *Power Switch*

Objective: Given a brief scenario involving the use of energy, students will identify the era in which the scenario most likely would have happened.

Sample item: Read each event below. Circle the letter beside the answer that shows when it most likely would have happened.

Richard and his father rode their horses to the store. There they met Mr. Lopez, who proudly showed them his new automobile. It was the first car Richard and his father had seen.

a. Before 1885	b. Between 1885 and 1950	c. After 1950

Author note: The dates correspond to the three energy eras in U.S. history in which wood (before 1885), coal (1885 to 1950), and oil (after 1950) were our most-used energy sources.

High School. Unit name: *Energy Choices and Challenges*

Objective: Each student will name two energy issues, state each issue as a question, state their personal position on the issue, and give one argument in favor of their position and one argument against it.

Item: Pick a major energy issue in the United States. Write in your answers to the items below.

a. Name the issue.

b. State it as a question.

c. Tell what you think should be done to address the issue.

d. Write an argument in favor of your answer to item c.

e. Write an argument against your answer to item c.

Now pick a second energy issue. Write in your answers to items a, b, c, d and e for this issue.

Author note: The energy issues that students study include energy for the needy, drilling for offshore oil, acid rain, radioactive waste disposal, and legislating mandatory energy conservation.

Several design characteristics were intentionally incorporated into the program. All units employ an objectives-instruction-assessment approach. Practice on each objective is included in the student booklet and is supplemented by activities directed by the teacher. Each unit is designed so that the teacher can present it effectively using only the teacher guide and other program materials, with no additional study or outside preparation.

PROGRAM COMPONENTS

Each of the eight units in the Energy Source Program consists of a set of colorful instructional materials for use by the students and teacher. Included in each unit are:

- One or more video programs, approximately 10–15 min long, to introduce the content and stimulate student interest. The one exception is the kindergarten unit in which Offalot, a furry animal puppet who turns energy users (appliances, lights, water faucets, etc.) off a lot to conserve energy, is used by the teacher to present much of the information and practice.
- An illustrated, colorful student booklet for each student, containing information and practice and ranging in length from 16 pages for kindergarten to 48 pages for high school.
- A home-activity booklet for use by parents with their child for each elementary-school unit.
- One or more 24 × 36-inch illustrated colored posters summarizing the content for each unit.
- A unit pretest and posttest for each level except kindergarten. The test items are organized by objective and the tests range in length from 12 items at grades 1–2 to 30 items at high school.
- A program record sheet on which the teacher records class pretest and posttest scores, student attitudes toward the unit, and the teacher's comments and suggestions for improvements. The teacher returns this sheet to the program sponsor and also uses it to reorder the program for the following year.
- A teacher guide that briefly describes the unit and gives lesson-by-lesson procedures for teaching it. The teacher guide also includes optional enrichment activities for each lesson, reduced reprints of key pages from the student booklet at their appropriate point of use in the unit, teacher background information on energy, and the script of the unit filmstrip.

Each unit was thoroughly reviewed, and revised by EDS on the basis of the reviews, at both the program design stage and the program development stage prior to field testing. The reviewers consisted of an Energy Source Board of Directors representing the major program financial sponsors and an advisory council organized by the board. The advisory council, which met twice annually for the three-year development period, consisted of representatives from industry, education, and public-interest groups. Organizations represented on the council included the American Federation of Teachers, American Wildlife Association, National Council for Social Studies, National Education Association, and National Science Teachers Association.

FIELD TESTING

Field tests of the elementary school and high school units were conducted as a part of their ID cycles in the early 1980s in six states: CA, CO, KY, PA, UT and WI. One hundred four teachers and more than 3,000 students participated in the field tests of the elementary and high school units. The number of participating classes and students far exceeded the number needed solely for the purpose of formative evaluation because an additional purpose of the field test was to increase sponsor involvement and identification with the program.

Teacher reports indicated that slightly more than half the classes were from middle-income areas, about a third from low and low-middle income, and the rest from high-income areas.

A local coordinator at each field-test site coordinated the field testing using standard procedures prepared by the program developers and distributed to all coordinators. The coordinators

included industry employees, a university professor, and school district administrative personnel. Each coordinator contacted the schools and arranged the tryout in the local area according to the national field test procedures. The regular classroom teachers delivered the instruction under normal classroom conditions and also administered and scored the pretest and posttest for each unit, except for the kindergarten level for which there was no formal assessment.

Field testing of the elementary and high school units involved only one cycle of tryouts for the elementary units but two cycles for the high school unit. The first field tests yielded mean posttest scores of 85–92% for the elementary school units, but a mean of only 62% for the high school unit. Consequently, several revisions were made in the high school unit, primarily to incorporate more written and oral practice on the instructional objectives, and a second field test of this unit only was conducted. The second field test of the high school unit resulted in a mean score of 82%. The mean pretest and posttest scores across all units for the field test, using the data from the second field test of the high school unit, were 52% and 86% respectively. The field test teachers also made many suggestions for improvements that were incorporated into the units.

Student and teacher attitudes from the field test were assessed with brief attitude questionnaires administered by the teacher at the end of the unit. Attitudes were consistently positive. More than 90% of the elementary pupils indicated that they liked their unit, that they learned many important things about energy, and that they would try to do more to save energy. More than 95% of the field test teachers reported that their students reacted positively to the program, that they were satisfied with student learning, that the energy content was objective and unbiased, and that they would like to teach the unit again.

A more detailed description of the field test is contained in an earlier article describing the initial development and field testing of the Energy Source Program (Sullivan, 1984).

PROGRAM IMPLEMENTATION

Most ID models include an implementation phase or at least a phase that calls for release of a program for general use after the field testing and revision of the program. The implementation phase often receives relatively little attention in many of these models because, not surprisingly, the primary concern of instructional developers is ID, not implementation. Often, a program developer's work is considered complete when the program is delivered to the client or sponsoring agency, and implementation of the program is the client's responsibility. However, even though much of the prior training and experience of the Energy Source Program developers was in ID, we also participated very actively in the implementation of the program.

For the Energy Source project, both the program developers and its corporate sponsors had important reasons to focus on implementation as well as on development. In our proposal to the corporate sponsors, we (the program developers) requested distribution rights for the program at a negotiated profit level for 10 years after its development. The development sponsors agreed to this request, thus providing us with an incentive to work with them to implement the program widely. EDS's rights to distribute the program were subsequently extended and remain in effect at this time. The companies that sponsored development of the program invested approximately $1 million in its development (this included development and graphics costs, as well as expenses for travel, board meetings, etc.), so they also had a strong interest in its successful implementation.

Long-term implementation of the Energy Source Program involved four major tasks: (a) fund raising, (b) program installation, (c) monitoring learner performance, and (d) keeping the program current. Other long-term implementation efforts are likely to be similar to the present one in the sense that they would also be concerned with most or all of these areas. Each of the four tasks for the Energy Source project are described below.

Fund Raising

To raise funds for installation of the program, representatives of the major development sponsors organized the Energy Source Education Council, a national nonprofit group whose mission was to educate American youth about energy. The Council's administrative structure consisted of the Executive Advisory Board and the Energy Source Board of Directors. The Executive Advisory Board was composed primarily of the chief executive officers or chief operating officers of several large energy companies (of which Atlantic Richfield Company, Westinghouse Electric Corporation, and San Diego Gas & Electric Co. were the original sponsors), top-level officials from several national public-interest and governmental groups (General Federation of Women's Clubs, National PTA, National Urban League, U.S. Department of Energy, U.S. Chamber of Commerce), three large-city school superintendents (from Houston, Pittsburgh, and Los Angeles). The Energy Source Board of Directors was composed mainly of managers from the education or consumer affairs divisions of the sponsor companies. The Council publicized the Energy Source Program to executives and education directors in energy-related companies and encouraged those companies to purchase the program for installation in the schools in their corporate areas.

Raising funds for installation of a program is important to program developers when they receive a percentage of sales of the program, of course. EDS worked closely with the Council in fund-raising and installation efforts. When development of the program was completed, EDS was designated as the Program Distribution Office. EDS staff carried out the majority of the work required on a day-to-day basis for fund-raising and installation of the program, including regular communication with existing and potential clients, production and inventory management, program sales, and distribution of the program to the schools.

The Council and EDS employed a variety of strategies to publicize and market the program to companies and other organizations that purchased the program or were potential purchasers. These included:

- Direct mailings of brochures and other information about the program, followed by phone calls, to each organization.
- Semi-annual publication and distribution of an Energy Source newsletter.
- Regular phone calls to participating organizations regarding implementation, sales, and program needs.
- Publication and distribution of an annual report describing accomplishments during the year.
- A one-day meeting of program purchasers held in conjunction with the annual national conference of gas and electric utility educators.
- An EDS-hosted dinner at the annual national utility educators conference.

Activities such as these not only helped to promote the program, but also contributed to a perception of broader ownership of it and to friendship and camaraderie among members of the Council, EDS, and the program purchasers.

The Council raised more than $1 million for installation of the Energy Source Program in the schools in 1984, the first year in which all units in the K–12 program were available for use. This money came primarily from more than 75 energy-related companies and foundations that contributed from $1,000 to $150,000 each. Sales of the program continued to top $1 million annually until 1994, peaking at $1.5 million in 1992. The cost of the program averaged approximately $1.00 per pupil over this period. Rising material costs over the period were offset by the fact that teachers who reused the program from year to year could order resupply kits of the expendable materials at a much lower cost than the complete program.

Program Installation

Companies that purchased the program typically made it available to the schools in their geographic area and worked directly with the schools to distribute and install it. Company representatives often conducted orientation workshops to inform school personnel about the program and to motivate them to use it. The

workshop leaders normally were education staff members from the company, teachers hired as consultants to conduct the workshops, or company employees who volunteered to conduct the workshops on released time under the company's public service program.

EDS developed an implementation guide to assist company personnel in installing the Energy Source Program in the schools. The guide included a description of the program, procedures and materials for informing educators about it, a description of alternative methods for installing it in a school district, procedures and materials for an orientation workshop, a set of questions most commonly asked about the program and information for answering these questions, a description of how to distribute the program to schools, and procedures for collecting program record sheets and summarizing achievement and attitude data from them. The implementation materials also included a 10-min videotape about the program and its individual units.

Program sales dropped sharply during the middle and late 1990s because of external events beyond the control of the Council and EDS. The decline began with the corporate downsizing movement in the United States, which in many energy companies resulted in reduction or elimination of staff members in education departments. Shortly thereafter came the deregulation movement in the utility industry, which enabled utility companies to compete for sales in markets where sales rights previously had belonged to a single utility. This caused utility companies to focus on lowering costs in an effort to become the least-cost provider of energy to consumers in their potential market areas and led to further cuts in education personnel and educational programs.

The downsizing and deregulation movements had a dramatic effect on new sales and installation of Energy Source. Annual sales plunged to $300,000 for the year 1998 and dropped below $200,000 for 1999. Whether this downward spiral will continue until marketing and distribution of the program are no longer cost-feasible remains to be seen.

Learner Performance

EDS was able to obtain data on student performance well after the program was field tested and released for general use, an opportunity that often is not available to developers of instructional programs. These data were collected and summarized through the efforts of the designated Energy Source coordinator for one of the large program sponsors. For the first three years of implementation of the program (1983–1986), the coordinator, a former high school teacher, constructed detailed summaries by grade level of the test results and attitude data reported by the teachers in his service area on the program record sheet. He then made these summaries, which were based on 47,000–67,000 students per year, available to key individuals in his own company, members of the Energy Source Board of Directors, and EDS. These achievement data from the first three years of implementation of the program, accompanied by the field-test data from 1981–83, are shown in Table 1.

Table 1 ☐ Energy Source Program Field Test and Installation Achievement Data: Grades 1–12.

Years	*Phase*	*Approximate Sample Size*	*Pretest Mean*	*Posttest Mean*
1981–83	Field Test	3,010	52%	86%
1983–84	Implementation	50,000	54%	84%
1984–85	Implementation	47,000	53%	82%
1985–86	Implementation	67,000	49%	84%

Note: The field-test phase refers to tryouts of the units for formative-evaluation purposes under specified tryout-and-reporting conditions. The implementation phase refers to general use of the program after its field testing and publication.

Table 1 indicates that student achievement remained quite consistent from the field-test stage, during which a local contact person coordinated each tryout under conditions specified by the program developers, to the implementation phase, when the program was available for general use. There is no assurance, of course, of

the equivalence of these samples, nor were we concerned with equivalent samples in the implementation phase. Nevertheless, it can be seen from Table 1 that the posttest mean was 86% during the field-test stage and ranged from 82% to 84% with large student samples during the first three implementation years. Corresponding pretest scores were 52% for the field-test phase and ranged from 49% to 54% for the initial implementation years. The general stability of the scores from the field test to the less-controlled implementation phase was encouraging.

Table 1 reports data collected on end-of-unit posttests during annual use of the Energy Source Program in the schools. In addition to these data, the Energy Source Education Council commissioned a study by an independent research organization, Hanson Research Systems, to extend the evaluation of the Energy Source units by measuring their long-term effects. This study was conducted in 15 schools during the 1991–92 school year. It involved measurement of the knowledge about energy, attitudes toward it, and energy-conservation behaviors of 1,349 grade 6 students who, over the past seven years, had received instruction with zero to four Energy Source units (Hanson, 1993).

Hanson used a 119-item instrument, *The Energy Biographer*, which was administered to students by their classroom teachers in the 15 schools to collect data from 591 students who had not used any Energy Source units and 758 students who had used one to four units. He found a general pattern that the more Energy Source units students had used, the higher their scores. This pattern occurred consistently on the energy knowledge, energy attitudes, and energy conservation sections of the assessment instrument. Students who had participated in four Energy Source units had a mean score of 64% on the knowledge section of the instrument compared to a mean of 49% for those who had no Energy Source units. Students who received three or four units also had significantly higher scores than those who received no units on the following selected items: feel informed or very informed about energy (82% to 52%), spent much time in school studying energy conservation (71% to 43%), turn unused lights off in house (80% to 66%), take quick showers (45% to 32%), turn water off while brushing my teeth (80% to 69%), and interested in learning more about energy (80% to 65%). Thus, Hanson's data indicated that use of the Energy Source Program had long-term benefits that extended far beyond the period of its use in the classroom.

Keeping the Program Current

Keeping an instructional program up to date is a concern whenever the program is used over an extended period. The subject-matter content, the number of student activities, the graphics, and even the instructional philosophy are program elements that can become outdated in a matter of just a few years. To keep the Energy Source Program current during the time it has been used in the schools, we have used at least four different techniques, as described below.

Regular Revisions

Each year, many of the teachers who use the program return the program record sheet to EDS or to their program sponsor, who forwards the record sheet to EDS. The record sheet contains a space for teacher comments and suggestions for improvements in the program. EDS staff maintain a list for each unit of all teacher suggestions for improvement. Each of these suggestions, plus those provided by other persons (board members, sponsors, staff), are evaluated by our program staff prior to each reprinting of a unit. We incorporate the approved suggestions into each unit as revisions when it is reprinted.

Instructional Strategy Changes

Two major instructional strategy changes have been made in the program during the time it has been in the schools. The first occurred in the late 1980s when our staff observed that most high school teachers were not following the instructional procedures in their teacher guide. The high school procedures were similar to those in the elementary units and were intended to incorporate effective instructional practices into each lesson. Instead, most of the high school

teachers simply assigned the students to read the chapters in their student book, often as homework, and in some cases asked them to answer the questions at the end of each chapter. Thus, there was little student interaction or teacher-student interaction in most high school classes and, in many classes, relatively little student practice and discussion on the learning task.

Discussions with high school teachers and observations of their classroom use of the unit revealed that most of them ignored the detailed lesson-by-lesson instructional procedures, which included written and oral practice, class discussion, and optional enrichment activities, in favor of a "read-it-and-answer-the-questions" approach. Our instructional strategy change involved eliminating the detailed lesson-by-lesson procedures from the teacher guide and substituting a general set of procedures for use across all lessons. In the process, the teacher guide was shortened and simplified, the chapter review questions at the end of each chapter in the student book were organized into one section so that they could easily be reproduced at one time, and greater emphasis was placed on teacher-led discussion of these questions and the energy issues in the unit. Despite these changes, we found that high school teachers were still not as conscientious as elementary school teachers about using the activities and procedures in their teacher guide.

The second major instructional strategy change occurred in the late 1980s and early 1990s and involved incorporating many more student activities, especially "hands-on" activities, into the elementary and junior high school units. This change was made in response to a strong movement among teachers to include more hands-on activities in the curriculum. We increased the number of activities that were not primarily direct instruction (i.e., motivational introduction, information, practice, and review) from 10–12 mostly optional enrichment activities per two-week unit to 25–30 per unit. We also incorporated more of these activities into the core lessons rather than presenting them as optional activities. The hands-on-activities movement in education resulted in classroom instruction becoming more activities-driven and less objectives-driven. The movement caused us to revise the Energy Source units to include many more activities while still maintaining an objectives-based focus.

Content Updates

The development of a new unit on energy and the environment for grade 5 was the single largest content update in the program. A strong environmental movement in the 1980s resulted in a projection for the 1990s, not entirely correctly, by many sources in the news media as the "decade of the environment." The grade 5 environmental unit was developed in the early 1990s and released for use in the schools in 1993. Numerous content changes were also made in other units as a result of efforts in the United States to conserve energy and to develop alternative energy sources to the fossil fuels.

Computer Integration

In retrospect, it would have been more accurate to project the 1990s as the decade of the personal computer than as the decade of the environment. The growth of the use of personal computers in the schools led to the incorporation of a computer-based component into the grade 5 environmental unit in 1995. This component enabled each student in a class to enter the results of a home energy audit conducted by the student into a computer. The computer then printed out a Home Energy Report showing the most effective conservation measures that could be taken to save energy in the student's home. We also incorporated several classroom and home activities, based on the home audit and the computer-generated energy report, into the grade 5 program.

GUIDELINES FOR LONG-TERM INSTRUCTIONAL DEVELOPMENT PROJECTS

The Energy Source Project has provided the authors with an exceptional opportunity to develop and implement an instructional program over a long period of time. Unique features of the project in the ID field include the K–12

grade range, the industry-education partnership in development and implementation of the program, the 20-year duration of the project, and the large number of students who have used the program.

We have reflected in depth on our two decades of experience with the Energy Source Project in order to develop a set of guidelines for long-term development and implementation projects. These guidelines are similar to the "lessons learned" from developing instructional programs as described by Richey (1997) in her article on developmental research. Some of them are closely related to steps included in many ID models and were important enough in the Energy Source Project that we feel they deserve additional emphasis here. Others deal with factors that contribute to the long-term viability and financial support for an educational program. The 10 guidelines follow.

1. Choose a topic area that has long-term value to society.

In our opinion, several topic areas have long-term societal value and could be addressed in a comprehensive program for learners throughout a state or the entire country. One example includes education about the use of drugs, alcohol, and tobacco. Another relates to social and physical interaction between and among the sexes, associated health and medical issues, gender equity, and equality in the workplace. Environmental education is also a promising area because of the importance of the environment to our lifestyles and well-being. In the training field, instruction about a company's corporate history and culture and its expectations for employees' workplace performance and civic responsibilities has potential as a development project with long-term value.

2. Secure adequate development funding.

Adequate funding is necessary to pay the salaries of the development team and other costs during development of the program. Depending on the topic area, potential development sponsors for long-term ID projects would include health-insurance companies, pharmaceutical companies, corporate foundations, state and federal governmental agencies, environmental protection and control agencies, and large corporations.

Our start-up development funding for the Energy Source Program was $231,000 in 1980 dollars, which turned out to be insufficient. However, we were able to secure additional funding for research and development activities from some sponsor companies during the development period. Of greater importance was the fact that two program sponsors bore most of the substantial graphics costs by using their own corporate graphic artists and by employing freelance artists.

3. Base the program on specific instructional objectives.

This, of course, is a key principle of most ID models. We stress it here because of the importance both to instructional developers and their clients of a clear understanding of the intended knowledge, skills and behaviors that learners are to acquire from an instructional program. Specific instructional objectives communicate the expected outcomes of instruction clearly to instructional developers and to their clients or program sponsors. They provide focus to the developers in planning effective instruction and in developing assessment that has high validity for making instructional success explicit in the form of student achievement.

Certainly, incidental and "open-ended" learning may also occur during a unit of instruction. But these less intentional outcomes present problems that do not occur with prespecified instructional objectives. Incidental and open-ended learning are more difficult to detect and more likely to vary across learners because of less intentional emphasis on them. Therefore, they are more difficult to assess accurately and less likely to yield good learner performance levels. It is also much more difficult to justify financial sponsorship of an instructional program to clients on the basis of less intentional outcomes than on the basis of specific instructional objectives.

4. Work closely with your clients.

We are intentionally inserting this guideline among the ones that deal most directly with ID because working regularly with clients is such

an important part of the development and implementation process. We found that the "buy in" to the Energy Source Program from many of our clients began when they reviewed its proposed instructional objectives, and continued to grow as they reviewed and commented on the instruction for each unit. Many program sponsors and advisory council members provided information, references, or suggestions that were incorporated into the program and contributed to its quality. As this occurred, they developed a growing identification with the program and a sense of shared ownership of it.

The participation and good will of our clients had several positive effects. Several members of the board and advisory council volunteered to coordinate field tests of the units in their geographic regions. Subsequently, several members of the advisory council either made substantial annual purchases of the program from their department budgets for the schools in their regions or convinced their companies to make such purchases. Thus, the buy-in that came initially from client participation in development of the program carried over to contribute strongly to its field testing and implementation in the schools.

5. Focus on direct instruction.

The instructional focus of the program should be on direct instruction and practice on the desired learning outcomes for the program. Additional instruction and learning activities may be aimed at enabling learners to extend the knowledge and skills that they learn to related content and to generalize the knowledge and skills to a broader variety of situations. The direct instruction on the learning outcomes and their application may be delivered using either or both inductive and deductive learning strategies, of course.

In the past few decades, many school districts have emphasized covering a range of levels from the Bloom taxonomy (Bloom, Englehardt, Faust, Hill, & Krathwohl, 1956) during instruction on a body of subject-matter content. Today many educators also advocate an instructional approach that is designed to help each individual student construct personal meaning (Duffy & Cunningham, 1996; Jonassen, 1991). If not used very carefully, approaches such as these have the potential for diverting an instructional developer's or instructor's primary focus away from the desired learning outcomes and to the taxonomic levels or presumed learning strategies of each individual student. Our emphasis on direct instruction on the desired learning outcomes is simply a way of saying "Don't lose track of what's important to learn."

6. Make the program easy to use and the learning fun.

The program must be easy to use or teachers will not use it. All materials for required activities in the program should be included with it, and the materials for optional activities should either be included or easy to obtain. The scoring of unit and program tests should be straightforward and easy for the teacher, even if it requires simplifying the developer's preferred form of test items somewhat, both to increase the likelihood that teachers will score the tests and to increase reliability of scoring. Activities for learning more complex skills can still be included and emphasized in the instruction, practice, and informal assessment activities, even if these skills are too complex to assess reliably on unit posttests scored by the classroom teacher.

The program should also be educational and entertaining for the students. As noted above, the instruction should focus heavily on the instructional objectives and on other activities that enable students to extend and generalize their newly acquired knowledge and skills. The program should be fun in order to capture and maintain the students' motivation. The program theme, characters, graphics, and selected activities in a novel or game-like form are components that often can be designed to appeal to students.

7. Provide evidence of learner achievement.

Program developers and teachers want to know how well students learn from a program. Program sponsors also want this information, and students often like to demonstrate their own learning. A well-developed instructional program with a good objectives-based end-of-program assessment instrument should yield high achievement scores. The high achievement can

be rewarding to the students, teachers, program developers, and program sponsors. It can also be used as evidence of the program's success in marketing it to other potential sponsors and to the schools.

8. Field test the program thoroughly.

Field testing is a basic step in ID models. Yet only a small percentage of instructional programs used in the schools have been field tested with students prior to their publication. Thorough field testing of a program is important for determining how well students learn from the program, identifying revisions to make in it, and deciding whether to conduct further field testing following the revisions but prior to publication.

The Energy Source units were field tested with more than 100 classes, far more than would have been necessary for formative evaluation purposes only. More comprehensive field testing of this type is valuable not only for formative evaluation, but also for yielding a more reliable learner-achievement base and for public relations (the developer is able to involve more development sponsors in the field test) and prospective marketing purposes. The total cost of the field testing of the Energy Source units was approximately $125,000, about 1% of the program sales to date. The field tests enabled us to make numerous improvements in the programs prior to their release and, in the case of the high school program, to significantly improve student posttest achievement. Clearly, the comprehensive field testing of the units yielded information and improvements that were well worth the field-test costs relative to total development costs and program sales.

9. Develop and implement a marketing plan.

A marketing plan is an essential part of publicizing and selling a program. Involving the development sponsors in marketing the program will normally be beneficial, if not essential. Potential buyers are likely to see corporate sponsors and users of a program as being more credible sources of information about it than the program developers, whom they may perceive to be vendors with a vested interest.

Energy Source sales were made in the name of the Energy Source Education Council as a nonprofit agency. However, the sales transactions and most of the marketing were handled by the Program Distribution Office (EDS), which included the program development team acting on behalf of the Council. The development sponsors received a discount on purchases of the program, and the Council and program developers shared profits from program sales. The Council's portion of the profits was used to pay for additional marketing and for program updates and improvements.

Marketing plans and strategies may change often in a long-term project, so it is important to review them frequently and to update them as appropriate. Several procedures used on a regular basis to market the Energy Source Program are listed earlier in the Fund Raising section of this article.

10. Update the program regularly.

Regular updates are required to keep a program current when it is used over an extended time period. Comments and suggestions from program users are one good source for regular program revisions. Trends and major events in the content area of the program also require changes. (Examples of content-related events that required updates in the Energy Source units are the dramatic drop in the price of foreign oil from $36 a barrel in 1981 to $10 a barrel in 1986, the Chernobyl nuclear reactor explosion and fire, and the Exxon Valdez oil spill in Alaska.) Changes in instructional practices, such as computer integration in the schools and the movement to increase hands-on learner activities, are another source of program updates. These updates must be made in a timely manner to maintain a program's currency and credibility.

CONCLUSION

Our greatest satisfaction as developers of the Energy Source Program comes from the fact that we have been able to sustain the project over a 20-year period and to provide education about energy and energy conservation to more than 12 million students. We have spent a considerable part of our professional lives over the past two decades working together on the development

and implementation of the Energy Source Program. It has been a lot of work and a lot of fun.

We believe that the potential exists for several other long-term projects that have societal value and are appropriate for large student populations. We hope that our description of the Energy Source Project and our guidelines for long-term development will provide ideas that may encourage other instructional developers to seek and obtain long-term projects of their own.

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