Seels, B. & Glasgow, Z. (1998). *Making Instructional Design Decisions* (2nd ed.). Upper Saddle River, NJ: Prentice-Hall. (pp. 149-161)

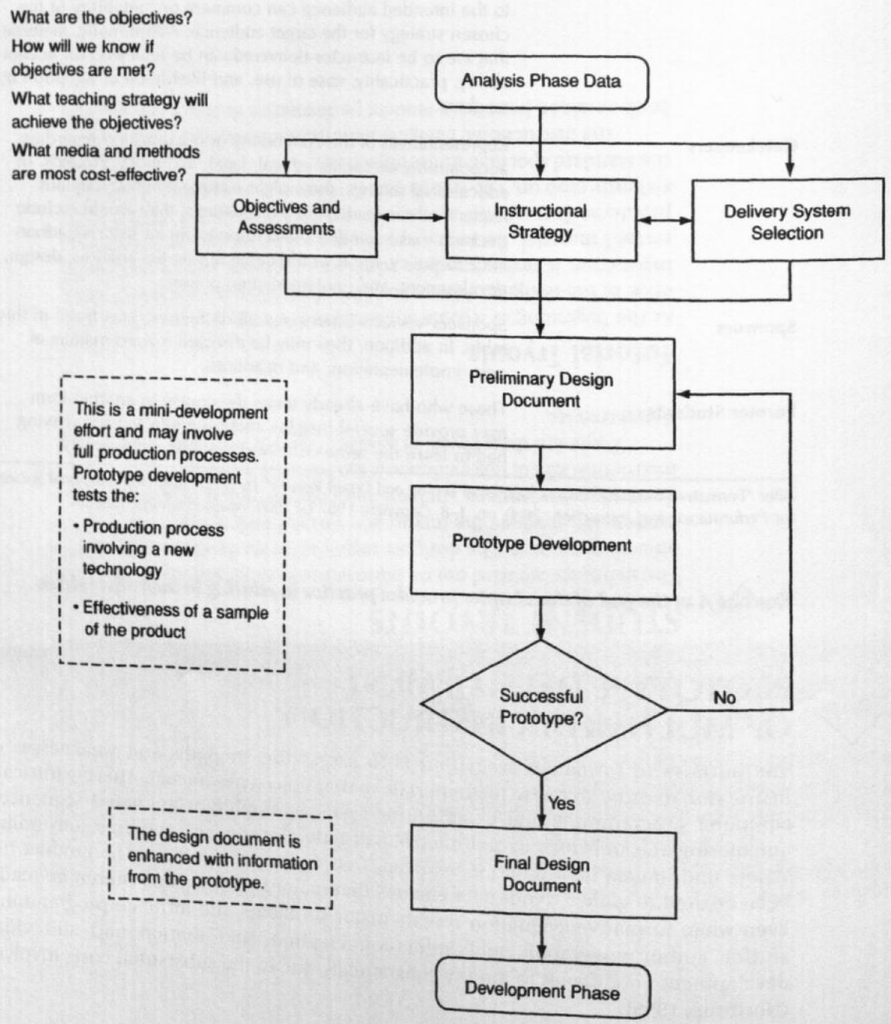
PROTOTYPE DEVELOPMENT OF MULTIMEDIA INSTRUCTION

The purpose of formative evaluation is to assess the strengths and weaknesses of instruction in order to revise the materials so that objectives are met. Altering intricate computer programming and/or authoring systems, graphic or animated sequences, and motion and still video in multimedia instruction is expensive and time consuming. Where multimedia instruction is involved, waiting until a version of the product has been created to gather tryout data ensures that major modifications cannot be made. Even when formative evaluation reveals major problems, the intricate programming and/or authoring, graphic and animation creation, and motion and still video development are difficult to modify substantially due to the substantial costs involved (Northrup, 1995).

To overcome the difficulties of making expensive post-production modifications, prototyping has emerged as a way to test design approaches and user interfaces before full scale production. Prototyping is defined by Tessmer (1993) as a hybrid of formative evaluation and design activities. As Figure 6.2 illustrates, prototype development takes place during the design phase of the ISD process. Flagg (1990) refers to prototyping during the late design phase as "pre-production formative evaluation."

When the design phase is completed, the decisions made at each step are documented in a design document. The final document reflects the lessons learned from the prototype. In the development phase the materials are authored, reviewed, produced, and validated. The physical features of the material are produced during this phase. The design document guides the production team to answer the driving question of the development phase: "How will the instruction look and sound?"

Figure 6.2 Design Phase with Prototype



Why Develop a Prototype?

There are two reasons for developing a prototype. First, the designer may have questions about the students' ability to learn from and use the new system. Secondly, when a new technology is involved there may be questions about the design team's experience with new ways of doing things. Prototype development allows the client to assess the cost effectiveness of the new system and allows the design team the opportunity to learn new skills in an environment where the consequences are less expensive.

Compatibility with Target Audience Entry Level. The intent of the prototype is to test approaches on the target audience. Northrup (1995) notes, "The prototype may emphasize the general flow, screen design, button placement, use of a metaphor, color, font, learner control, general interactivity, user interface, and how multiple media, including text, graphics, animation, audio, and/or video impact" (p. 28). A full blown production effort is not necessary in order to evaluate an approach. The prototype may incorporate storyboards, paper and pencil mockups, rough videos, etc. Detailed content is not needed. Northrup recommends that the prototype contain only enough descriptive information for a design team member to work one-on-one with a student to test the general approach while interacting with the prototype.

Choices of media and interactive strategies should be tested with the target audience, rather than relying on the professional experience and personal preferences of the production staff. Prototyping to answer design questions is sometimes called "rapid prototyping," because it allows quick construction of an approach in order to evaluate its effectiveness before full scale development. Flagg (1990) identifies a number of questions about user friendliness in an interactive learning environment that can be evaluated by a rapid prototype. The criteria are defined in Table 6. 2.

Cost Effectiveness. A second reason for developing a prototype is to evaluate the cost effectiveness of the approach. Development costs, budgets, and development time are among the factors considered in media selection. If the technology to be used is untried and untested in the setting where it is to be used, or if there are concerns about its cost effectiveness, a prototype may be developed.

Prototyping is a mini-development effort for a sample of the larger program. The propose of the cost-effective analysis is to replicate the production process on a small scale. Prototype development provides the project team a chance to debug the production

Table 6.2 Criteria to Evaluate User Friendliness of Interactive Strategies

Accessibility	Was the information easily accessible? Did users understand what to do next or how to proceed through a decision-making process?
Responsiveness	Was the program responsive to the users' wishes? Did users receive timely feedback appropriate to their needs? Did users find all the tools that they wanted?
Flexibility	Could users change the parameters in the program to suit their own needs? Could users go back and change their responses after an initial decision? Could users go back and review previous content?
Memory	Could users retrieve and examine their past decisions and performance to the extent desired? Are hard copy printouts from selected portions available for later study?

Adapted from *Formative Evaluation for Educational Technologies* by B. N. Flagg, 1990, Hillsdale, NJ: Laurence Erlbaum Associates.

process when a new technology is involved. An instructional segment representative of the total production requirements is selected for prototyping. Then, to the extent possible, full scale production is carried out with an eye to answering the following questions:

- Are the system capabilities for graphics, interactivity, animation, etc., compatible with the objectives and instructional strategies selected? The design team's lack of familiarity with the new system may lead to misconceptions about what it can do or the level of effort required to accomplish the instructional objectives.
- What are the staffing requirements for each step in the production process? Does the current staff have the requisite production competencies? If not, can they learn them? Do we need to add new staff? Can we subcontract the work? etc.
- What are the time lines for each step in the process? How can steps be performed more efficiently?
- What are the costs associated with each step? If costs are too high, how can we reduce costs without reducing instructional effectiveness?

Development costs, budgets, and development time are among the factors considered in media selection. The media selection decision process takes into account resources and constraints on the project and provides flexibility by allowing trade-offs to be made. High costs may discourage development of complex multi-media courses.

However, when considering cost effectiveness, decision makers should look to the long-term life of the training to be developed. With many high-tech, self-instructional media, up-front development costs are relatively high, but implementation and maintenance of the course is low compared to traditional classroom training, where the instructor bears the burden of delivery. Furthermore, because these media deliver instruction to students in their homes or businesses, the costs of travel to a facility for instruction, if paid for by the client agency, and the overhead costs for classrooms and offices space needed for faculty and staff in traditional courses are saved. Thus, when looked at in terms of per student costs over the life of the instruction, the perception that certain media are expensive is not always supported by the facts.

Exercise B at the end of this chapter is designed to evaluate your understanding of prototype development.

STUDENT TRYOUTS

The materials are tried out on naive learners to determine to what extent the instructional objectives are met. The designer responsible for developing the instruction collects information about where the instruction worked and where it did not. When instruction fails, the designer questions students to obtain as much evidence as possible about why the instruction failed; this evidence is the basis for revision.

There are three levels of student tryouts: tutorials, small-group tryouts, and operational tryouts.

Tutorial Tryouts

At the beginning of tryouts students individually go through the instruction in the presence of the designer. After a handful of students have worked through the materials, the instruction is revised and an additional group of two to five students work through the revised material. Revisions are seldom made on the basis of one student's idiosyncratic problems. Instead, the instructional designer looks for trouble spots and errors that consistently crop up. The tryout-and-revision cycle continues as long as necessary to achieve the standard specified in the objectives.

The instructional designer determines the adequacy of the instruction through feedback obtained from tests, student performance during learning, and student comments.

Student Performance During Learning and on Tests. As students work through each exercise or task, the instructional designer notes difficulties and probes for the source of any failure. After the tryout, performance on pre- and post-tests are examined to determine any gain due to instruction. Analysis of the post-test will identify errors and help interpret learner difficulties. However, it may be too complicated and expensive to attempt to use a performance test on a pre and post basis. For example, the post-test in the loan documentation course in chapter 1 required students to actually document loans for typical lending arrangements. Because the test took about four hours to complete, it was impractical to administer on a pre-test basis. Therefore, a written test was developed for use as a pre-test during the tryout.

Student comments. After students complete the post-test, reactions to the instructions and suggestions for improvement are obtained.

Student Sample. Students participating in the tryouts should fall within the range of prerequisite abilities defined as the entry-level behavior of the target audience. Research using ninth graders as tryout subjects for math materials suggests that different aptitude groups in the one-to-one stage of formative evaluation provide different types of feedback (Wager, 1983). High-aptitude students can help analyze weak spots in the instruction and provide information about the strategies they use to overcome them. Low-aptitude students are able to identify more basic problems, but are unable to suggest revisions. Groups with mixed aptitudes provide a greater variety of feedback than either high- or low-aptitude groups. Wager reports that materials revised on the basis of the mixed aptitude group produced higher post-test scores and were more favorably received than materials revised solely on the basis of either high- or low-aptitude students.

Delivery System Requirements. The medium used during the tryout will depend on what is available and economically feasible. One of the purposes of the tryout is to uncover problems before expensive production has begun. Therefore, unless the medium of choice can be inexpensively produced in a rough version, the tryout uses storyboards, scripts, drawings, or mock-ups of the instructional materials. As discussed earlier, a prototype may be developed when highly complex and expensive media systems are used. An abbreviated version of the instruction is produced for evaluation. Thiagarajan (1978) suggests that tryouts of complex multimedia instruction be done in successive stages. For example, if the finished product is to be a videotape, formative evaluation might begin with a storyboard, then use a rough cut of the video before final editing.

Tryout Practices. Lowe, Thurston, and Brown's (1983) guidelines for conducting one-to-one tryouts are based on their experience developing vocational technology courses for students in Saudi Arabia.

- Conduct the tryout early in the development process to allow designers time to improve materials while still in development, thereby saving time and money.
- Put the student at ease by explaining that it is the instructional system and not the student that is being evaluated. Make the student feel that he or she is a part of the development team.
- Prepare for the tryout in advance by reviewing all material and setting up any equipment or media before the student arrives.
- Select a quiet place with no distractions for the tryout.
- Use a checklist to ensure that all necessary materials are available and procedures are correctly followed.

- Sit close enough to the student to see what he or she is working on, but not so close as to crowd the student.
- Do not help answer questions until the student has sought the answers in the materials. Question the student to locate the difficulty only when he or she is frustrated by a problem.

Exercise C at the end of this chapter provides practice identifying good tryout practices.

Revision. Stolovitch (1982) compares 12 systems models, all of which prescribe formative evaluation. None of them, however, prescribe specific revisions to counteract learning failures. Typically the revision step in a systems approach is largely a process that draws on the designer's knowledge of the principles of learning. The designer uses posttest information as well as other subjective and objective data. If the materials have been subjected to an internal review and are the product of an experienced designer, decisions about how to revise them are usually straightforward. For a skilled and experienced designer, usually the "fix" is obvious. Practice and feedback requirements may be insufficient, or step size may be too large, and so on. That is, the materials must be broken down into smaller parts with additional guidance and practice added. But with less able designers or with complex subject matter, a number of tryouts may be necessary before learner outcomes are affected.

Glasgow (1974) developed guidelines for translating tryout data into revisions. Three types of student failures and associated revision strategies are shown in Table 6.3.

Exercise D at the end of this chapter provides practice on distinguishing types of learning failures.

Small Group Tryouts

Small-group tryouts provide an opportunity to obtain feedback about how well the course achieves the learning objectives, as well as duration of the instruction and instructor preparation requirements. The same issues applicable to tutorial tryouts are applicable to small-group tryouts.

Duration. Each learning situation fits into a larger context with schedules. By their nature, individual tryouts will not give you good estimates on the time to complete the program. Small-group tryouts consisting of eight to 10 students are useful for estimating the duration of the instruction. For individualized instruction, the median completion time is usually calculated for each unit of instruction. In group-paced instruction, everyone moves at the same pace; therefore, the instructor's task during the tryout is to determine whether the lessons can be contained within the time limits needed to meet the learning requirements of most members of the group and the practical time constraints of the organization offering the instruction.

Instructor Preparation. If instructional designers conduct the instruction themselves, they will learn a great deal from the instructor's point of view about problems with using the materials. Lessons learned from the tryout will have implications for the instructor's guides, lesson plans, and other materials and equipment used to prepare for and conduct the instruction. The instructional strategies may require instructors to assume new, unfamiliar roles. For example, an instructor used to delivering instruction by lecturing may have difficulty assuming the role of a facilitator in a course that makes use of group discussions and case studies. Findings about instructor competencies during the small tryout will influence the degree and scope of formal training necessary to prepare instructors to conduct the training and perform these new roles during the operational tryout, and later when the course is implemented.

Table 6.3 Types of Learning Failures and Associated Revision Strategies

Type of Failure	*Examples of Failure*	*Revision Strategy*
Failure in retention Students correctly performed during instruction, but on the test failed to remember what they learned.	• There are many steps in a procedure. On the test, the student omits a step. • On an end-of-week test, students miss items learned earlier in the week. • Students are learning a new way of doing things. Instead, they use the old procedure on the test.	• Provide more opportunities to practice the task to be learned before the test. • Provide a performance aid, a mnemonic, or visual image to help memory. For example, "RAT" will help you remember **R**etention, **A**cquisition, & **T**ransfer.
Failure in acquisition The student failed to learn the material during instruction and demonstrated that failure by errors during instruction and on the corresponding test items.	Despite repeated attempts to learn long division, students are unable to perform satisfactorily on workbook exercises and fail the test.	Compare the analysis data with the instruction to determine whether the instruction accommodates the: • learners' motivational problems and/or learning preferences; • prerequisite requirements; and • sequencing requirements for the types of learning. Review the instructional strategy to determine whether principles of learning are appropriate for the type of learning.
Failure in transfer The student correctly performed during instruction, but on a test failed to apply what he had learned to new situations.	Student correctly applies Ohm's Law on workbook exercises, but fails to apply law to new examples on the test.	• Range of examples used during instruction is too narrow. Include examples that are representative of the variety of applications (easy to difficult). • Students have misconceptions about application. Direct attention to relevant and critical properties of problems that call for the response.

Adapted from "Planning, Developing and Validating the Instruction," by Z. Glasgow, 1974, in *Handbook For Developing Instructional Systems: Vol. VI* (Contract No. F331615-72-C1363, USAF Human Resources Laboratory, Wright-Patterson AFB, Ohio). Butler, PA: Applied Science Associates.

A designer who lacks subject matter expertise required by instructor tasks may not be the right person to conduct the tryout. In such cases, the designer should work closely with whoever actually instructs during the tryouts, collecting information to detect strengths and weaknesses in the materials and procedures required of the instructor.

Exercise E at the end of this chapter helps you understand the small group tryout process.

Operational Tryout

The materials are tried out under conditions that simulate those of the actual instructional environment. The operational tryout provides an opportunity to work out administrative, equipment, facility, or any other implementation problems.

In operational tryouts, the instruction is evaluated as an integral part of the environment where it will eventually reside, and it is delivered by the instructors and administrators who ultimately will be responsible for it. In addition to providing an opportunity to work out administrative, equipment, facility, or any other implementation problems, the operational tryout ascertains students' attitudes toward the course.

Satisfaction with the training is important. Although there is not always a direct connection between high satisfaction and learning effectiveness, as a rule satisfied participants will help ensure the success of a program. Some activities essential to learning may be difficult or tedious and therefore distasteful to the students. A program that does not satisfy its students will probably not continue in business for long.

A standard approach to assess student satisfaction calls for having students use questionnaires to evaluate the environment, presenters, materials, length, and organization of the program. The survey may be done at the end of training or after some time has elapsed. These indices are disparagingly referred to as "smile" or "happiness" scales because they seldom have demonstrated reliability and validity.

Schwier (1982) points out the difficulties of developing effective scales as well as the pitfalls of using them. He cites four uses in a developmental context

1. as a placebo when student data are gathered but ignored;
2. as an ice breaker where the designer collects satisfaction data in response to client's concerns;
3. as a product appraisal where information about the difficulty, sequence, entertainment value, and instructional approach are used to provide insights to problems overlooked by designers; and
4. as an instructional appraisal where evaluations are used to identify perceived weaknesses and strengths of the instructional staff.

A number of important issues affect student evaluation outcomes. They include the reliability and validity of the instruments and intervening variables that influence students' acceptance of the course. Variables include class size, whether the instruction is compulsory or not, personality of the presenter, and the students' actual or anticipated grade. Although Schwier (1982) points out the difficulties of developing effective scales as well as the pitfalls of using them, Schwier concludes that student evaluations judiciously used and carefully constructed can contribute to assessing an instructional package.

Debriefing is another way to assess student satisfaction. A debriefing is a discussion—sometimes with an individual but usually with a group—about the activities just experienced. A debriefing session provides an opportunity to talk about emotions, such as frustration. The debriefing approach is always used with simulation/gaming activities (Heinich, Molenda, Russell, & Smaldino, 1996). A discussion or debriefing leader asks questions about emotions and about what happened, what was learned, and the relevancy of what was learned. ("How did you feel about playing the game?" "To what extent was the game realistic?" What part does chance play in the game? How realistic is this part?" "What factors affect success in the game?") Notes are taken on participant's responses.

Another approach to improving instruction on the basis of student comments is the evaluation interview, which is a form of debriefing. The U.S. Department of Labor's Employment Standard Administration (ESA) has pioneered a mechanism for gathering formative evaluation data through group interviews. The mechanism allows the instructor to improve an ongoing course and collect data for future revisions. This approach employs evaluation meetings and works best for workshops and training sessions that last longer than two days. Although no formal evaluation of the approach is known, it has been used by ESA trainers for more than 10 years and by other organizations in modified forms (Stevenson, 1980; Pearlstein, 1988).

Meetings generally last 30 minutes and are attended by the instructor and representatives selected by the course participants. Evaluation meetings are held daily to determine how the course is going and to air issues that, if allowed to go unvented, might interfere with the course. Topics may include pace, problems with materials, problems with exercises or group activities, and problems with the instructors. If students are reluctant to reveal their real concerns, the instructor will have to probe—and be willing to accept and respond to negative comments.

Meetings are most effective if feedback will make a difference immediately. A meeting held at the end of the day should result in a change the next day. The instructor must be willing to follow through in the next session on any commitments, or students will feel that comments they make at the meetings are not taken seriously. On the other hand, changes that violate learning principles and harm the effectiveness of the course should not be made. A suggestion that cannot be acted upon can be handled by explaining that the basic course design is founded on principles of learning that are not subject to change. In other words, although learning is a cooperative venture, don't be coerced into altering the nature of the course.

Example of an Operational Tryout. The example presented here shows the difficulties associated with conducting formative evaluations.

The Educational Technology Laboratory at the Medical University of South Carolina (MUSC) developed a CD-ROM program to interest middle school students in environmental careers (Mauldin, 1996). The design team wanted to evaluate ease of use, the computer program performance, and the content. Because MUSC did not have access to the target audience, tutorial and small group tryouts were not possible. However, several school systems were persuaded to volunteer as evaluation sites for operational tryouts.

Three rounds of tryouts were conducted over a one-year period. In the first round, two versions of the program with different interfaces were developed and tried out in two schools. Revisions were made based on the results of observations of students using the program and interviews with school personnel. The second round of tryouts involved two other schools. Evaluation instruments included: pre- and post-tests, observations, interviews, and questionnaires regarding students' likes and dislikes. Further revisions were made and a third round of tryouts was conducted to evaluate the latest changes in another two schools. The same evaluation procedures and instruments were used. A final set of changes were made before the CD-ROM was mastered, duplicated, and delivered to the client.

In order to obtain the cooperation of the schools, MUSC provided the schools with complete computer systems, gave the teachers written documentation on the program (including suggestions for incorporating it into the classroom instruction), and furnished teachers and administrators with letters of appreciation, sending copies to supervisors and personnel files. MUSC also publicized the schools' involvement in newspaper articles, and gave the schools credit in the finished programs for participation in the evaluation.

Exercise F at the end of this chapter provides practice developing and evaluating formative evaluation plans.

EXERCISES

A. An Exercise Designed to Identify Who Should Conduct an Internal Review and When

The following are descriptions of instructional design projects. For each project name an expert who should review the materials and the step in the instructional systems design process where the review should take place.

Steps: Analysis, design, development, evaluation, and implementation.

1. Develop a slide-tape to explain to parents and employees the school board's plans for asbestos removal from the high school.
2. Revise an instructor-delivered course on the documentation requirements for commercial loans. Students are new employees in the commercial loan departments of banks.
3. Develop a videotape for elementary school children on safe street-crossing behavior. The videotape will employ a nationally known host of a children's television show.
4. Develop a two-hour course for emergency medical technicians on how to deal with the emotional trauma of parents whose infant dies as a result of sudden infant death syndrome (SIDS). The sponsor is the U. S. Department of Health and Human Services. The training is mandated under a law enacted as a result of the efforts of parents who have experienced SIDS.

B. An Exercise Designed to Help You Plan Prototypes

Prototypes are appropriate for the following situations. Describe what kind of prototype you would develop to answer the questions posed by the problems.

1. **Problem:** A telecommunications course on statistical concepts is being developed for college freshmen. The designer plans to use bar graphs, line charts, scatter diagrams, and pie charts to display data.
   Question: How much explanation will the students need in order to understand the graphics?
2. **Problem:** A computerized reading course with audio is being developed for kindergarten children. The instructional strategy uses a phonic approach.
   Question: Will children understand directions for using the mouse to point, click, and drag?
3. **Problem:** A national chemical manufacturer is considering using DVI for its safety training for employees in processing plants throughout the country. (Figure 5.7 in chapter 5 shows the activities involved in developing DVI.) The Vice President for Human Resources wants to use the corporate training staff and its video production facilities. The staff has never developed interactive instruction.
   Question: How much will it cost us to convert our present courses to DVI using corporate staff and facilities?

C. An Exercise Designed to Help You Recognize Appropriate and Inappropriate Tryout Practices

The following are descriptions of an instructional designer's behavior during a small-group tryout. Indicate whether the designer's behavior is correct or incorrect. If incorrect, state what the designer should have done.

1. Self-instructional slide-tape art appreciation course. Target audience is ninth graders.
   The instructional designer set up the equipment before a ninth grader arrived for the tryout. The designer had already determined that the tryout subject's aptitude was average. When the tryout began, the designer gave the directions on what to do and left the student alone to work.

2. Self-instructional science materials for seventh grade.
   Instructional designer asks a seventh-grade teacher to provide subjects for the tryout. The teacher, wanting to make a good impression, sends the three best pupils.
3. Course to teach bank employees which forms are required to document commercial loans.
   A bank employee agrees to try out the material. The instructional designer explains to the employee that assistance is needed to find out how well the materials work. The designer points out that on the basis of the employee's comments, the materials will be revised, and that thereby the employee will contribute to the effectiveness of the training eventually to be offered to other bank workers. The designer leads the bank employee through the materials, noting difficulties and discussing possible improvements. They work as a team throughout the tryout.
4. Management training presented on videodisc.
   The scriptwriter and instructional designer try out the materials in storyboard form on typical management trainees.
5. Correspondence course for soldiers in the reserves who are being trained to do maintenance and repair radios.
   Instructional designer sends out draft materials to several reserve units after selecting subjects based on their aptitude test scores. A person assigned to each unit will administer the materials and mail them back to the designer.

D. An Exercise Designed to Help You Distinguish Among Acquisition, Retention, and Transfer Failures

Indicate whether the learning problems described below are failures in retention, acquisition, or transfer.

1. On an exercise, a student fails to select the correct form to use for a loan guarantee. She makes the same mistake on a test.
2. On an exercise, a student selects the correct form to use for a loan guarantee, but misses the item on a test.
3. On an exercise, a student selects the correct form to use when the guarantor is a spouse. On the test, when asked to select a form to use when the guarantor is a corporation, the student selects the wrong form.
4. A student is learning to use a computerized program to calculate statistics. The student is learning to select the correct statistical procedure to use given a particular request for analysis. On an exercise, the student uses the correct procedure for entering the test score on a spelling test to obtain descriptive statistics. On a test, the student is given weather data for several cities and is asked what procedure to follow to obtain descriptive statistics. The student doesn't know the answer.
5. A student photographer is learning to develop black and white film. There are many steps in the procedure that must be performed exactly right. The instructor works with the student until he or she can do all of the steps correctly. The instructor schedules a test for the following week. On the test, the student mixes the chemicals incorrectly.

E. An Exercise Designed to Help You Understand the Small-Group Tryout Process

Following are descriptions of how instructional designers approach the same problem in a small-group tryout. Select the one who is likely to obtain information from the tryout. Explain your choice.

1. Tryout of self-instructional text materials.
   Designer A. The designer collected time data at the start and end of each day. At the end of the tryout, the designer calculated the range and median completion time for the course.

Designer B. The designer collected time data for each module for each student, then calculated the range and median completion time for each module.

2. Tryout of instructor-led materials of a three-day workshop requiring the instructor to lead discussion groups on highly technical matters. The instructor for the small group tryout is the SME who has been working with the designer all along.
   Designer A. The designer constructs a checklist of issues he wants feedback on. At lunch and at the close of the business day, the designer and the SME/instructor review the events of the day against the checklist.
   Designer B. The designer constructs a checklist of issues that require feedback and asks the SME/instructor to complete it for each course segment. Because of the working relationship established during the course's development, the SME and the designer schedule a debriefing at the end of the course.

F. A Group Exercise to Help You Plan the Steps in Formative Evaluation and Help You Evaluate Plans for Formative Evaluation

From your own experience, select an instructional design problem or materials used in a learning environment. Briefly describe them and prepare a plan for a formative evaluation. Your plan must include tutorial, small-group, and operational tryouts. For each tryout, specify the subjects, tryout environment, tryout procedures, data collected, and the prototype to be developed, if one is warranted.

Exchange evaluation plans from this exercise with another student and evaluate each other's plans. First construct a checklist against which you will evaluate the plan, then discuss each other's evaluations.

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ANSWERS

A. An Exercise Designed to Identify Who Should Conduct an Internal Review and When

1. Representative of school board (analysis phase)
   Representative of parents and employees (design phase)
2. SME on documentation from bank (analysis phase)
   Former instructor (design phase)
3. SME on traffic safety (analysis phase)
   Child development expert (analysis and design phases)
4. Emergency medical technician or technical SME (analysis and design phases)
   Sponsor (all phases)
   Parents (analysis and design phases)

B. An Exercise Designed to Help You Plan Prototypes

1. There is no one correct answer. This is how one designer approached the problem. Using one-on-one evaluation, the designer showed freshmen sample graphics in paper format. He asked each student to explain what the graphics mean to him or her. He taped the responses for later analysis. From the responses, he drew tentative conclusions about what freshmen understood about graphics.

   Next, he projected colored slides, and played an audio tape of the narration to a small group of students. The script covered the basic information the design teams thought Freshmen needed based on information gained from the one-on-one evaluation. He administered a quiz on interpreting the graphics. Then he conducted a debriefing to get more detailed reactions from the group. (The designer could also have done a rough version of a video and tested it the same ways as the slides.)

2. There is no one correct answer. This is how one designer approached the problem. The designer did not develop a rapid prototype. Rather, she used Macintosh Basics, a program with cartoons, designed to teach use of the mouse. She conducted a series of one-on-one sessions with kindergarten children. During the sessions she worked with them on mouse skills. Another member of the design team observed her and took notes on the children's performance.

3. There is no one correct answer. This is how one training director approached the problem. After getting the OK to spend money on a prototype, the Training Director spent considerable effort selecting a segment of a course representative of the existing safety training.

   He then proceeded to produce a DVI carefully tracking costs associated with the prototype. He generalized the findings to the remaining courses to derive an estimate of the final costs for redevelopment to DVI for all courses.

C. An Exercise Designed to Help You Recognize Appropriate and Inappropriate Tryout Practices

1. Incorrect. She should have stayed with the subject during tryout to collect information on why mistakes were made.
2. Incorrect. She should have obtained students who represent the full range of abilities in seventh grade.
3. Correct.
4. Correct.
5. Incorrect. The materials should be tried out by the designer. With this approach, one cannot be sure that the examiner is adhering to accepted tryout practices.

D. An Exercise Designed to Help You Distinguish among Acquisition, Retention, and Transfer Failures

1. Acquisition
2. Retention
3. Transfer
4. Transfer
5. Retention

E. An Exercise Designed to Help You Understand the Small-Group Tryout Process

1. **Designer B.** More accurate time was collected.
2. **Designer A.** When feedback is immediate, corrective action can be taken promptly.

F. A Group Exercise to Help You Plan the Steps in Formative Evaluation and Help You Evaluate Plans for Formative Evaluation

The two parts of this exercise build on each other. Plans must include tutorial, small-group, and operational tryouts. For each tryout, specify the subjects, tryout environment, tryout procedures, data collected, and the prototype to be developed, if one is warranted.