

The Courseware Development process

This extract describes one possible approach to the courseware development process. It is obviously not the only approach, but is useful in that it itemizes the various activities which are involved. The text is taken from **Chapter 7, Preparation, of "Computer-based Instruction" by Alessi and Trollip, (1991).**

Step 1. Determine needs and goals

In this step you determine the goal of a single lesson. The goal of a lesson includes what the student should know or be able to do after completing the lesson. The primary consideration affecting definition of goals is the entry knowledge of the student. Determining goals therefore includes assessing the characteristics and instructional needs of your intended students.

Step 2. Collect resources

Resource materials are relevant to the subject matter, instructional development, and the instructional delivery system, in this case computers. Useful subject-matter resources include textbooks, reference books, original source materials, films, and most importantly, other people knowledgeable in the area. Resource materials for instructional design include texts on instructional design (such as this book), storyboarding sheets, graphics arts materials, a word processor, and if at all possible, persons who have experience in instructional design. Resource materials for the delivery system include the computer itself, its operation manuals, software reference guides, and people experienced with the computer and software you intend to use during development.

Step 3. Learn the content

The person developing a CBI lesson will either be a subject-matter expert who must learn about CBI design or a designer who must learn the content. Even when working in conjunction with a content expert, the designer must learn the content. To a lesser extent, the content expert will also learn about instruction. For the designer, learning the content includes interviewing the expert, reading texts and other instructional materials, and generally becoming a student again. You cannot develop effective instruction which challenges the student in creative ways unless you become thoroughly familiar with the content. Shallow understanding can only produce a shallow lesson.

Step 4. Generate ideas

This step consists of brainstorming to generate creative ideas. Generating ideas via brainstorming is very important, and we suggest procedures for encouraging creative ideas in the development process. Many designers get stuck at this early point, either spending too much time trying to come up with the perfect idea or, more frequently, giving up and proceeding with a mediocre idea. With brainstorming, the designer, with assistance from others, pursues the goal of generating as many ideas as possible, suspending any judgment of their quality

or feasibility until a later time. ~ We are strong advocates of brainstorming because it has proved to ~be a method that facilitates creativity and quickly produces a list that will include some interesting and good ideas.

Step 5. Design instruction

The outcome of brainstorming is a long list of ideas that range in quality from very bad to very good. You must eliminate the worst ideas and then begin ordering, detailing, and refining the ideas that are good. This is done by performing concept and task analyses on the content. Regardless of the nature of the content, such analyses bring to bear principles of learning to assemble a plan for an effective lesson. This includes preliminary choices about instructional methodologies and factors.

It cannot be emphasized enough that good instructional development incorporates evaluation throughout the process, not just at the end. This is reflected in the model by incorporating explicit evaluation and revision activities as part of several steps. After the design step, evaluation includes review and discussion by the content experts, instructional designers, and clients. Revision may require reassessment of goals, collecting more resources, learning more about the content, generating more ideas, correcting task analyses, changing the methodology and so on. After revision the evaluation should be repeated. Evaluation and revision form a cycle which progresses until all concerned parties are agreed that the quality is sufficient to progress to the next step.

Step 6. Flowchart the lesson

A flowchart is a series of diagrams describing the operations a computer performs. Flowcharting is important because computer-based instruction should be interactive, and interactions are best depicted as a visual representation of decisions and events. While the flowchart does not include the actual text and pictures for your lesson, it should include their sequence. The flowchart includes information about when the computer will draw or animate pictures, what happens when the student makes mistakes, and when the lesson should end.

Flowcharting can be done in varying amounts of detail. We recommend different amounts of detail for different instructional methodologies. For simpler methodologies (tutorial, drill, and tests) we recommend simple flowcharts , giving an overview of the lesson's scope and sequence. For complex methodologies, such as simulations and instructional games we recommend more detailed flowcharts that include the algorithms underlying the simulation models, game rules, and so on. Regardless of the amount of detail, we suggest producing flowcharts in a series of drafts.

Step 7. Storyboard displays on paper

Storyboarding is the process of preparing textual and pictorial displays so they will fit within the display limitations of your computer. While the flowcharts depict the sequence and decisions of a lesson, the storyboards depict its content and presentations. This step includes drafting the actual instructional messages

students will see, such as information presentations, questions, feedback, directions, prompts, pictures and animations.

At this point the draft lesson on paper should be carefully evaluated and revised until members of the project team agree on its quality. It is important to use more than content experts and instructional designers for this review. The materials should also be looked at by potential students and persons not already knowledgeable about the content. This uncovers ambiguities, confusing or missing content, and material that is too easy or too hard.

Step 8. Program the lesson

This is the process of translating what you have on paper into a series of instructions understandable to the computer. We use the word "programming" in a more general sense than has been used in the past. Historically, programming has referred to writing code in a standard language such as BASIC or Pascal. We use it to mean any way of producing a lesson on the computer. As the state of the art of computer-based instruction advances, an increasing variety of methods for producing programs are becoming available. We discuss the relative advantage of different kinds of programming languages, authoring languages, authoring systems, and tools. We make a number of suggestions on how to go about programming, how to avoid errors, checking your program for errors, and making changes until it does exactly what you want.

Step 9. Produce supporting materials

Computer-based instruction is rarely sufficient without some supporting materials. We discuss four kinds: student manuals, instructor manuals, technical manuals, and adjunct instruction. Teachers and students have different needs, and materials for them should be quite different. Teachers need information about setting up programs, accessing student data, and integrating the materials into their curriculum. They also need summary information, both for determining whether to use a particular program and also to aid students going through programs. Students primarily need help running a program and moving around in it. Technical manuals are necessary when setting up a lesson is complicated or requires sophisticated devices such as local area networks. Adjunct instruction includes worksheets, diagrams, exams, photographs, and assignment sheets.

Step 10. Evaluate and revise

Finally, the lesson and support materials should be evaluated with emphasis on how the lesson looks and works. You will determine how well the lesson looks by using it yourself and having other people with design experience go through it. We call this procedure lesson review. You will assess how well the lesson works by observing the results of real students studying the lesson and assessing how much they learn. These students should be representative of those for whom the lesson is intended. This step includes both pilot testing and validation.