



instructional development educational assistance

Instructional Design for Technology-Based Education

What is instructional design?

Instructional design has been defined as "an organized procedure that includes the steps of analyzing, designing, developing, implementing, and evaluating instruction" (Seels & Richey, 1994, p. 31).

Expanding on these basic steps are my words, *italicized* for emphasis:

". . . analyzing *learner needs*, designing *content to fill the gap of knowledge, skills, problem-solving abilities needed*, developing *modules and lesson plans*, implementing *training or course using variety of technology and learning strategies*, and evaluating *during and after* instruction."

How do I get started integrating technology in my teaching?

Gagne recommends "the best way to design instruction is to work backwards

from its expected outcomes" (1979, p. 45). Required is thinking beyond the subject matter, assignments or technology to what you want the learners to ultimately know, think, or do. It can be expressed like this - "If you don't know where you are going, how will you know when you've arrived?"

Which Technology to Use?

There ought to be good reasons for using a specific technology or application in your teaching. Why not think in terms of what it takes to reach "mastery" levels of instruction? The technology questions can be answered as you deal with each component of instruction.

Mastery instruction has been characterized as having five components. The following guidelines are based on these essential instructional components:

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The 5 Components of Mastery Instruction

1. Specificity of goals
2. Modularization of lesson units
3. Activity in learning,
4. Self-pacing of instruction
5. Feedback on performance

(White & Coscarelli, 1986)

Specificity of Goals

Goals and objectives are best student-centered. In writing objectives, ask yourself two questions: (1) what are the learners' knowledge, skills and attitudes now? and, (2) how will learners be different as a result of my instruction?

The behaviors you specify should be stated as both observable and measurable.

Format for Stating Objectives

Given this new learning/testing situation, the learner will be able to perform these specific, observable knowledge, attitudes, or skills at this measurable level of competence.

Secondly, separate the objectives into manageable content units and write more specific performance objectives. Ask yourself whether learning one unit will be required before learning another. Is there a

preferred sequence from general to specific in order to build upon prior knowledge? Is there a required order in order for a procedure to be performed? By thinking about the sequencing of content, you have begun the second instructional component, that is, modularizing the lesson units.

Modularization of Lesson Units

Modules of subject matter that can be learned as intact understandings, explanations, procedural rules or problem-solving processes are typically "chunked" for instructional development. The amount of time devoted to each module may range from several hours to several weeks. The complexity of the content, as well as the current level of comprehension on the learners' part will dictate the time commitment assigned to the lesson unit.

At this stage of instructional development, the teacher might decide that the targeted learners' access, reflective and evaluative abilities, or optimal coverage of the subject matter content would be enhanced by technology. It is also at this stage (if not sooner) that the teacher should be actively



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(4) allow a final product or solution; and
(5) be extendible” (Graber & Graber, 1998, p. 72).

Remedial opportunities or the ability to redo assignments, papers, and tests are also critical pieces in self-pacing. Students need to be given an opportunity to make improvements and to demonstrate their expanded knowledge and skills. The choice to do so can be left to the individual or can be an expectation of meeting course requirements. Access to electronic media makes the remedial tasks a whole lot easier and can also involve other people in developing the learning projects.

Feedback on Performance

Feedback should be thought of as a continuous loop - going back and forth between and among instructor and students. Students will benefit by early interventions, and should have the opportunity to participate in peer assessment as well as self-assessment of performance. Formal and informal feedback mechanisms can be instituted.

Instructors can benefit by soliciting feedback on course activities, pacing of instruction, and on their feedback to students. The earlier in the semester one seeks feedback, the

greater the opportunity for making the recommended changes or for shoring up instructional plans to better accomplish stated objectives.

Instructional Roles from "Sage" to "Guide"

With the advent of technology-based instruction, and societal need for problem-solving skills, and as the age and experience levels increase among our students, instructional roles are shifting. Guiding the learning process is as important as being the source of knowledge in your subject matter area. Instructors will find themselves learning along with their students as they integrate technology into their teaching and as students find authentic and applicable knowledge from multiple, global sources.

Instructors should expect to work with an instructional team (each partner an expert), in order to prepare course materials, select and use various educational technologies, and support and guide learners.

The professionals in Faculty Instructional Support have both pedagogical and technical expertise and are ready to lend their support.

seeking out an instructional team, including technician, librarian, graphic designer, or instructional designer. An instructional designer is an expert in packaging —s/he knows the features, strengths and weaknesses of media and can help in using the media to best advantage.

Activity in Learning

Planning the events of instruction is the next step in instructional design. The activities form a series of communications with the learner. Each of the events should help support the acquisition and retention of what students need to learn.

Gagne listed the following discrete stage for engaging the student.

- Gaining attention - informing the student of what's in it for them
- Establishing objectives - encouraging the students to add individual learning objectives to the ones stated for the course
- Stimulating recall of prior learning - invoking prior knowledge, motivation and an attitude of confidence
- Presenting the learning materials
- Providing learning guidance - sustaining

learning by questions, group discussions, testing, and practice of skills

- Eliciting the performance or learning responses
- Providing feedback about performance correctness
- Assessing performance and reinforcing continued learning
- Enhancing retention and transfer of learning to future situations

Interactivity and Technology

Activity or more precisely "interactivity" theory (Moore, 1989) asserts that for successful learning, students must be engaged with the subject matter content, with the instructor and with one another. More recent research has advocated an orientation to the technology — making sure the learner interacts successfully with the technology, too (Hillman et al., 1994).

Integrating technology is one excellent means to create activity in learning. Various practitioners have described a variety of electronic activities to accomplish interactivity. For example, Mercer (1994) delineated seven types:

- (1) class/group discussion covering issues generated by either the instructor or students,
- (2) class/group tutorial focused on understanding course material and testing comprehension,
- (3) group analysis and paper writing;
- (4) role playing critical incidents;
- (5) polling among class members or others outside the class;
- (6) involving guest lecturers; and,
- (7) practical electronic exercises, (e.g., making library requests, subscribing and participating in listservs, exchanging files or retrieving information from databases).

Actually, there is a way to do just about any face-to-face activity via technology. You may have to prepare well in advance and involve other people, but creativity and serendipity will help you accomplish interactivity.

Figure 1. Components of mastery instruction in a cyclic change model, by Marcel Bechtoldt, University of Missouri-St. Louis, 2000.



Self-Pacing of Instruction

Self-pacing supports the constructivist model of teaching and learning. Two key principles of constructivism assert:

WHAT A PERSON KNOWS IS NOT PASSIVELY RECEIVED BUT ACTIVELY ASSEMBLED

LEARNING IS NOT THE STORAGE OF "TRUTHS" BUT OF "USEFUL" PERSONAL KNOWLEDGE (GRABER & GRABER, 1998)

Technology-mediated instruction, available to learners at any time from anywhere, captures the essence of the self-pacing component. For classroom-based instruction, self-pacing can be accomplished by several means. The first instructional task would be to encourage, integrate, and facilitate the development of individual learning objectives by students. Secondly, "real world" and self-directed learning could be adopted as guiding principles for the course.

Real-World Learning.

Real world learning implies that the content is both relevant and applicable to the individual learner. A good way of expressing the concept is that authentic instructional activities be planned; authentic activities are those that "ordinary people doing ordi-

nary things" do. A question to ask yourself, "what is it that readers, writers, biologists, users of math, or speakers of Spanish do as they use their skills?"

Technology can connect the individual learner and real-world experts. There is the potential of inviting guest lecturers to contribute to your students' learning, live or asynchronously. Student questions might be posed via email to make the content more personally relevant.

Self-Directed Learning.

Self-directed learning is defined as "a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning, choosing and implementing appropriate learning strategies, and evaluating learning outcomes" (Knowles, 1970, p. 18).

Project-based learning especially lends itself to technology utilization.

Project selection should:

- (1) "encourage students to make decisions;
- (2) encourage 'what-if' questions;
- (3) require discussion and communication;