Chapter 8

Heuristics for Selecting Distance or Classroom Settings for Courses

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When new courses are developed, a decision must be made about the “delivery media and setting” for student access to the instruction. In the past, a huge variety of instructional settings and media have been used to deliver courses including (most commonly) classrooms and teachers and (most recently) multimedia transmitted via the Web and/or recorded on CD or DVD. The purpose of this chapter is to describe a relatively simple procedure for making a cost-beneficial decision between the classroom and a distance delivery platform for any one course of instruction.

MEDIA SELECTION RESEARCH

A recent, comprehensive review by Sugrue and Clark (2000) of approximately 45 media selection schemes published over a period of 30 years concluded that most “gave an illusion of rationality and scientific precision to what were, at best, decisions driven by practical and economic consider-
ations, and at worst, by invalid assumptions about learning, learners and the effects of media on them” (p. 208).

There are no published studies of the way that instructional designers or curriculum managers actually select media for courses but informal talks with media producers suggest that existing selection models are seldom used in practice. For example, nearly all of the published models give designers the excellent advice to delay media selection until the end of the instructional design process but before instructional materials are developed. In this way, media can be selected that will adequately carry the necessary instructional design without excessive cost. Yet, the opinion of many curriculum experts and experienced designers is that media are chosen far ahead of the design process either because the organization is focused on a specific medium or because administrators want to appear to be using the latest technology. This seemingly irrational behavior fits the evolving model of automated decision making proposed by Ellen Langer (1994) and reinforced in recent reviews by Daniel Wegner (2002). Langer suggested that rational, deliberate, conscious decision making (in any domain) may most often be a myth and argued that

the processes that are most generally understood as leading to decisions, such as integrating and weighing information in a cost-benefit analysis, most often are post-decision phenomena, if they occur at all .... Cognitive commitments are frozen on rigidly held beliefs .... Once a cognitive commitment is reached, choice follows mechanically, without calculation. (p. 34)

Media Impact on Learning and Motivation

Sugrue and Clark (2000) concluded that existing evidence suggests that media are not expected to contribute any unique influence on learning and motivation based on reviews of media comparison studies by Clark (1983, 1994, 2001) and others (Morrison, 2001; Russell, 1999). Another way to view this conclusion is that any learning goal that can be achieved in one medium, for example in the classroom, can also be achieved at the same level in another medium or mix of media, for example in computer-based instruction or interactive televised settings. Even Kozma (1995), who is widely regarded as a critic of this point of view, acknowledged that “no significant difference” is the best view of all past comparisons of different media to teach similar learning tasks and learners. Similarly, Salomon (1984) has made a compelling case that media do not uniquely motivate learning. He presented evidence that the same media can have very different motivational qualities depending on the beliefs and expectations of learners and vice versa.

The most comprehensive and current meta-analyses of the media comparison studies to be conducted were undertaken by Bernard, et al. (2004).
In an analysis of hundreds of studies, they found no learning differences between the two media delivery platforms that were attributable to medium or instructional context. Bernard, et al. did report some very strong motivational results in their studies that indicated a dislike of asynchronous distance education by the subjects in the experiments they reviewed. Yet, this finding seems to be due not to the media employed but to the delayed feedback conditions and students' general dislike of asynchronous distance courses. Thus, the most reasonable conclusion from many studies seems to be that the media or mix of media selected for instruction cannot influence learning and/or motivation, because neither outcome seems to be influenced by the medium of instruction. So what impact does media have on the instructional process?

**Access and Efficiency Benefits**

Most reviewers agreed with Cobb (1997) and Clark (1983, 2001) that media may have a significant impact on student access to instruction, and the cost (Levin, 1983) and efficiency of their learning (Cobb, 1997). Presumably, distance education is a potential solution to instructional access problems when students are widely distributed geographically and when travel is either more expensive or less convenient than "distance" access via the Internet or television transmission. In addition, when large numbers of students must be served, there may be a considerable economy of scale in serving them at a distance. Both access and scale are economic issues that can and should be addressed in an a priori, cost/benefit analysis (e.g., Levin, 1983; Levin & McEwan, 2001).

**A Cognitive Approach to Media Selection**

Sugrue and Clark (2000) suggested a “cognitive approach [that] (a) conceives of training as a collection of [instructional] methods that support specific cognitive processes essential to learning and transfer, and (b) treats media as collections of attributes that facilitate the delivery of those methods” (p. 208). Their view of the instructional impact of media and methods is summarized in Fig. 8.1.

They recommended an analysis of the instructional methods that are required to learn in any course and then an analysis of the variety of media that will effectively and efficiently present necessary methods. Thus, they confirmed previous views by authors of the few systematic media selection schemes that media should not be chosen until a complete blueprint or instructional design for a course has been developed. Only at this point can course developers know what instructional methods are needed to teach the instructional content in a course.
THREE INSTRUCTIONAL METHODS THAT OFTEN LIMIT INSTRUCTIONAL MEDIA SELECTION

The research evidence is that there are no learning or motivation differences when the same course is presented by live instructors teaching students in classrooms or when a variety of electronic media are utilized. Yet some instructional methods cannot be presented in all media. Designers are advised to follow the suggestions made by Sugrue and Clark (2000) and ask first what instructional methods are required to achieve course learning goals, and then ask what media are available that will present those methods at the least expensive cost. In our clinical attempts to examine this issue, we have often found that three of the most common instructional methods can only be presented via a limited number of media. Those three methods are: 1) the sensory modes required for learning concepts, processes, and procedures; 2) conditional knowledge requirements for the use of learned information; and 3) the need for synchronous feedback when complex knowledge is being learned.

Sensory Mode Requirements

Sometimes, adequate learning requires that a person be able to not only see and/or hear something, but perhaps also to smell, taste, or recognize the texture of an object or event. If sensory-based information is absolutely required to learn, it must be presented. Because most electronic media now

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only provide visual and aural sensory information, those parts of an instructional presentation that require smelling, tasting, or touching something may have to be conducted "in person." The first author of this chapter once helped to design a specialized lesson for pastry chefs and so smell, taste, and texture were all critical to learning many of the key concepts. This fact does not imply that an entire course where one lesson may require familiarity with a smell, taste, or texture has to be entirely taught "in person"—but certainly the lesson or part of a lesson would have to be live and perhaps "classroom based."

Conditional Knowledge Requirements

Instruction not only teaches people what to do but also when and where to do it. The "when and where" information is often called "conditional knowledge" (for example, Taylor & Dionne, 2000). Another way to think about conditional knowledge is that it describes the "if" condition in "If ... Then" sequences. Some conditions that must be present before procedures are implemented or before a certain process can be said to be underway can be very complex. For example, conditional knowledge might require that we simulate a poorly lighted street at night, an electrical fire, an urban riot, or an angry confrontation between bullies and a victim. The issue that designers must consider is what media will adequately depict the key elements of the conditions that must be present for students to use the new knowledge they are learning.

Synchronous Feedback Requirements

When instruction attempts to teach complex knowledge, very detailed observation of student practice accompanied by corrective feedback must be provided to support learning. Complex knowledge is defined as requiring the integration and coordinated performance of task-specific constituent skills rather than merely recalling definitions and other conceptual knowledge about concepts, processes, and principles. In addition, complex knowledge requires what van Merrienboer (1997) called "part-task and whole-task practice." Most instructional design models emphasize instruction in relatively simple learning tasks and assume that a large, complex set of interrelated tasks are achievable as "the sum of the parts"—by sequencing a string of practice exercises focused on simplified, component task procedures until a complex task is captured and mastered. There is overwhelming evidence that this does not work (see van Merrienboer, Clark, & de Crook, 2002, for an in-depth discussion of these issues). Thus, when complex practice exercises must be undertaken, a live "expert coach" must often be available to observe each student's practice and to give supportive
and corrective feedback. The media selected to support complex practice exercises therefore has to support synchronous (real time) observation of practice and both verbal (voice) and visual (demonstration by the coach) feedback to each learner. This requirement can severely limit the range of media available to deliver instruction.

A "JOB AID" FOR SELECTING DISTANCE AND CLASSROOM PLATFORMS FOR INSTRUCTION

The final part of this chapter presents a very specific, proceduralized "job aid" for deciding between classroom and distance media for instruction (see Table 8.1). In addition to analyzing the three instructional methods that often require "live" instruction, the job aid (Rosett & Gautier-Downes, 1991) described an approach to assessing the cost and benefit ratio of various options based on work by Levin (1983) and Levin & McEwan (2001).

Instruction

A Decision Procedure for Selecting Cost-Beneficial Delivery Platforms for Distance or Classroom Training. The goal is to make a cost-beneficial selection of either classroom or distance learning delivery platforms for effective training and education.

The prerequisites include access to required learning objectives, location and number of learners, cost of delivering instruction on all platforms being considered, information about practice and feedback requirements, and sensory mode information necessary to achieve all course objectives.

Backup Information for Training Delivery Platform Selection Procedure. There are four steps in the selection procedure.

- Step 1. Review the learning objectives for the course and determine whether all delivery platforms being considered can adequately simulate all of the necessary "conditional knowledge,"—defined as knowing when and why to select and use specific procedures, concepts, processes and principles. Conditions are often expressed as the "If" statement in "If (this is the condition) then (do this procedure)." Conditions can be events (such as formal orders, the end of some process that signals the beginning of another, the presence of a fault in equipment or a system) and/or reasons (for example, "this fault needs to be repaired in order for this system to work more efficiently"). All conditions that lead to the implementation of knowledge and skills gained in training must be able to be simulated during instruction so that the learner will be able to recognize the conditions on the job. Some conditions are difficult but not impossible to simu-
late in distance education or in classrooms that are not "on or near the job site."

- **Step 2.** Determine whether the learning objectives and instructional methods required for your course specify the observation of learner practice that must be conducted by a live expert who gives immediate (or synchronous) corrective feedback about practice performance in real time. The alternative to synchronous feedback is asynchronous feedback meaning "delayed" for hours or days. Synchronous practice and feedback is most often required when highly complex knowledge is being learned. An example of complex knowledge can be found when

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**TABLE 8.1**

<table>
<thead>
<tr>
<th>Steps</th>
<th>Decisions and actions (see below for explanations of concepts marked with *)</th>
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<tbody>
<tr>
<td>1</td>
<td>Can both a distance and a classroom platform simulate all of the necessary conditions* in the job setting where the learner will apply their skills and knowledge? If yes, go to Step 2. If the answer is no for any platform, select the platform that will provide the necessary conditions.</td>
</tr>
<tr>
<td>2</td>
<td>Can both platforms provide the required immediate (synchronous*) and delayed (asynchronous*) information and corrective feedback* needed to achieve learning objectives? If yes, go to Step 3. If the answer is no for any platform, select the platform that will provide the necessary feedback.</td>
</tr>
<tr>
<td>3</td>
<td>Can both platforms provide the necessary sensory mode information* (visual, aural, kinesthetic, olfactory, tactile) required to achieve all learning objectives? If the answer is no for any platform, select the platform that will provide the necessary sensory mode information.</td>
</tr>
<tr>
<td>4</td>
<td>If both distance and classroom platforms have survived as viable options, subject both to cost-per-student* (Steps 4A and 4B) and (if desired) value-enhanced-cost* (Step 4C) analysis:</td>
</tr>
<tr>
<td>4.A</td>
<td>Derive the cost of each platform by listing and summing the costs* associated with a specific course. Derive two sums, one for distance delivery and one for classroom.</td>
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<tr>
<td>4.B</td>
<td>Divide the projected cost of each platform by the number of learners to be trained to determine the cost-per-student* of each platform. Either select the platform with the lowest cost per student (or go on to Step 4C).</td>
</tr>
<tr>
<td>4.C</td>
<td>To determine the value-enhanced-cost* for classroom or distance platforms, survey command staff and other key stakeholders to determine their preference or value for each platform. Subtract the percent of average value assigned to the preferred platform by stakeholders from the cost-per-student of that platform to derive a value-enhanced-cost.</td>
</tr>
</tbody>
</table>
students learn a number of different troubleshooting procedures that must often be combined in novel ways to debug problems in a set of interconnected, complex systems such as the avionics for a complex aircraft. What defines complex knowledge is that it is clearly more than the sum of its parts because it also includes the capability to coordinate and integrate those parts. In general, if it is possible to automate (with technology) the real-time (synchronous) observation of practice and corrective feedback to learners during practice in the distant alternative, and if live experts are available for classroom settings, you can select either option.

- **Step 3.** Review your objectives and ask, "Is it possible to provide all of the necessary sensory information required to learn and perform the main objectives in this course in both the classroom and distance learning options?" For example, if learning that will transfer to adequate on-the-job performance requires that during training, a learner recognize a specific set of sounds (e.g., of a broken mechanism), smells (e.g., of burning insulation), the surface texture (e.g., of a fabric or a biological or geological sample), the taste (e.g., of a well-prepared cake) or the sight (e.g., of a rapid real-time event slowed to 10% of its speed), you must ask whether the distance and classroom platforms can provide the required sensory information.

- **Step 4.** Cost-per-student is the value of all resources invested in the development and delivery of distance and classroom versions of a course divided by the number of students who must complete the course. Cost includes development, production, and transmission expenses for media and TDY or PCS travel expenses for classroom options. Divide the cost of each platform by the number of students who must be trained in the foreseeable future. For example, a course whose platform costs $850,000 and will be delivered to 15,000 trainees has a cost-per-student of $56.67.

_VALUE-enhanced-cost_ is defined as the percent of value (relative strength of the preferences) stakeholders place on their preferred delivery platform above the value they place on their less preferred option multiplied by the cost-per-student. Value-enhanced-cost analysis is useful whenever developers work with a variety of stakeholders and/or managers who are concerned about whether training technology platforms are trendy or conform to public expectations. Some people believe that live trainers are essential and others emphasize the public relations value of using trendy new technology. This analysis permits you to weight the final decision about delivery platforms by assessing the strength of stakeholder values toward each of the alternative platforms being considered. This way, the final decision is influenced by a combination of instructional method, cost/benefit ratios, and stakeholder values. For example, if stakeholders prefer the distance
option 23% more than the classroom option, and the cost of the distance option is $56.67 per student, the value-enhanced-cost would be $56.67 - (.23 \times $56.67) or $56.67 - 13.03 = $43.64. Platform value is derived by first identifying the stakeholders (stakeholders are the individuals and teams who have an immediate responsibility for, or interest in, the success of the students who are trained). Develop a brief questionnaire made up of one or more items where you ask for agreement or disagreement on a seven-point scale from the lowest rank of 1 (worst option) to 7 (best option). Sum all responses from stakeholders and derive a mean rating for each delivery option. Divide the highest mean into the lowest mean to determine the percent difference and use that percent to derive a value-enhanced-cost estimate.

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