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435 97-2698

13 September, 2000

Instructional Strategies that Teach

CBT Solutions Nov./Dec. 1997 1-11.

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> "There is a scientific discipline of instruction and a technology of instructional design founded on this science."
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> "There are known instructional strategies. The acquisition of different types of knowledge and skill require different conditions for learning (Gagné , 1985). If an instructional experience or environment does not include the instructional strategies required for the acquisition of the desired knowledge or skill, then effective, efficient, and appealing learning of the desired outcome will not occur." (Merrill, et al, 1996)

During a visit to an instructional development company, I saw the following maxim on their wall:

"IF A PRODUCT DOES NOT TEACH, IT HAS NO VALUE !"

I was very impressed. I couldn't agree more. Why are we spending billions of dollars for training unless we expect this training to increase quality performance, quality products, and more efficient and effective performance on the part of our employees? Yet a week does not go by that I don't have the opportunity to review products that DO NOT TEACH. Why? What is the preamble to this maxim?

May I suggest the following:

- There are different kinds of knowledge and skill (Gagné assumption).
- The different kinds of knowledge and skill each require different conditions (strategies) for learning.
- **IF** an instructional strategy does not include presentation, practice, and learner guidance that are consistent with the type of knowledge or skill to be taught, **THEN** it will not teach.
- **"IF A PRODUCT DOES NOT TEACH, IT HAS NO VALUE."**

Today's headlines always contain the word *information*. We are told that this is the *information age*. We are encouraged to jump onto the *information highway*. There seems to be an assumption that if we have sufficient information, then people will learn. The internet is a wonderful new medium for the exchange of information. However, dare I suggest that INFORMATION IS NOT INSTRUCTION.

May I quote again from our brief "Reclaiming …" paper:

> "Instruction involves directing students to appropriate learning activities; guiding students to appropriate knowledge; helping students rehearse, encode, and process information; monitoring student performance; and providing feedback as to the appropriateness of the student's learning activities and practice performance." (Merrill, et al, 1996)

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In addition to information, instruction involves several other very important activities: appropriate student practice with appropriate feedback (multiple choice questions are often not appropriate practice); learner guidance; and appropriate organization of knowledge elements. Information frequently does not have any of these important activities. Too much so-called instruction uses these activities inappropriately.

I was recently interviewed by a reporter who asked, "How does multimedia change training?"

I answered that in my opinion multimedia does not change training. We have always (at least in my lifetime) had multimedia (not always on a single display device like a CRT driven by a computer), but we have always had audio, text, graphics, video (or movies). With computer-based multimedia access is easier, production is easier. These are obvious answers.

My most important comment to this reporter was, "It is not multimedia resources that make a difference in training, it is how they are used." (Will this comment show up in the article?) All effective instructional strategies potentially require all of the types of media. Media is merely a way of representing subject matter content. Merely having multimedia objects included does not determine instructional effectiveness. If the media objects are relevant to the instruction, if they facilitate in implementing effective instructional strategies, then the effect is efficient, effective and appealing instruction. If, on the other hand, the media objects are merely decorative and serve no instructional purpose, then they may in fact interfere with, rather than facilitate, learning.

Unfortunately, effective, scientifically sound, instructional strategies are poorly understood. They are almost always inconsistent with the goals of instruction in most of the many instructional products that I have a chance to review.

What constitutes an instructional strategy?

A complete instructional strategy consists of **knowledge structure** consistent with, and appropriate for, the knowledge and skill being taught, a **presentation** consistent with, and appropriate for the kind of knowledge or skill being taught, an opportunity for **exploration** of the ideas being taught, **practice** with feedback consistent with, and appropriate for, the knowledge or skill being taught, and **learner guidance** consistent with, and appropriate for, the knowledge and skill being taught. The following paragraphs provide a brief overview of some basic instructional strategies.

Information-About Strategy

An Information-About strategy describes features, cautions, and context for some set of entities, activities, or processes. Information-about a device or procedure is contrasted with what-are-its-parts (parts of), what-kind-is-it (concept), how-to-do-it (procedure), and how-does-it-work (process). An information strategy should always be supplemental to other kinds of strategies.

A consistent information-about … strategy has the following characteristics:

Goal: The student will be able to identify information about a device or system.

Knowledge Structure: Information can be of many forms including, but not limited to, functions, features, cautions, and context. This information is usually verbal but can take other forms of representation.

Presentation: The student is given a name for the information, shown some multimedia portrayal of the information if required, and provided the description of the information. This portrayal and description together provide information that the student is expected to remember about the device or system. A presentation may also include "nice to know" information that the student will not be required to remember or later identify. When "nice to know" information is presented the student should be told that this is for interest only and they will not be required to remember this information.

Exploration: Information about should be available on learner demand in other types of instructional strategies such as parts-of, kinds-of, how-to-do, and how-does-it-work strategies. The student should have access to this information with a mouse click.

Practice: Given the description or portrayal the student is able to recognize or provide the name associated with the information. Or given the name the student is able to recognize the portrayal or description or to paraphrase the description. This is often accomplished with multiple choice, matching, or short answer questions.

Learner Guidance: During the presentation distinctive characteristics of the information is pointed out to the student. If appropriate, the student is provided with a mnemonic to assist in the remembering of the information. The guide also makes the context of the information clear to the student.

Parts of … Strategy

A consistent parts of … strategy has the following characteristics:

Goal: The student will be able to identify the name and location (with regard to some whole) of a given part of a device or system.

Knowledge Structure: An illustration of the device or system or some subassembly of the device or system. A high light to show the location of each part of the device or system to be taught. A name for each part. A description of the function or purpose of each part.

Presentation: The student is shown or can explore each part. This can be accomplished by having the name and description pop-up when the student points to a part, or by having a presentation which highlights each part and gives its name and description. The student should be allowed to explore the parts until he/she feels that they can locate each part.

Exploration: Students prefer explore type presentations where they can click on a part and be given its name, description, and other information. This allows the student to go back to a given part as many times as necessary to learn the necessary information.

Practice: The student is asked to point to the location of a given part given its name or description. Or the student is asked to recognize or type the name and/or description of a given part shown its location.

Learner Guidance: During practice, if a student points to an incorrect location for a given part, the correct location is shown to the student. During practice, if a student selects or types the wrong name or description for a given part the correct name or description is given.

Concept or Kinds of … Strategy

An consistent kinds of … strategy has the following characteristics:

Goal: The student will be able to identify unencountered examples of objects, devices, procedures, actions, or symbols as belonging to a particular class.

Knowledge Structure: A list of the discriminating characteristics which determines class membership. A set of examples from the class of objects, devices, systems being taught which include a multimedia portrayal of the example, a description of the example which illustrates each of the discriminating characteristics. A set of examples from coordinate classes which are not members of the class under consideration. Each of these examples have a portrayal and description which illustrate that they lack the discriminating characteristics or have different values for the discriminating characteristics.

Presentation: The student is told the superordinate class name (x is a kind of <superordinate class name>). The student is told the discriminating characteristics. The student is shown an example providing a specific case which clearly shows the discriminating characteristics. The student is shown other examples and non examples of the class being taught.

Exploration: The student is allowed to select new examples and non-examples. The student is allowed to request help in identifying the discriminating characteristics of a given example or non-example.

Practice: The student is presented unencountered examples from the class being taught and from coordinate classes (non-examples) and asked to identify those which belong to the class and those that do not belong to the class. The student may also be asked why a given instance belongs or does not belong to a given class by identifying the presence or absence of discriminating characteristics.

Learner Guidance: During presentation the illustration of each of the discriminating characteristics present in the examples are pointed out to the student. During practice the illustration of the discriminating characteristics of both instances correctly classified and incorrectly classified are pointed out to the student.

Procedure Strategy

A consistent procedure strategy has the following characteristics:

Goal: The student will be able to perform series of actions which lead to some desired consequence.

Knowledge Structure: A complete task should be identified. The task should be divided into distinct steps. If there are many steps the steps should be grouped into meaningful sub-sequences. Each step should be illustrated by showing the student how the step is performed in a specific situation. The consequence of each step should be illustrated by showing the student the state of the device or system following the execution of each step. If the task is a general procedure that can be applied in a number of different situations, then a number of specific cases should be identified and a demonstration prepared for each case.

Presentation: An adequate presentation consists of presenting the student with the task to be accomplished, with a list of the steps to be accomplished, and the order in which these steps must be executed. Each step must be demonstrated by showing the student how to perform the step. The consequence of each step must be demonstrated by showing the student the state of the device or system following the execution of each step. If the procedure can be applied in a number of different situations, the student should be shown a demonstration of additional cases. The number of specific cases demonstrated depends on the complexity of the procedure.

Exploration: The student should have an opportunity to "play with" the procedure. This "play" should allow the student to explore "what happens if …" type questions by actually trying out a variety of actions and observing the consequences. Such exploration requires some form of an exploratory environment or simulation.

Practice: Adequate practice consists of performing the complete task. For complex tasks, those with many steps or difficult steps, the practice should move from highly prompted practice to an opportunity to perform the whole task without any guidance. If the task cannot be performed using the actual device or system, then the student should have the opportunity to practice with an exploratory environment or simulation of the device or system. The simulation should allow the student to perform the task in a way that is similar to doing the procedure with the actual device or system. Both intrinsic feedback, observing the consequences of a given action or set of actions, and extrinsic feedback, informing the student about the appropriateness of a given action or set of actions, should be available.

Learner Guidance: During the demonstration the important aspects of the performance should be highlighted for the student. During early stages of practice the student should be prompted when they hesitate on a given step. As practice is repeated this help should be withdrawn until the student is able to perform the entire task without any learner guidance.

Process, Principle or How does … work Strategy

A consistent "how does … work" strategy has the following characteristics:

Goal: Given a set of conditions, the student is able to predict the consequence of an event. Or given a consequence (expected or unexpected) the student is able to identify the conditions which were present in order for this consequence to occur. When an unexpected consequence occurs (an error) then finding the precipitating conditions is called trouble shooting.

Knowledge Structure: A set of process rules consisting of conditions and consequences. A set of specific situations (correct or faulted) to which the process rule applies.

Presentation/Exploration: The process is demonstrated for the student (often in a simulation). The student is allowed to play with the simulation to "see what happens if…". The conditions necessary for each event in the process to occur are shown or told to the student. If the process will apply to a number of different situations, then a number of different scenarios (simulations) are demonstrated to the student or the student is allowed to "play with" a number of different simulations of the process.

Practice: The student is presented a specific situation. Based on the conditions of the device or system the student is asked to predict the consequence. The prediction is confirmed by allowing the system to execute and show the consequence of the execution. Or the student is presented a consequence (correct or flawed) and asked to identify the condition or conditions which were met or not met which caused the observed consequence. In complex systems the student may have to trace the execution back through several events to find the condition(s) which caused the observed consequence.

Learner Guidance: During the presentation the conditions necessary for a consequence for given event are made clear to the student. Often the best guidance is to allow the student to ask for an explanation of an unexpected consequence during exploration. This explanation identifies the conditions which caused the consequence. During practice the student's predictions or trouble shooting are confirmed by executing the system with explanations of what occurred during each step of the process and why (What conditions were met?).

BEWARE !

Are you considering the development of interactive, multimedia, computer-based courseware to meet your training needs? Be cautious!

Far too many CBT vendors are underprepared in instructional design. Ask your vendor the following questions:

- Is the principal person assigned to my project familiar with a variety of instructional strategies?
- Does the proposed approach involve different strategies for different goals?
- Does the proposed approach involve practice appropriate to the goals of the instruction? Multiple-choice questions may be consistent with information strategies, but they are usually not consistent with other kinds of instructional goals. Remember, information-about is always a supplementary goal, seldom the primary goal of the instruction.
- Is the proposed courseware product really instruction or merely information?
- Will the proposed courseware product really teach?

If you answered NO to more than 2 of these questions you might want to reconsider your vendor. Remember neither a clever name, an impressive title, experience in a subject matter domain, experience in

computer graphics, nor experience in computer programming can substitute for adequate expertise in the design of consistent instructional strategies.

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IF YOUR PRODUCT HAS NO VALUE, YOU HAVE WASTED YOUR TRAING DOLLARS!

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