Interest in distance education is at an all time high and is being driven by popular interest in the Internet and the World Wide Web. These particular technologies, however, represent only the tip of a huge technology iceberg. Today's instructional designer has a myriad of highly advanced communication delivery media available ranging from the mundane to the exotic.

Historically, instructional design practice taught that media selection was the result of a meticulous understanding of the relationship between an audience and the learning objective. Further, delivery media was merely a conduit for learning and did not effect the content of what was being taught. However, according to McGrath and Hollingshead (1994), the relationship between task and delivery media is not strictly neutral but one that exerts a reciprocal effect. This is clearly the case in distance education where the task depends heavily on the effectiveness of the delivery medium to carry the instruction. What is needed, therefore, is a clearer understanding of the structural characteristics of tasks in order to better select the most effective media from the emerging communication technologies which are shaping the future of education. The key is how to maximize the effectiveness of our choices in order to improve instruction.

This article proposes a framework that will allow designers and teachers to research better design methodologies given the rapid expansion of technologies, and also to choose the most appropriate current technologies for a particular instructional task. Most teachers or administrators do not have the luxury of unrestricted access or availability of a given technology. Therefore another use of this framework is to design better instructional tasks in order to match the available technology.

**Task outcomes**

The goal of any instruction is to overcome a deficiency of skill or of knowledge in a learner. Careful determination of the instructional task provides the designer with clear guidelines in terms of content organization, as well as determining content sequence and pacing. Without a clear understanding of the task, instruction becomes muddled and unproductive.

Essentially there are two kinds of tasks, well-defined and ill-defined.

**Well-defined.** Well-defined tasks usually have a clearly understood solution or can be solved through a systematic process of problem decomposition to axiomatic propositions. For example, identifying or locating the capital for each

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of the 50 states is a well-defined task which has a single solution. This type of outcome is well suited for novices, and for factual information which can be presented directly and is easily acquired.

**Ill-defined.** In contrast, an ill-defined task does not have a single solution and typically cannot be reduced to axioms. An ill-defined task is equivocal and normally requires multiple inputs that can lead to different solutions or different perspectives. For example, trying to understand the reason that Lee lost at Gettysburg is an ill-defined problem because there is no single answer. There are a lot of factors, issues, and different perspectives which provide a range of solutions.

**Structural characteristics of tasks**

Even though the essential outcomes of the two task types are different, we can analyze them from four structural characteristics. These are: social dynamics, procedures, interaction, and information sources. The structural characteristics of the task (Table 1) is normally determined by the type of task.

Well-defined tasks exhibit distinctive structural characteristics. First they are normally solved by an individual using available information at hand. The traditional problem-solving strategies are learned externally and can be applied in a systematic process. Levels of peer-to-peer interaction is low because all of the necessary information to solve the problem is contained within the problem.

For example consider a typical word problem in arithmetic:

> James drove to Dallas from Lubbock. The total number of miles that James drove was 345 and it took him 5 hours to complete the trip. How fast was James driving?

This is a well defined problem because all of the information necessary to solve the problem is contained in the text of the problem. By knowing the correct procedure (rate \( \times \) time = distance), a student should be able to glean enough information to solve the problem without much interaction or intervention.

Board games such as Monopoly™ are also examples of well-defined tasks. The rules of the game are externally imposed with all the necessary information self-contained in the game. The game is competitive at an individual level with little requirement for dialogue.

In contrast consider an ill-defined task or problem. For example a city needs to plan for the building of a new stadium. The social dynamics suggest a group would be better since an individual would not possess enough information necessary to solve the problem. Also, it may not be clear what is the true problem. By interacting with other individuals the true nature of the problem could be better understood. In addition the strategies and procedures necessary to solve the problem most likely will emerge from the exchange within the group. Consequently, for most ill-defined problems dialogue is frequent and important because the necessary information needed to solve the problem is not contained by the problem statement.

Bridge is also a good example of an ill-defined task. A successful hand of bridge depends on the interaction, the collective strategies, and knowledge of both bridge partners.

**Inherent nature of delivery technology**

Selection of delivery media is more often than not viewed as being neutral to the instructional outcome. The problem is that we classify technology more by the way we use it and not by its inherent qualities to solve specific types of learning problems. By identifying inherent qualities of a delivery technology in terms of the connectivity, patterns of interaction it supports, the type of artifact it produces, and its social structure, we are better able to match the technology to the task. (Table 2)

Delivery media are not all equal. Individual delivery technologies have inher-