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Instructional Strategies and Learning Styles: Which takes Precedence?

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There is pretty general agreement that "Individuals differ in their general skills, aptitudes, and preferences for processing information, constructing meaning from it, and applying it to new situations." (Jonassen & Grabowski, 1993). Keefe (1979) defines "... learning styles [as] the composite of characteristic cognitive, affective, and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with, and responds to the learning environment." There is currently much discussion of learning styles in both the popular and academic press. One author suggests that "The aim of learning style research is to find clusters of people who use similar patterns for perceiving and interpreting situations. Based on this information, we should be able to adjust educational environments to make them more efficient and successful places." (O'Connor, 1999).

In this paper we explore the relationship between instructional strategies and learning styles. Here are a couple of questions you might consider while reading the following material. Do different learners have different learning mechanisms? Which is most important in determining an appropriate instructional strategy for a given instructional goal: the content to be taught or the learning style of the learner?

It is our position that: "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)

Gagné's position has been called content-by-treatment interaction (Jonassen & Grabowski, 1993) or I would prefer content-by-strategy interaction. This position suggests that the goals of instruction are primary in determining an appropriate instructional strategy for a particular instructional goal. Many research studies have demonstrated that, regardless of the learning style of the student, when the goal of the instruction, as measured by tests that are consistent with this goal, are consistent with the strategies used to teach this goal, then learning is optimal. (See Merrill, 1994). When the instructional strategies used are inconsistent with the goal of the instruction, then there is a decrement in learning. In a recent paper we outlined a few of the appropriate strategy requirements for some common different kinds of instructional goals (Merrill, 1998). An examination of much of the available training material demonstrates that much of our current training materials include instructional strategies that are inconsistent with the goals of the instruction. Inconsistent instruction is ineffective instruction regardless of learner style.

Wait a minute, I can hear you think, it is obvious that learning styles make a difference. How? Where? If not in the essential elements of instructional strategy, where?

Gardner argues for different kinds of intelligence (Gardner, 1983). He argues that some persons are strong in one kind of intelligence while another person is stronger in another kind of intelligence. That if

my strength is in *bodily-kinesthetic* intelligence I might learn to dance very well while having trouble learning mathematics or science. Isn't this a case where learning style (Gardner intelligence type) makes a difference? Of course it makes a difference, but, not in the fundamental components of the instructional strategy. This difference might be characterized as a learning-style-by-content interaction. A given person might have learning mechanisms and physical abilities that favor the content of one domain of learning over another. However, the content types suggested by Gagné and myself do not refer to subject domains but rather to kinds of outcomes that are likely to occur within every domain. Each of the different types of intelligence may still require the learner to acquire a concept, learn the parts of an entity, learn a procedure, or understand a process. It is these fundamental types of outcome that determines different instructional strategies in a content-by-strategy interaction. Whether a learner's strength is *logico-mathematical* or *bodily-kinesthetic* when learning a concept within that domain it is still necessary to have a definition, examples, non-examples, and to practice identifying previously unencountered examples in order to acquire the concept.

Isn't it necessary to modify an instructional strategy for a student learning a concept from a subject domain that is not his or her strength? Yes. It may be necessary to increase the number of examples, to make the representation of these examples more manipulative rather than symbolic, or to increase the amount and kind of attention-focusing learner guidance. However, these modifications are all elaboration of the fundamental components of an instructional strategy appropriate for, and consistent with, the teaching of a concept. The modification of the strategy to accommodate for a student's domain preference is secondary to the fundamental content-by-strategy consistency required for effective instruction.

Ruth Clark (1998) suggests four different instructional architectures (*receptive*, *directive*, *guided discovery*, and *exploratory*) that I would call instructional style. *Receptive* instruction is characterized by a lecture or an Internet site where the student is merely provided with information. *Directive* instruction is characterized by a computer-based tutorial where information is presented, the student responds, feedback is provided and this tutorial learning cycle is repeated. *Guided Discovery* is characterized by a computer simulation that allows the student to manipulate some device or environment. *Exploratory* instruction is characterized by an open learning environment in which the student is provided a rich, networked database of information, examples, demonstrations, and exercises from which the student can select whatever is appropriate to their current needs and mental models. Clark suggests that there is an interaction among student characteristics and instructional architecture. For example she suggests that a *directive* instructional style is more appropriate for novice learners while a *guided-discovery* instructional style may be more appropriate for more experienced learners, and an *exploratory* instructional style is best for expert learners. Consistent with learning style, Jonassen and Grabowski (1993) cite studies that show that *cognitive-constricted* learners do better with a *directive* style while *cognitive-flexible* learners do better with a *guided discovery* or *exploratory* style. Surely this suggests that learner style requires adjustment in instructional strategy? The answer is yes and no. Like different domains each of these instructional styles include all of the types of learning outcomes, that is, each of these styles can be used to teach concepts, procedures, and processes. Within each instructional style the essential components of a consistent strategy must be present. A concept requires a definition, examples, non-examples, and practice in identifying unencountered instances. In a *receptive* style the definition and contrasted examples and non-examples must be present or the learner will not effectively and efficiently acquire the concept. The *receptive* style is often an incomplete, and therefore inconsistent, style since it often does not include appropriate practice. In the *directive* instructional style the definition, examples, and non-examples are presented directly to the student and then the student is given appropriate practice. In a *guided-discovery* instructional style the learner may have more freedom in exploring a situation to find the appropriate examples and non-examples. However, in a *guided-discovery* instructional product if there are not contrasted non-examples available, or if the student does not have the opportunity to practice identifying instances of the concept, there will be a decrement in learning. In *exploratory* situations learning is often less effective because many students are not skilled in finding the necessary components of the appropriate instructional strategy. They may fail to find appropriate examples or they may fail to engage in appropriate practice, thereby causing a decrement in their learning. When a given instructional architecture results in ineffective learning it is not the architecture that is inappropriate for the learning

style of an individual student, but rather that the particular implementation of that architecture failed to include all of the instructional strategy components required to teach a given instructional outcome.

Each of these architectures may be set in individual or collaborative learning environments. *Field-dependent* learners do better in group-oriented or collaborative situations. *Field-independent* learners do much better in individualized learning situations than do *field-dependent* learners. However, whether a student is *field-independent* or *field-dependent* or whether the learning environment is individual or collaborative, a given instructional goal still requires all of the strategy components that are consistent with this goal for the learning to be effective.

The design of an instructional strategy includes a number of important instructional decisions including selecting content segments, sequencing these segments, selecting appropriate instructional transactions, sequencing these individual transactions, and configuring a given transaction for a given architecture and for a given student. As a student engages each of the instructional transactions in an instructional environment these transactions can be arranged so as to adapt in real time, during the instruction, to the individual learning needs of each student. Each of these various instructional decisions are subject to aptitude (learning style)-by-treatment (strategy) interactions. Within each of these decisions the content-by-strategy interaction is primary and the learning-style-by-strategy interaction is secondary. In other words, the adjustment in strategy necessitated by different learning styles takes place within the framework of the fundamental requirements of an instructional strategy that is appropriate for and consistent with a given instructional goal.

Let me very briefly illustrate some other possible learning-style-by-strategy interactions. These are representative interactions and not a complete list by any means. (See Jonassen and Grabowski, 1993 for a more complete elaboration of these and other learning-style-by-strategy and learning-style-by-content interactions).

Content sequence. *Cognitive-restricted* and *serialist* learners learn better from content arranged in a logical sequence and prefer to learn each topic in order. *Cognitive-flexible* or *holist* learners learn better when they are able to select which topic to study next and to review each topic to get a whole picture before studying each topic in detail. Note however, that when the detail study comes each type of learner must engage in the instructional strategy that is appropriate for and consistent with the instructional goal.

Transaction Sequence. *Holist* learners prefer an *inductive-sequence* where they are presented examples and demonstrations first prior to figuring out a definition or seeing the steps listed. *Serialist* learners prefer a *deductive-sequence* where they see the definition or list of steps first prior to seeing examples or a demonstration. Nevertheless, both the inductive and deductive sequence of transaction components must still contain all the components of the appropriate and consistent strategy or there will be a decrement in learning.

Transaction Configuration. Instruction is characterized by the representation of the content information included and by the addition of information, directions, and learner guidance that enhances the students ability to acquire the information presented. It is in the area of learner guidance where learning-style-by-strategy interactions may also play a significant role. *Visual* learners learn best when information is presented in graphic form. *Verbal* learners prefer textual presentations or lectures. *Haptic* learners prefer information they can manipulate. Nevertheless *visual*, *verbal* or *haptic* learners must still have all the components of an appropriate and consistent instructional strategy even though these components may have different forms of representation.

Concept Instruction. In learning a concept all learners need to see examples and non-examples. However, *holist* learners tend to have a problem with undergeneralization, they need to see more divergent examples to promote generalization. *Serialist* learners tend to have a problem with overgeneralization, they need to see more matched example non-example pairs to facilitate their ability to discriminate among examples and non-examples. Both of these types of learners need examples and non-examples as these are essential components of a concept instruction strategy. However, each type of learner requires a different emphasis in the relationships among these instances.

We conclude with the following:

Learning style is secondary in selecting the fundamental components of instructional strategy appropriate for and consistent with a given learning goal. However, learning style should be considered in selecting instructional style and adjusting the parameters of a given instructional strategy.

In conclusion:

We have suggested that a student must engage in those activities (conditions of learning) that are required for them to acquire a particular kind of knowledge or skill. These activities can be directed by an instructional system (live or technology-based) or they can be engaged in by the student on their own. However, (a) too many instructors do not know these fundamental instructional strategies, consequently much of what passes for instruction is inadequate and does not adequately implement these fundamental learning activities. (b) Most students are unaware of these fundamental instructional (learning) strategies and hence left to their own are unlikely to engage in learning activities most appropriate for acquiring a particular kind of knowledge or skill.

We have suggested that (a) there are certain fundamental learning activities that are necessary if a student is to efficiently and effectively acquire a particular kind of knowledge or skill. (b) These fundamental learning activities cut across subject matter domains. (c) A learner can engage in these fundamental learning activities in a wide variety of delivery systems (ranging from live instruction to exploring the internet), in a wide variety of instructional architectures (receptive, directive, guided discovery, or exploratory), and in a wide range of social contexts (individual study to highly interactive cooperative learning environments). (d) Finally, these learning activities can be suggested, directed, coached, monitored, or promoted by an instructional system or these learning activities can be initiated by the learner themselves.

If a learner (whatever the context of learning) does not engage in the learning activities that are appropriate for, and consistent with, a given kind of knowledge or skill then there will be a decrement in the learning effectiveness, efficiency and appeal. Do we know all the answers for these fundamental learning activities? NO! That is the role of a science of instruction and a technology of instructional design, to continue to explore and find these fundamental principles. Do we know some of these fundamental learning activities? YES! Do we use what we know? SELDOM!

Bottom line. Appropriate, consistent instructional strategies are determined first on the basis of the type of content to be taught or the goals of the instruction (the content-by-strategy interactions) and secondarily, learner style determines the value of the parameters that adjust or fine-tune these fundamental learning strategies (learning-style-by-strategy interactions). Finally, content-by-strategy interactions take precedence over learning-style-by-strategy interactions regardless of the instructional style or philosophy of the instructional situation.

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