

Reflections on the Implications of Constructivism for Educational Technology

Charles M. Reigeluth
Contributing Editor

I applaud the special issue of *Educational Technology* on the implications of constructivism for educational technology (May, 1991). Constructivism is a valuable perspective that has much to contribute to our understanding of how to facilitate learning, and I think educational technologists will gain some valuable insights from the special issue. The following are comments about each of the five articles by constructivists. I have chosen not to comment on the last two articles of the special issue because they are themselves commentary on the other five articles.

Duffy and Jonassen

My major concern with the Duffy and Jonassen article—and the Cunningham article—is that the authors advocate an extreme view of constructivism, with an ideological fervor that borders on evangelism, rejecting all other perspectives as “heresy.” In a related article, Bednar, Cunningham, Duffy, and Perry (1991) talk more like evangelists trying to sell educators on a new religion, than like educators trying to identify the best ways to facilitate learning. Constructivism has much that is of value to educators, but so do other perspectives. And what constructivism has to offer is not equally useful for all learning situations.

For example, a major thesis of Duffy and Jonassen is that “There are many ways to structure the world and there are many meanings or perspectives for any event or concept. Thus, there is not a correct meaning that we are striving for” (p. 8). Aside from the fact that the authors don’t

practice what they preach, I agree with this statement—*sometimes*. There are also instructional situations where there *is* a correct meaning that we are striving for. There *are* situations where learners want and/or need to acquire the understandings and skills of an “expert” as defined by “objectivist cognitive psychology” (p. 8). It concerns me that such an open-minded, pragmatic approach doesn’t seem to be a part of the authors’ “holy writ.” Educational practitioners, who are looking for the best means to facilitate a diversity of kinds of learning, can’t afford the luxury of being so ideological, dogmatic, and exclusionary in their view of education. As such, educational technologists need to be more pragmatic and eclectic, drawing from diverse theoretical perspectives as each proves useful in facilitating different kinds of learning. It was encouraging to see Spiro and his colleagues supporting this notion in their article (see my comments later).

Similarly, I have concerns about the authors’ statement that “there is no ultimate, shared reality, but rather, reality is the outcome of a constructive process.” And “. . . each [person] has their own construction, their own understanding, rather than both encompassing some common reality” (p. 9). Again, this seems like an extremist, ideological view of the world. Can’t the constructive process result in a shared reality? Aren’t there any objective, verifiable realities in the world? Can’t some constructions be right and others wrong? I agree that many views are not a matter of right or wrong; there are equally plausible views. And I agree that all knowledge we have is the outcome of a constructive process. But let’s be reasonable. We couldn’t even have language without *some* shared reality. And it seems to me that the purpose of learning is to increase the extent to which we share the more plausible realities.

It is also helpful to keep in mind that educational technologists have long espoused some of the major tenets of constructivism. They have for some time advocated “situating” learning experiences in authentic activities. For example, in 1975 Merrill advocated making examples and practice consistent with the post-instructional requirements (Merrill and Wood, 1975). And I don’t think any would deny that a learner’s experience influences her or his understanding of an event or concept. Also, educational technologists have long decried that schools have decontextualized learning.

Much of what is advocated under the rubric of these authors’ extreme view of constructivism seems to me to be more relevant to curriculum theory than to instructional theory, for it is more concerned with decisions about *what* to

Charles M. Reigeluth is Professor and Chairman, Instructional Systems Technology, Indiana University, Bloomington, Indiana.

teach than with *how* to teach it. Although the two are highly interrelated, very different considerations are used to make decisions for each. Decisions about *what* to teach are made primarily on the basis of pragmatism (e.g., through a needs analysis) or philosophy and values (e.g., through a democratic process). Decisions about *how* to teach are made on the basis of what works best for different kinds of learning, learners, and situations, which is what instructional theory attempts to prescribe. When Duffy and Jonassen say, "Instruction should not focus on transmitting plans to the learner . . ." (p. 9), they are stating a philosophical position that may contradict the pragmatic requirements in a given training situation. For example, certain employees in the ABC company may only need to use plans to perform a task. But, on the other hand, I also believe that in many situations it is better to "... develop the skills of the learner to construct plans . . ." (p. 9).

I have two additional concerns with the article by Duffy and Jonassen. First, they hold that our instructional designs are "an implicit expression of our theory of learning" (p. 7). But, not all instructional designs are based on a theory of learning. Some were developed inductively by trial and error: teachers found that certain instructional strategies worked better than others. Those teachers may have no inkling as to why, or what learning processes are involved. In fact, theories of learning have been invented to explain why instructional strategies work, as well as instructional strategies being invented to implement a theory of learning.

Second, Duffy and Jonassen refer to "goals for learning" and a "concept of what it means to 'understand' the subject matter" as synonymous with "theory of learning" (p. 7). But these are both outcomes, ends. Theory, on the other hand, is concerned with change relationships: how learning occurs, in the case of learning theory, or how to best facilitate learning, in the case of instructional theory.

Finally, there is a minor inaccuracy I would like to clarify. Duffy and Jonassen advocate an integration of learning theory and instructional theory, and contrast that goal with "Reigeluth's call for a distinction" between the two. I didn't *call* for such a distinction; I tried to *clarify* some distinctions between the two. They *are* different, though related, phenomena, as Herbert Simon, a Nobel laureate, pointed out so well in his book, *The Sciences of the Artificial* (1969). I don't believe learning theory and instructional theory should be divorced from each other, any more than theory and practice (which are also two different things) should be divorced. But it is still useful to under-

stand the differences between the two. Like all descriptive and prescriptive bodies of knowledge, both learning theory and instructional theory have much to contribute to the other. Hence, I support the authors' thesis that it is beneficial to "integrate" learning theory and instructional theory, but I also feel it is important to recognize the differences between the two.

Cunningham

The Cunningham article also seems to me to take an extremist, exclusionary, and somewhat evangelical, view of cognitivism. I agree that

... when instruction is embedded in situations where students are involved in realistic or actual tasks, assessment arises naturally from those situations . . . (p. 15)

Sometimes. I also think that there are times when formal tests or "objective measurements" are needed, such as when you want to make sure that someone like a surgeon who is going to perform an operation on you has acquired specific skills. It's not sufficient to know that the doctor was on a team of medical students that performed the operation successfully; you want to know if that doctor can do it without that team.

Cunningham, in the voice of Sagredo, also says:

If the purpose of the group is to promote the attainment of the same objective by every member, then your criticism may be justified. . . . If, however, the objective of the group is a collective one—that is, to solve the problem at hand . . . (p. 17)

If the objective of the group is only to solve the problem at hand, then it is a performance objective, not an instructional objective, and you need performance technology, not educational technology. But just as importantly, you could well have a team-learning situation where the purpose is not for all members to learn the same objective. Each team member may well need to learn a different role from the others. That is a separate issue from whether one needs to make sure that the necessary learning has occurred. The point is that there *are* some situations in which it is important to confirm that certain learning has occurred, and successful completion of the task by the team will not, in *some* situations, be enough to make that confirmation.

The author, again in the voice of Sagredo, also says:

Objective measurement is a fiction or at best a degenerative case where knowledge is so decontextualized that only one context (the school context) is relevant. (p. 15)

I'm sure that in some cases this is true, but certainly not all. There are also cases where performance-based testing in context can—and should—be done objectively. Even the author's prescription that "learning should occur in realistic settings" (p. 14) is not always true; cost-effectiveness considerations may occasionally favor the use of a not-so-realistic setting. Such sweeping ideological pronouncements do little to help practitioners make wise, professional, effective decisions.

Like Duffy and Jonassen, Cunningham offers a number of prescriptions that are more relevant to curriculum theory than to instructional theory, such as:

The role of education in a constructivist view is to show students how to construct knowledge, to promote collaboration . . . , and to arrive at self-chosen positions

Again, these objectives will be very appropriate for some situations but will not be appropriate for others.

I have two other concerns, which may be more of a philosophical nature, although research may also prove illuminative. On p. 15 Cunningham indicates that the teacher should be the judge as to whether a task has been successfully completed (learned). Putting the teacher in the role of judge is an industrial-age mindset that establishes an adversarial relationship between the teacher and the learner. Many who are interested in restructuring education to meet the needs of learners in the information age are calling for outside evaluators—often a panel of evaluators that includes community members and other students, as well as teachers—so that the teacher assumes the role of coach or facilitator, someone who is on the learner's side.

Finally, Cunningham says that higher-level skills cannot be "conceived independent of the problems to which they are applied" (p. 16). This is in direct conflict with what most other constructivists emphasize as the importance of promoting transfer of higher-level skills. In fact, the Cognition and Technology Group advocate "pairs of related adventures" to help students to "analyze exactly what they are able to carry over from one context to another and what is specific to each context but not generalizable" (p. 36). The latter is the kind of rational, nonideological approach that educational practitioners need to most facilitate learning.

Perkins

In contrast to the previous two articles, I found this one (and all the remaining ones) to be a much more reasoned and pragmatic view of the application of constructivism to education. The five facets of a learning environment, the BIG-WIG distinction

(along with the author's viewpoint that the important issue is to find the appropriate balance of the two), and the morals for front-end analysis, instructional strategies, and assessment were all valuable insights that all educational technologists would do well to incorporate into their instructional design repertoires.

Spiro, Feltovich, Jacobson, and Coulson

I found the article by Spiro, Feltovich, Jacobson, and Coulson to be insightful and informative. I could not find a single point of disagreement, and I came away with many valuable new insights. I was impressed by their delimitation of boundaries for the generalizability of their Cognitive Flexibility Theory and Random Access Instruction:

We will be concerned only with learning objectives important to *advanced post-introductory knowledge acquisition: to attain an understanding* of important elements of conceptual complexity, to be able to use acquired concepts for reasoning and inference, and to be able to flexibly apply conceptual knowledge to novel situations. (p. 25)

And in introducing their hypertext approach:

The omission of other varieties of computer-based instruction from our discussion does not imply any negative evaluation of their merits. Indeed, in other instructional contexts the kinds of hypertexts we will discuss would be inappropriate (e.g., computer-based drill would be better suited to the instructional objective of memorizing the multiplication tables) (p. 25)

And the acknowledgment that

. . . *compartmentalization* of knowledge components is an effective strategy in well-structured domains, but blocks effective learning in more intertwined, ill-structured domains which require high degrees of knowledge interconnectedness. (p. 27)

I am particularly impressed with the analysis of kinds of learning deficiencies (actually, kinds of oversimplification, or "reductive bias"): additivity bias, discreteness bias, and compartmentalization bias (p. 27). I also like the notion of the "new constructivism" as "doubly constructive":

(1) understandings are constructed by using prior knowledge to go beyond the information given; and (2) the prior knowledge that is brought to bear is itself constructed, rather than retrieved intact from memory, on a case-by-case basis [in ill-structured domains]. (p. 28)

I am concerned by something Duffy and Jonassen said in their two paragraphs about this article:

We cannot simplify the context by removing the complex features, for example, as is done in forming an epitome (Reigeluth and Stein, 1983).

This is a misleading statement, first because it does not accurately characterize the Elaboration Theory, and second because it does not accurately characterize what Spiro and his colleagues say in this article. An epitome does not simplify the *context* at all; it utilizes a class of simple *real-world* cases, complete with all their real-world context. Given the statement by Duffy and Jonassen, I was surprised to find that Spiro and his colleagues make no reference to epitomes at all in their article. Furthermore, none of their three kinds of oversimplification (additivity bias, discreteness bias, and compartmentalization bias) is prescribed by the Elaboration Theory. It surprises me that Duffy and Jonassen would make such an inaccurate characterization.

I was also particularly impressed with the discussion of oversimplification by Spiro and his colleagues:

The common denominator in the majority of advanced learning failures that we have observed is *oversimplification*, and one serious kind of oversimplification is looking at a concept or phenomenon or case from just one perspective. In an ill-structured domain, that single perspective will *miss* important aspects of conceptual understanding, may actually mislead with regard to some of the fuller aspects of understanding, and will account for too little of the variability in the way knowledge must be applied to new cases. (p. 29)

Perhaps this statement also applies to those who only view learning and instruction from an extreme and exclusionary constructivist perspective.

Cognition and Technology Group

Like the previous two articles, I found this one to be a very reasoned and pragmatic view of the application of constructivism to education. The seven design principles (or more accurately strategies) are ones that educational technologists either have already or should incorporate into their instructional design repertoires. My only concern is that it was not made very clear as to when each of the seven strategies should—and should not—be used. Clearly, a video-based presentation format is not always most appropriate. And the same is true of each of the other six strategies. Nevertheless, the strategies are all important ones for practitioners to call upon when appropriate.

Conclusion

Overall, I found this special issue to be a useful contribution to our professional dialogue. I applaud the editors for putting it together. And I encourage educational technologists to continue to explore the most appropriate application of constructivist insights. □

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