

Constructivism: Implications for the Design and Delivery of Instruction

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Indiana University Instruction should be designed to support a dialogue between the child and his or her future; not a dialogue between the child and the adult's history. Adult wisdom does not provide a teleology for child development.

Adapted from Griffin and Cole's discussion (1984) of the zone of proximal development.

7.1 Introduction

Constructivism! The increase in frequency with which this word appears in the discourse of educational research, theory, and policy is truly remarkable. Unfortunately much of the discussion is at the level of slogan and cliché even bromide. "Students should construct their own knowledge" is being reverentially chanted throughout the halls of many a school/college/department of education these days, and any approach that is other than constructivist is characterized as promoting passive, rote, and sterile learning. For example, consider Rogoff's (1994) description of what she calls the adult-run model of how learning occurs:

... learning is seen as a product of teaching or of adults' provision of information. Adults see themselves as responsible for filling children up with knowledge, as if children are receptacles and knowledge is a product.... [The] children are seen as receivers of a body of knowledge, but not active participants in learning. The children have little role except to be receptive, as if they could just open a little bottle cap to let adults pour the knowledge in. In this adult run model, adults have to be concerned with how to package the knowledge and how to motivate the children to make themselves receptive (p. 211).

The views expressed in this paper, however, do not necessarily reflect the views of the Laboratory. We wonder how many, if any, educators would recognize themselves in this description. Perhaps the proponents of programmed instruction? Skinner would certainly reject the aspersion:

A good program of instruction guarantees a great deal of successful action. Students do not need to have a natural interest in what they are doing, and subject matters do not need to be dressed up to attract attention. No one really cares whether PacMan gobbles up all those little spots on the screen.... What is reinforcing is successful play, and in a well-designed instructional program students gobble up their assignments (1984, p. 949).

Skinner goes on to describe a classroom in which the students are so volubly engaged with the instruction on their "teaching machine" that they don't even look up when the teacher makes distracting noises by jumping up and down on the teacher's platform at the front of the room. It may be time to move beyond the paradigm debates of the last few years for precisely the reason that the tendency to sort the various approaches into "Good Guys" and "Bad Guys" (Cunningham, 1986) has not led in profitable directions. Skinner and his advocates see themselves as virtuous as any constructivist (see [2.5.2](#))! The debates have focused on method, as in whether we should use a problem-based method, or cooperative groups, or hypermedia databases, or programmed instruction, etc. For some, the paradigm issue has reached the status of the utterly irrelevant; we should ignore theoretical issues and simply pick the methods that work, that reliably and efficiently lead to student learning.

What we see as crucial in these debates, however, is scarcely acknowledged: a fundamental difference in world view, disagreement at the level of grounding assumptions, the fundamental assumptions underlying our conception of the teaching-learning process. It must be recognized that grounding assumptions are always assumed, that they can never be proved unambiguously true or false. We may and certainly will provide evidence and try to persuade you that our assumptions are reasonable and those to which you should commit. An important part of our argument will be that these assumptions lead to demonstrably different goals, strategies, and embodiments of instruction, even when there are some superficial similarities to instruction derived from different assumptions.

An immediate difficulty confronts us, however. The term constructivism has come to serve as an umbrella term for a wide diversity of views. It is well beyond our purposes in this chapter to detail these similarities and differences across the many theories claiming some kinship to constructivism. However, they do seem to be committed to the general view that (1) learning is an active process of constructing rather than acquiring knowledge, and (2) instruction is a process of supporting that construction rather than communicating knowledge. The differences, some quite pronounced, are in definitions of such terms as knowledge, learning, and construction, and about the processes appropriate for supporting learning. For example, within Rogoff's (1994)

distinction between three instructional approaches--(1) adult-run (transmission from experts to novices), (2) children-run (individual or collaborative discovery), or (3) community of learners (transformed participation in collective sociocultural experience)--one can see possibilities of both constructivist and nonconstructivist instruction. So, for example, reciprocal teaching (e.g., Palinscar & Brown, 1984) is often cited as a constructivist teaching strategy, yet it is very much teacher led. Similarly, group problem-based learning interventions (Savery & Duffy, 1995) might focus on the individual achievement of prescribed learning outcomes rather than on any sort of pattern of collective participation.

As the quote from Skinner suggests, everyone agrees that learning involves activity and a context, including the availability of information in some content domain. Traditionally in instruction, we have focused on the information presented or available for learning and have seen the activity of the learner as a vehicle for moving that information into the head. Hence the activity is a matter of processing the information. The constructivists, however, view the learning as the activity in context. The situation as a whole must be examined and understood in order to understand the learning. Rather than the content domain sitting as central, with activity and the "rest" of the context serving a supporting role, the entire gestalt is integral to what is learned.

An implication of this view of learning as constructed in the activity of the learner is that the individual can only know what he or she has constructed--and we cannot "know" in any complete sense of that term what someone else has constructed. This implication has led to considerable debate among many individuals seeking to understand constructivism. In particular we hear the reaction that constructivism leads inevitably to subjectivism, to a relativism where anyone's constructions are as good as any one else's and where we are unable to judge the value or truth of constructions with any degree of certainty. As will be detailed below, constructivists typically substitute some notion of viability for certainty; that is, we judge the validity of someone's knowledge, understanding, explanation, or other action, not by reference to the extent to which it matches reality but, rather, by testing the extent to which it provides a viable, workable, acceptable action relative to potential alternatives. As Bruner has noted, asking the question "How does this view affect my view of the world or my commitments to it, surely does not lead to 'anything goes.' It may lead to an unpacking of suppositions, the better to explore one's commitments" (1990, p. 27).

A second concern has been that the idiosyncrasies of constructions lead to an inability to communicate. That is, how can we possibly talk to one another if our world constructions (meanings) are idiosyncratic based on our experience. Indeed, the lack of shared meaning can make communication very difficult for two people from very different cultures. Simple language translations do not do the trick; rather we must develop cultural understandings before we can

communicate adequately, a lesson the business community has already learned in this increasingly global economy. For those of us who share a common culture, however, the communication is not that difficult. Indeed, cultures are defined by a set of common experiences and the agreement of a common set of values based on those experiences. As Bruner (1990) puts it, culture forms minds, and minds make value judgments.

But don't we have shared meaning within the culture? Is it possible to have shared meaning? We can only evaluate whether meaning is shared by testing the compatibility of our individual meanings: exploring implications, probing more deeply. Of course, no matter how much we probe, we can never be sure that the meaning is shared. Thus, rather than assuming a shared meaning, within the constructivist framework there is a seeking of compatibility, a lack of contradiction between views (Rorty, 1989). We probe at deeper and deeper levels to determine where or if our understandings begin to diverge. There are two important implications of this constructivist framework. First, we do not assume that we must have a common meaning, but rather we actively seek to understand the different perspectives. Second, from a learning perspective, we do not assume that the learner will "acquire" the expert's meaning, and hence we do not seek a transmission approach to instruction. Rather we seek to understand and challenge the learner's thinking.

The common ground of constructivism could be summarized by von Glasersfeld's statement: "Instead of presupposing knowledge is a representation of what exists, knowledge is a mapping, in the light of human experience, of what is feasible" (1989, p. 134).

7.1.1 A Brief Historical and Philosophical Context

Current research and theory in learning and instruction has far too often been presented in an historical framework, with a consequence that we fail to learn about the complexity of the issues and the potential pitfalls from previous work (Cuban, 1991). Constructivism certainly has a long history in education and philosophy, and there is much to be learned from that history. However, a review of that history could easily be a book in and of itself. As a consequence of the space available, it is with apologies that we can only offer a brief reference to these historical contexts.

Von Glasersfeld (1989) attributes the first constructivist theory to an Italian philosopher, Giambattista Vico, in the early 18th century. As described by Von Glasersfeld, "one of Vico's basic ideas was that epistemic agents can know nothing but the cognitive structures they themselves have put together . . . 'to know' means to know how to make." (1989, p. 123). While Vico has received little attention in current constructivist theory building, there are several 20th-century philosophers who provide significant epistemological grounding for the current constructivist views. Chin (1970), the later Wittgenstein (Malcomb, 1986), and Rorty (1991) are all frequently cited for their basic argument that knowledge is a construction by individuals and is relative to the

current context (community), rather than representing some correspondence to external reality.

Kuhn (1970), of course, has made this point most strongly in considering theory and research in science. His *Structure of Scientific Revolution* (Kuhn, 1970) provided the grounding for a major paradigm shift in science toward a "best description" view of theory rather than an approximation to the "truth." In essence, he argued that the meaning of our vocabulary resides in our theory rather than outside of it. Thus, there is no metavocabulary that sits independent of theory, and, as such, it is impossible to translate between theories. That is, theories provide their own lens into the world, with each theory providing a different lens (or perspective). For example, Kuhn argues that there is no independent way to reconstruct phrases like "really there." All "facts" are theory laden.

Wittgenstein (Malcom, 1986) took a similar position in his study of language, forsaking his initial logical positivist position (i.e., that words can be fully defined by their correspondence to objects) to argue for the total context dependency of meaning. Hence, he argued that as we crisscross the landscape of contexts for a word, it will continually become richer and richer in meaning. The pragmatic theory of Richard Rorty (1991) has played a particularly significant role in the theoretical work of those constructivists most interested in the cognitive development of the individual in society. Rorty's pragmatism holds that "knowledge is not a matter of getting it right but rather acquiring habits of action for coping with reality" (1991, p. 1). Thus, rather than seeking "truth" by correspondence to the real world, we seek viability, i.e., explanations that are viable in the world as we understand it. We are always seeking to increase the viability of our understanding, both by improving our account of specific events or experiences and by interweaving our explanations, thus weaving a web of understanding.

Rorty argues that viability is culturally determined; knowledge and understanding are ethnocentric, and viability is established through obtaining unforced agreement within the community. Thus knowledge (or fact) and opinion are distinguished not by their "truth" value, but rather by the ease with which one can obtain agreement in the community. Rorty points out that if we can set aside the desire for objectivity, we can change our self-image from one of "finding" to one of "making." Knowledge is in the constructive process rather than a finding: The culture defines and is defined by what it agrees is "known."

While Rorty describes the construction of knowledge as the seeking of unforced agreement within the community, the focus is not so much on the agreement as it is on the dialogical process involved in seeking understanding:

We cannot, I think, imagine a moment at which the human race could settle back and say, "Well, now that we've arrived at the Truth we can relax." We should relish the thought that the

sciences as well as the arts will always provide a spectacle of fierce competition between alternative theories, movements, and schools. The end of human activity is not rest, but rather richer and better human activity (Rorty, 1991, p. 39).

For example, science is not "better" than the arts or everyday problem-solving activity because it is discovering the truth, but rather because it has rules of discourse that support and focus on the seeking of unforced agreement (Bereiter, 1994). As Rorty puts it the only sense in which science is exemplary is that it is a model of human solidarity" (1991, p. 39). Bereiter (1994) has argued that this "solidarity" rests in four key commitments in science. These are commitments to:

- Work toward common understanding satisfactory to all.
- Frame questions and propositions in ways that permit evidence to be brought to bear on them.
- Expand the body of collectively valid propositions.
- Allow any belief to be subject to criticism if it will advance the discourse.

To say that we think we are going in the right direction is simply to say that we can take back on the past and describe it as progress. That is, rather than moving closer to the truth, we are able to interweave and explain more and more. Rorty claims, for example, that the pragmatists' distinction between knowledge and opinion, ". . . is simply the distinction between topics on which agreement is relatively easy to get and topics on which agreement is relatively difficult to get (1991, p. 23).

Philosophy is only one discipline that has relevance to constructivism in its application to instruction. There are views from a wide range of other disciplines that reflect the epistemological and methodological stances that are compatible with constructivism that we simply do not have the space to pursue in this chapter, e.g., sermiotics (Cunningham, 1992), biology (Maturana & Varela, 1992), structuralism (Hawkes, 1977), and postmodernism (Lemke, 1994; Hlynka & Belland, 1991).

The philosophers, themselves, generally did not directly address the educational implications of their views. Rather, we see parallel developments in pedagogical theory and practice. Thus, while Vico published his work in the early 18th century, in the middle part of that century (1760) Jean Jaques

Rousseau published *Émile* (Rousseau, 1955), a treatise on education in which he argued that the senses were the basis of intellectual development and that the child's interaction with the environment was the basis for constructing understanding (Page, 1990). Thus Rousseau emphasized learning by doing with the teacher's role being that of presenting problems that would stimulate curiosity and promote learning. Rousseau's views were in direct opposition to the existing educational framework in which the focus was on study and

memorization of the classics. His treatise came shortly before the French Revolution and served as the basis for educational reform in France after the revolution.

John Dewey (1916, 1929, 1938) was perhaps the greatest proponent of situated learning and learning by doing. Dewey, like Rousseau, reacted against the traditional educational framework of memorization and recitation and argued that "education is not preparation for life, it is life itself." Also like Rousseau, Dewey was responding to the need for restructuring education to meet the changing needs of society, in this case the start of the Industrial Age in America and the demands of industrial technology. Dewey argued that life, including the vocations, should form the basic context for learning. In essence, rather than learning vocations, we learned science, math, literature, etc., through vocations (Kliebard, 1986). This is similar to the current argument for "anchored instruction" in which the learning of any subject is anchored in a larger community or social context (CTGV, 1992).

Most importantly, learning was organized around the individual rather than around subject-matter topics and predetermined organizations of domains. Dewey emphasized perturbations of the individual's understanding as the stimulus for learning (Rochelle, 1992). In essence, the learner's interest in an issue had to be aroused, and learning was then organized around the learner's active effort to resolve that issue. Dewey's focus was on an inquiry-based approach to learning, for he saw scientific inquiry as a general model for reflective thinking (Kliebard, 1986). This is not to say that the learners were to learn the scientific method as a fixed procedure, but rather that they were to learn the problem-solving skills and informal reasoning associated with scientific work (see, for example, Bereiter, 1994).

In concluding this discussion of Dewey, we would like briefly to address the role of the teacher in this discussion of constructivist theory. While the focus of Rousseau, Dewey, and current constructivist educational theory is on the student's struggle with a problem, this should not be taken to suggest that there is no role for the teacher beyond developing and presenting problems. Indeed, as will be evident throughout this chapter, the teacher plays a central role, a role that we suspect is more central than in most instructional design frameworks. Dewey provides an eloquent statement on the issue:

There is a present tendency in so-called advanced schools of educational thought ... to say, in effect, let us surround pupils with materials, tools, appliances, etc., and let the pupils respond according to their own desires. Above all, let us not suggest any end or plan to the students; let us not suggest to them what they shall do, for that is unwarranted trespass upon their sacred intellectual individuality, since the essence of such individuality is to set up ends and means. Now, such a method is really stupid, for it attempts the impossible, which is always stupid, and it

misconceives the conditions of independent thinking (Dewey in Page, 1990, p. 20).

Alfred North Whitehead also argued for a pedagogy reflective of the current constructivist theories. In his essay on the Aims of Education, Whitehead argued:

Education is the acquisition of the art of the utilization of knowledge.... Interrelated truths are utilized en bloc, and the various propositions are employed in any order, and with any reiteration. Choose some important application of your theoretical subject; and study them concurrently with the systematic theoretical disposition (1929, p. 4).

Whitehead goes on to contrast this view of education with the prevailing approach:

You take a textbook and make them learn it.... The child then knows how to solve a quadratic equation. But what is the point of teaching a child to solve a quadratic equation? There is a traditional answer to this question. It runs thus: The mind is an instrument; you first sharpen it and then use it.... solving the quadratic equation is part of sharpening the mind. Now there is enough half-truths in that to have made it live through the ages. But for all its half-truths, it emphasizes a radical error which stifles the genius of the modern world. It is one of the most fatal, erroneous, and dangerous conceptions ever introduced into the theory of education. The mind is never passive; it is a perpetual activity. You cannot postpone its life until you have sharpened it. Whatever interest attaches to your subject matter must be evoked here and now; whatever powers you are strengthening in the pupil must be strengthened here and now; whatever possibilities of mental life your teaching should impart must be exhibited here and now. That is the golden rule of education, and a very difficult rule to follow (1929, pp. 5-6).

Like Rousseau and Dewey, Jerome Bruner saw learning in the activity of the learner (1966, 1971). In particular he emphasized discovery learning, focusing on the process of discovery in which the learner sought understanding of some issue. Within this context, Bruner emphasized that the issues or questions that guide the discovery process must be personally and societally relevant. Bruner's development of the social studies curriculum, *Man: A Course of Study (MACOS)*, perhaps best exemplifies his theory. In designing this social studies curriculum for upper elementary students, Bruner and Dow summarize their overarching pedagogical view as:

It is only in a trivial sense that one gives a course to "get something across," merely to impart information. There are better means to that end than teaching. Unless the learner also masters himself, disciplines his tastes, deepens his world view, the "something" that is gotten across is hardly worth the effort of transmission (undated, p. 3).

From that perspective, Bruner (1966) and his colleagues designed a social studies course that has as its goals that pupils:

- Have respect for and confidence in their powers of mind and extend that power to thinking about the human condition
- Are able to develop and apply workable models that make it easier to analyze the nature of the social world
- Develop a sense of respect for man as a species and to leave with a sense of the unfinished business of man's evolution

It should be clear from these goals that in Bruner's framework, knowledge is not in the content but in the activity of the person in the content domain. That is, the active struggling by the learner with issues is learning. Thus it was important for Bruner to begin the MACOS curriculum with the unknown as a means of stimulating the child's curiosity: In this case, it involved the study of baboon communities and the culture of the Nestlik Eskimos. This unknown was then related to the known, the child's familiar culture (family, school, etc.) in exploring the tool-making activities, language, social organizations, etc., as a mechanism for understanding both the unknown and the known. With this basic sequencing, the instructional methods used included: inquiry, experimentation, observation, interviewing, literature search, summarizing, defense of opinion, etc. (Hanley, Whitla, Moo & Walter, 1970). As this list suggests, the students were very much involved in the construction of their understanding, and the social interaction in the classroom was essential to that constructive process.

Bruner paid particular attention to aiding teachers in adapting to this new approach. In addition to extensive workshops, there was a variety of support materials. Video of students participating in sample lessons provided visual images of the patterns of activity that were being sought and highlighted problems. Model lessons were designed to address particularly difficult concepts; reading material for the teacher provided a "lively" account of the nature of the unit, discussing the "mystery" and why it impels curiosity and wonder; and a guide presented "hints" to teachers as to the kind of questions to ask, contrasts to invoke, and resources to use.

Evaluations of the MACOS curriculum indicated that it was successful in promoting inquiry and interpersonal interaction, increasing the children's confidence in expressing ideas and their ability to attend, and increasing the children's enjoyment of social studies (Hanley et al., 1970; Cole & Lacefield,

1980). The difficulty came in the acceptance of an inquiry-driven curriculum that did not "cover the basic content." Some teachers expressed concern that there was a neglect of traditional skills; and there was a fairly widespread public concern that the students should actually be exposed to diverse perspectives and be involved in inquiry that examined the basic tenets of our culture (Dow, 1975; Conlan, 1975). We suspect this to be a continuing struggle in any inquiry-based approach to instruction. Indeed, in spite of his tremendous philosophical influence on education, Dewey's schools were similarly short lived. Kliebard (1986) proposes that, as with Bruner's MACOS curriculum, teachers and the community felt uncomfortable with the lack of a well-defined content that students will "have" when they leave school, and thus the inquiry approach became increasingly constrained by detailed content specifications.

7.1.2 Current Views

Beyond this common framework of learning as situated in activity, constructivism has come to serve as an umbrella for a wide diversity of views. These views may lend particular emphasis to the role of the teacher as a manager or coach, as in reciprocal teaching (Palinscar & Brown, 1984) and many other apprentice frameworks. Alternatively, they may focus on the student and his or her ownership of the learning activity, as for example in the design of problem based learning curricula (Savery & Duffy, 1995), in using student query as a mechanism for defining curriculum (Scardamalia & Bereiter, 1991), or any of the variety of other learner-centered approaches (see, for example, Brooks & Brooks, 1993). Finally, an increasingly dominant constructivist view focuses on the cultural embeddedness, of learning, employing the methods and framework of cultural anthropology to examine how learning and cognition are distributed in the environment rather than stored in the head of an individual (Engstrom, 1993; Cole & Engstrom, 1993; Saxe, 1992; Cunningham & Knuth, 1993).

Cobb (1994a, 1994b) has attempted to characterize this diversity as representing two major trends that are often grouped together: individual cognitive and sociocultural (see Table 7-1). The individual cognitive approach derives from Piagetian theory (Piaget, 1977) and is closely associated with the current writings of Ernst von Glasersfeld (1984, 1989, 1992) and Cathy Fosnot (1989). This view emphasizes the constructive activity of the individual as he or she tries to make sense of the world. Learning is seen to occur when the learner's expectations are not met, and he or she must resolve the discrepancy between what was expected and what was actually encountered. Thus, the learning is in the individual's constructions as he or she attempts to resolve the conflict, or, alternatively put, individuals literally construct themselves and their world by accommodating to experiences. The conflict in Piagetian terms is known as disequilibrium, but Dewey refers to the same stimulus as a perturbation. The first author has preferred the more neutral term puzzlement

(Savery & Duffy, 1995). From this perspective, the importance of the teacher and other students is as a source of perturbation or puzzlement as a stimulus for the individual's learning. As von Glasersfeld (1989) notes, people, by far, offer the most effective and ready-at-hand source of perturbation of a learner's current understanding. Hence, within this framework, the focus is on the individual within the group, and cognition occurs in the head of the individual. In studying learning, we examine the impact of culture on the individual psychological processes.

TABLE 7-1. CONTRASTS BETWEEN THE INDIVIDUAL COGNITIVE AND THE SOCIOCULTURAL CONSTRUCTIVIST VIEWS (adapted from Cobb, 1993)

	Cognitive Constructivist	Sociocultural Constructivist
<i>The mind is located:</i>	in the head	in the individual-in-social interaction
<i>Learning is a process of-</i>	active cognitive reorganization	acculturation into an established community of practice
<i>Goal is to account for:</i>	the social and cultural basis of personal experience	constitution of social and cultural processes by actively interpreting individuals
<i>Theoretical attention is on:</i>	individual psychological processes	social and cultural processes
<i>Analysis of learning sees learning as:</i>	cognitive self-organization, implicitly assuming that child is participating in practices	acculturation, assuming an actively constructing child
<i>Focus of analyses:</i>	building models of students' reorganization and of their joint constitution of the	individual's participation in culturally organized practices and face-to-face interactions

local social situation of
development

In looking at a an evolving microculture that is instantiation of the culturally
classroom, we jointly constituted by the teacher organized practices of schooling
see: and students

In looking at a the heterogeneity and eschew that the homogeneity of
group, we analyses single out pre-given members of established
stress: social and cultural practices communities and to eschew
analyses of qualitative
differences

In contrast to the von Glasersfeld/Piaget focus on individual constructions, the sociocultural approach emphasizes the socially and culturally situated context of cognition. Drawing on the insights of such theorists as Vygotsky, Leont'ev, and Bakhtin (e.g., see Wertsch, 1991), this approach examines the social origins of cognition, for example, the impact of an individual's appropriation of language as a mediating tool to construct meaning. Collective actions become the focus, as in Rogoff's (1994, p. 209) learning communities, where "learning occurs as people participate in shared endeavors with others, with all playing active but often asymmetrical roles in sociocultural activity." It is the changes of ways in which one participates in a community which are crucial, not individual constructions of that activity. Likewise, Driver and her colleagues (Driver, Asoko, Leach, Mortimer & Scott, 1994, p. 4) characterize learning science as "being initiated into ideas and practices of the scientific community and making these ideas and practices meaningful at an individual level." Learning, then, is a process of acculturation, and thus the study of social and cultural processes and artifacts is central.

While Cobb (1994b) argues that these two approaches are complimentary, we are not of one mind on this matter. While we will not argue the case here, it does seem that there is a contradiction between a position that posits development as increasingly abstract and formal constructions of reality, and another that views reality as a constructive process embedded in sociocultural practices with the possibility of acting on and transforming reality within the context of those practices.

With this background in hand, the next two sections detail some of the grounding assumptions that characterize our approach to constructivism, in order to better position the examples and recommendations to follow.