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Constructivism and socio-constructivism

Definition:
Constructivism implies that learners are encouraged to *construct their own knowledge* instead of copying it from an authority, be it a book or a teacher, *in realistic situations* instead of decontextualised, formal situations such as propagated in traditional textbooks, and *together with others* instead of on their own. (Kanselaar, De Jong, Andriessen & Goodyear, 2001)
Constructivism's central idea is that human knowledge is *constructed*, that learners build new knowledge upon the foundation of previous learning. This view of learning sharply contrasts with one in which learning is the passive transmission of information from one individual to another, a view in which reception, not construction, is key.
This new learning theory have spawned a changing view on learning and instruction since 1985.
Constructivism is not a single concept, but can involve the following three aspects:

a) a set of epistemological beliefs (that is, beliefs about the nature of reality, whether there is an independent reality - cf. Von Glasersfeld (2001) or Bereiter (in press);
b) a set of psychological beliefs about learning and cognition (e.g. that learning involves constructing one's own knowledge);
c) a set of educational beliefs about pedagogy, the best way to support learning (e.g., that one should allow the learner to define their own learning objectives; that knowledge emerges from constructive interaction between the teacher and the student or between collaborating students). (Kanselaar, De Jong, Andriessen & Goodyear 2001)

Some people argue that these three aspects are necessarily very tightly coupled. But we want to argue that those three levels of description form a “loosely coupled system”. There are circumstances in which one can talk about shifts in (c) which are not significantly linked with shifts in (a) or (b). For example, one can adopt video-based anchored instruction (following Cognition and Technology Group at Vanderbilt (1992) without shifting in one’s beliefs about whether there is, or is not, an objective independent reality. Equally, lots of people give lectures who also believe that learning is fundamentally about the individual construction of meaning/knowledge. (There is no contradiction, in principle, between these two.). Such research and behaviours, in our view, can still be constructivist. (Kanselaar, et al., 2001).

History
There are two major historical strands of the constructivist perspective.
a. cognitive constructivism, an individualistic perspective
For Jean Piaget (1896-1980) the development of human intellect proceeds through adaptation and organization. Adaptation is a process of assimilation and accommodation, where, on the one hand, external events are assimilated into thoughts and, on the other, new and unusual mental structures are accommodated into the mental environment. As Piaget identifies knowledge with action, he considers that mental development organizes these schemes in more complex and integrated ways to produce the adult mind.
b. social-cultural constructivism (socio-constructivist perspective)
Lev Vygotsky’s (1896-1934) main relevance to constructivism derives from his theories about language, thought, and their mediation by society. He holds the anti-realist position that the process of knowing is rather a disjunctive one involving the agency of other people and mediated by community and culture. He sees collaborative action to be shaped in childhood when the convergence of speech and practical activity occurs and entails the instrumental use of social speech. Although in adulthood social speech is internalized (it becomes thought), Vygotsky contends, it still preserves its intrinsic collaborative character.

An important part of Vygotsky’s work (1986) is critical upon Piaget’s contributions in the field. Although they share some common ideas, there exist significant differences between them. On the topic of stages of development, Piaget believed that development precedes learning, while Vygotsky believed the opposite. In particular, on the development of speech, Piaget argues that the egocentric

speech of children goes away with maturity, when it is transformed into social speech. On the contrary, for Vygotsky the child's mind is inherently social in nature and so speech moves from communicative social to inner egocentric. Therefore, since the development of thought follows that of speech, Vygotsky claims that thought develops from society to the individual and not the other way.

The roots of constructivism go back to the theories of Piaget, Vygotsky and Dewey. But the influence of constructivism on instruction dates from the early eighties. Constructivism then became a reaction against the objectivist epistemology of behaviorism and information processing theories of learning. Behaviorism was replaced by the cognitive revolution in psychology around 1960. Cognitive theories of learning stressed the elaboration processes in working memory, the importance of prior knowledge and metacognitive strategies. The truth value of the information presented and the objectivity of our knowledge was not questioned then. Cognitive scientists, in practice, also attempt to factor out affect and context to the maximum extent possible.
Lauren Resnick (1987), in her presidential address at AERA in 1984, criticized traditional schools. She mentioned some important differences between learning in school and out school:

1. Individual cognition in school vs. shared cognition outside.
2. Pure mentation in school vs. tool manipulation outside.
3. Symbol manipulation in school vs. contextualized reasoning outside.
4. Generalized learning in school vs. situation-specific competencies outside.

Brown, Collins and Duguid, (1989) stressed situated cognition as an important aspect of learning that is missing in school. Duffy and Jonassen (1991; 1992) described the possibilities of new technologies to design a constructivist learning environment. Salomon (1996; 1998) also related the use of novel technologies to constructivist learning and also to the social nature of learning.
Criticism of traditional education, the idea of situated cognition and authentic learning tasks, the use of new technologies to build new learning environments and the idea of learning communities and knowledge building communities together lead to constructivism as a dominant theory of education in the nineties.

Epistemology
Ernst von Glasersfeld is one of the leading advocates of a radical version of constructivism both as a theory of knowledge and as a guide for science education. Asked about the differences in the various versions of constructivism he said: "A few years ago when the term constructivism became fashionable and was adopted by people who had no intention of changing their epistemological orientation, I introduced the term trivial constructivism. My intent was to distinguish this fashion from the 'radical' movement that broke with the tradition of cognitive representation" (von Glasersfeld, 1992, p. 170).
The radical constructivist movement abandons the traditional philosophical position of realism according to which knowledge has to be a representation of an essential reality, i.e., an 'out there' world prior to having been experienced. On the contrary, it adopts the relativist position that knowledge is something which is personally constructed by individuals in an active way, as they try to give meaning to socially accepted and shared notions. As von Glasersfeld himself says "knowledge is the result of an individual subject's constructive activity, not a commodity that somehow resides outside the knower and can be conveyed or instilled by diligent perception or linguistic communication" (Glasersfeld, 1990, p. 37).
The constructivist conclusion is unpopular. The most frequent objection takes the form of the accusation that constructivism *denies* reality (von Glasersfeld, 2001). But this it does not. It only denies that we can rationally know a reality beyond our experience. Constructivism has no quarrel with the mystics who express their intuitions about a transcendent world in poetic metaphors which, of their nature, are not translatable into scientific language. From my point of view, the trouble is that most critics seem to be unwilling to accept the explicit, programmatic statement that constructivism is a theory of knowing (epistemology, GK), not of being (ontology, GK). That a model of the construction of knowledge could be designed without making ontological claims about what is known, is apparently difficult to accept.
Bereiter (in press) elaborates on this discussion about epistemology and differentiates between two aspects. One is the idea that theories, e.g. Newton's laws, and the like are human constructions much

like material artifacts (Popper's World 3). The other and much more controversial part is that the *truth* of propositions is a social construction. The important thing to realize is that the first part does not imply the second part. You can buy the idea of conceptual artifacts and still believe anything you want to about truth. I think this permissiveness is essential if progress in the knowledge arts is not to get hung up on a philosophical controversy that shows no signs of settlement.

Knowledge at the Sociocultural Level

The work of sociocultural theorists has highlighted two kinds of knowledge that cannot be treated as objects (artifacts) in their own right and that are not attributes of individual minds either. These are knowledge constituted in the practices of groups and knowledge embodied in tools. The finely coordinated artistry of an improvisational comedy troupe illustrates the former. The knowledge of photography and physics embodied in an automatic camera illustrates the latter. Both the comedy troupe and the camera are, of course, treatable as objects, but there is knowledge involved that cannot be treated separately from them. 'Situated' learning and "distributed cognition" are perhaps the most widely used terms for referring to such knowledge.

Pedagogy

Constructivist learning is based on students' active participation in problem-solving and critical thinking regarding a learning activity that they find relevant and engaging. They are "constructing" their own knowledge by testing ideas and approaches based on their prior knowledge and experience, applying these to a new situation, and integrating the new knowledge gained with pre-existing intellectual constructs.

Central to constructivist pedagogy is the idea of learning as meaning making, and learning as the negotiation of meaning. Constructivists do not subscribe, as many claim that they do, to the view that all meaning is equally valid because it is personally constructed. Within any knowledge-building community, shared ideas are accepted and agreed upon. That is, meaning is reflected in the social beliefs that exist at any point in time by a certain community. (Jonassen et al. 1999, p. 6; Bereiter (in press) about World 3).

Jonassen (1994) proposed that there are eight characteristics that differentiate constructivist learning environments[1]:

1. They provide multiple representations of reality.
2. Multiple representations avoid oversimplification and represent the complexity of the real world.
3. They emphasize knowledge construction instead of knowledge reproduction.
4. They emphasize authentic tasks in a meaningful context rather than abstract instruction out of context.
5. They provide learning environments such as real-world settings or case-based learning instead of predetermined sequences of instruction.
6. They encourage thoughtful reflection on experience.
7. They enable context- and content-dependent knowledge construction.
8. They support collaborative construction of knowledge through social negotiation, not competition among learners for recognition.

[1] http://pdts.uh.edu/~ichen/ebook/ET-IT/constr.htm

Examples of learning environments based on socio-constructivism

- Knowledge building communities (Scardamalia & Bereiter, 1994, 1996)

The goal of knowledge building communities is to support students to "actively and strategically pursue learning as a goal"- that is, intentional learning (Scardamalia, Bereiter, and Lamon, 1994, p. 201). To support intentional learning among students, Scardamalia and Bereiter have developed a Computer-Supported Intentional Learning Environment (CSILE), where students produce their own knowledge databases in their own knowledge-building community. Scardamalia and Bereiter started developing CSILE in the Eighties and are still improving their system. A second generation of CSILE is the Web based Knowleddge Forum (KF, 2001). It is a Web environment for electronic discussions and for organizing the notes written by students.

- Fostering communities of learning (Ann Brown, 1989)

Ann Brown started the idea of learning communities in reading classes where students participated in discussions about the text they had to read. Those learning communities support reflection n the knowledge constructed.

- Anchored Instruction (CTGVB = Cognition and Technology Group at Vandebilt, 1990, 1001, 1992, 1993)

The group at Vandebilt (Pellegrino, Brandsford, Goldman) designed multimedia learning environments in which they presented a problem that is embedded (anchored) in a real-world context. Well-known is the Jasper-series; stories on CD-rom's with a character Jasper. The CD-rom's presented interesting problems as stories and provided also resources to help the students solve the problem.

- PBL, project based en case based learning (Barrows, 1985)

Problem Based Learning (in Dutch PGO) was developed in medical education in the early 1970's.

- Cognitive Apprenticeship (Collins, Brown, & Newman, 1989)

Collins et al. focus on authentic tasks and scaffolding the learner.

- Cognitive Flexibility (Rand Spiro, et al. 1992)

Spiro at al. stress the flexible use of prior knowledge and the importance of the complexity of so called ill-structured domains, like the social sciences or economics.

- Realistic Mathematics Education (Freudenthal, Cobb et al., 1992)

The use of intuitive strategies by the students to solve problems in mathematics and the "real life" nature of the problems presented are key features of RME.

Criticism on Contructivism

The most well-known critique of socio-constructivist learning theories is written by John Anderson. Lynne Reder, & Herbert Simon with the title "Applications and misapplications of cognitive psychology to mathematics education" (see also Anderson, Reder, & Simon, 1996, 1997). Anderson et al. (1996, 1997) and for a reply Greeno (1997) and for a summary of the discussion Anderson, Greeno, Reder, & Simon (1999). They discussed the differences between situative perspectives (social approach) and cognitive perspectives (individual approach) on learning in several issues of the Educational Researcher.
In a constructivist view, meaning is constructed as children interact in meaningful ways with the world around them. Therefore, cognitive constructivism attaches importance to whole activities as opposed to isolated skill exercises, authentic activities which are inherently interesting and meaningful to the student, and real activities that result in something other than a grade on a test.
Anderson discusses several claims of the situative approach to learning and of constructivism.
The first point Anderson is discussing, is the decomposition of complex skills and the decontextualisation of the learning situation.

Anderson argues: “With respect to decomposition, the correct principle is: Assessing learning and improving learning methods requires careful task analysis at the level of component skills, intimately combined with study of the interaction of these skills in the context of broader tasks and environments.” The example Anderson gives: “It is a well-documented fact of human cognition that large tasks decompose into nearly independent subtasks (…), so that only the context of the appropriate subtask is needed to study its components. For instance, there is no need to teach or assess the ability to perform multi-column addition in the context of calculating income taxes. The process of adding tax deduction items is the same as the process of taking sums in other tasks. And whether one does the sum by hand or by calculator is unlikely to affect the rest of the tax calculation procedures. Thus, the larger procedure is independent of the summing procedure, just as the summing procedure is independent of the larger procedure.”
The second point is the sequence of learning goals from a situated perspective: "Which combinations and sequences of learning will prepare students best for the kinds of participation in social practices that we value most and contribute most productively to the development of students' identities as learners?" (Anderson et al., 1997, pp. 19). “The analysis offered by situated learning seems a regressive move. What is needed to improve learning and teaching is to continue to deepen our research into the circumstances that determine when narrower or broader contexts are required and when attention to narrower or broader skills are optimal for effective and efficient learning.”

The third claim Anderson discusses is the definition of learning in constructivist theory.
“One can readily agree with one part of the constructivist claim: that learning must be an active process. Learning requires a change in the learner, which can only be brought about by what the learner does--what he or she attends to, what activities he or she engages in. The activity of a teacher is relevant to the extent that it causes students to engage in activities they would not otherwise engage in--including, but not limited to, acquiring knowledge provided by the teacher or by books. A teacher may also engage students in tasks, some of which may involve acquisition of skills by working examples. Other tasks include practicing skills to bring them to effective levels, interacting with their fellow students and with the teacher, and so on.
The problem posed to psychology and education is to design a series of experiences for students that will enable them to learn effectively and to motivate them to engage in the corresponding activities. On all of these points, it would be hard to find grounds for disagreement between contructivists and other cognitive psychologists. The more difficult problem, and the one that often leads to different prescriptions, is determining the desirable learning goals and the experiences that, if incorporated in the instructional design, will best enable students to achieve these goals. Of course, arriving at good designs is not a matter for philosophical debate; it requires empirical evidence about how people, and children in particular, actually learn, and what they learn from different educational experiences.”
After a reply by Greeno (1997) Anderson et al. and Greeno wrote an article together Anderson, Greeno, Reder, & Simon (1999). They summarize the discussion with the statement:
“We continue the discussion of cognitive and situative perspectives by identifying several important points on which we judge the perspectives to be in agreement: (a) Individual and social perspectives on activity are both fundamentally important in education; (b) Learning can be general, and abstractions can be efficacious, but they sometimes aren't; (c) Situative and cognitive approaches can cast light on different aspects of the educational process, and both should be pursued vigorously; (d) Educational innovations should be informed by the available scientific knowledge base and should be evaluated and analyzed with rigorous research methods.

Resources constructivism

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