Sabbatical Mini-Report #7
Constructivism and Telling

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What is "Constructivism"? Where Did it Come From?

Defining "constructivism" is challenging, since it comes in different "flavors".

In the most basic way, "constructivism" refers to the belief that knowledge is constructed by the learner. This belief is certainly supported by research, and most theorists take this statement as a "given".

However, that definition is lacking; most practitioners would say that some very critical distinctions are missing. Different practitioners will give different lists of these missing distinctions. For example, this list is from Rowlands (online, pg 2) in his review:

(1) Knowledge is built up from within;
(2) Social interaction is crucial to knowledge building;
(3) Cognition is functional and adaptive;
(4) Cognition serves the individual in their organization of the world.

Compare that list to this one from Kanselaar (online, page 3):

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.

In this list, "multiple representations" is not simply a suggestion that we show symbolic, verbal, graphic and numeric views. This use of the phrase "multiple representations" is from a social perspective – each learner represents reality, and the learners 'negotiate' (item 8).

Beyond these two lists, there is also the "radical social constructivist" position, which adds a belief that there is no objective reality being discussed here – that

all reality is constructed either socially or psychologically. Doolittle (online) provides a clear summary of the "types of constructivism".

Constructivism is not a learning theory; a theory produces predictions that can be tested, and constructivism does not yield predictions. For some discussion of this, see M. Matthews (online). The various types of constructivism are statements of a philosophical approach to learning; each advocate often sees a different 'type' of philosophy … but they often present their view as a theory of learning.

Origins of Constructivism

The origins of the constructivist approaches are often traced to Jean Piaget (see Kafai, pg 35) or Lev Vygotsky, also known as Lem Vygotskii (see Gredle, online). Both Piaget and Vygotsky (who were contemporaries) were interested in human development; their research involved examining what children's capabilities were at different ages and under different conditions, and looking for factors that enabled developing more advanced capabilities. In spite of this developmental interest, we see phrases like "Piaget, the founder of constructivism" or "constructivism is based on Vygotsky". If constructivism only dealt with human development and general capabilities, these would be accurate statements. However, constructivism is almost always presented as a description of how people learn best. The difference between development and learning is not trivial, and this difference leads to difficulties.

Of these two workers, Vygotsky tends to be cited more often. Actually, the work cited is not even really Vygotsky. The first translation available to English-speaking people was the Cole book (1978), and this source is still the most often quoted source for "Vygotsky". However, the real authors of the 1978 book are Cole, et al … they based their writing on translations of Vygotsky, adding and removing material to 'clarify' and avoid Vygotsky's "extremely difficult" writing style. Also, note that the Cole book was compiled from multiple original sources – two Vygotsky et al books, a series of essays by Vygotsky, and a lecture he delivered.

A more authoritative translation was made by van der Veerm and Valsiner (1994); this book contains some of the original sources used for the Cole book, and one can see basic ways in which the material is presented differently. The original material is far richer, and more subtle, than the material presented by Cole. It certainly is true that Vygotsky wrote complicated sentences and paragraphs. The main point here is that the 1978 Cole book has been filtered extensively, and this filtered version is what has influenced constructivism. The history of Vygotsky's work, subsequent suppression of this work by the Russian state, and the eventual release of documents after 30 years is interesting in itself (see both Cole and van der Veerm). For more on translation notes, see Veresov (online).

Jerome Bruner is also cited by constructivists; however, Bruner is more closely aligned with discovery learning.

Discovery Learning is Not Constructivism (They're Cousins)

The origins of discovery learning are based on earlier learning research, and originated earlier than constructivism – in the 1960s, roughly. Jerome Bruner is usually cited as the primary originator (see Hassard, online). Discovery learning does not embrace all of the features of constructivism, and is used in a variety of classroom environments … especially in science and mathematics. In other words, constructivists almost always use discovery learning as a pedagogy; however, discovery learning does not provide a complete description of constructivism. This relationship between discovery learning and constructivism is important in discussing the research.

Discovery learning is also not a learning theory; it is a design principle … and is a philosophical viewpoint.

What Does Research Say about Constructivism?

Briefly, the research on constructivism is not supportive of its use to guide learning. In my view, this is consistent with the origins of constructivism in developmental psychology; the original research base for constructivism lies in the development of general abilities, and especially tool & language use in the early years. Below are listed some general remarks (some cryptic!) about research related to constructivism (in one form or another).

"Constructivism cites sources in educational psychology, but major experts fail to find the connection … and dispute common statements in the constructivist approach." (Anderson, et al, online 1998)

Radical Social Constructivism: "the 'embodied nature of mathematics' disconfirms constructivism -- mathematics is NOT purely subjective, NOT merely social agreement, NOT historically & culturally contingent. Mathematics is not arbitrary." (Lakoff, pg 365)

"The research in this brief review shows that the formula constructivism = hands-on activity is a formula for educational disaster." (Mayer, online)

“The Learning Paradox as a fundamental problem for constructivism: If learners construct their own knowledge, how is it possible for them to create a cognitive structure more complex than the one they already possess?” (Scardamalia, pg 103)

Collaborative Learning: There is evidence that some learners are more focused on the interaction, rather than the learning intself. (Possibly shown by a larger number of interaction 'moves' -- inviting response, responding, referring,) "Many students may need explicit coaching in how to participate in effective collaboration." (Sawyer, pg 196) *Note: This comment is included because constructivism, almost by definition, depends on collaborative learning.*

"Constructivism attacks the immune system that saves us from silliness (Devitt, taken from Matthews 1997)." (quoted in Rowlands, online)

Seems to be an absence of data supporting basic 'constructivist assumptions'. (W. Matthews, online)

Direct instruction: "When students cannot construct the knowledge for themselves, they need some instruction. There is very little positive evidence for discovery learning and it is often inferior. In particularly, it may be costly in time, and when the search is lengthy or unsuccessful, motivation commonly flags. People are sometimes better at remembering information that they create for themselves than information they receive passively, but in other cases they remember as well or better information that is provided than information they create."
Competence in mathematics depends on the availability of symbolic structures; these external symbols do not necessarily match the internal representation. (Anderson et al, online, 2000)
Note: The phrase “direct instruction” here is a generic label; the next item has a different use for the phrase.

Project Follow Through was a very large federal project designed to validate models effective at improving the performance in urban and poor communities, with research being conducted starting in 1969, with early elementary students. Approximately 10 models were used, ranging from cognitive based to affective based; the ‘affective based’ models had features of constructivism. The models with constructivist features resulted in language performance equal to (or slightly below) that of the control groups. In mathematics, these models resulted in lower performance compared to the control groups. The best performing models were two of the cognitive based methods – the leader was “Direct Instruction”, which

was the only model to produce better performance in mathematics than the control groups.
Constructivism showed better results in Project Follow Through for language than for math; even in language, the results were equal to or lower than the control group. For math, the differences were greater. ("Learning Center" is the model being called 'constructivist'.)
(Based on Carnine online, Norton online and Becker online)
Note: Project Follow Through began before the term "constructivism" was used, which is why the label "constructivist features" is used here; the models described this way focused on discovery learning, collaboration, and student construction of knowledge.

Constructing versus Telling

Some popular accounts of best teaching practices suggest that we should avoid telling, and that we should design instruction so that students discover or create the knowledge themselves. (The original NCTM standards present such a view, though the 2000 NCTM standards are more complex in this regard.) Should we explicitly "tell" students?

This issue will be addressed in a separate report. A brief answer can be given here: There are actually reasons for teachers to use telling. The research is summarized by Anderson et al (2000 … quoted above). The Project Follow Through results support this position – a "telling-based" approach (Direct Instruction) produced the best results. Another reason is suggested by Solomon (Solomon, pg 252), who reported that minority students wanted him to be more explicit in teaching; why this might be appropriate will be addressed in a report on race and culture in mathematics education.

However, the most important reason to "tell" more and "construct" less is that the origins of constructivism are in the development of general abilities, especially in younger children. It is my view that constructivism is a sound philosophy for those settings. As teachers of adults, developmental levels are usually not a major objective of a course; if "develop adult levels of cognitive capabilities" was listed as a course outcome, then some implementation from a constructivist philosophy would make sense. [However, see the review of "APOS Theory" in the Learning Theories report; APOS theory is constructivist philosophy applied to collegiate mathematics, and its research is not encouraging.]

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