(Mis?) Constructing Constructivism

Many educators base recommendations for teaching mathematics on "constructivist" thinking. However, they often misunderstand constructivism, so their recommendations may be incorrect or inappropriate. We need to examine what constructivism is and is not, what myths have grown up around constructivism, and what characteristics define it.

We Do Constructivism on Fridays

Do students stop "constructing knowledge" when their teacher lectures? Do they switch over to "absorption" mode, passively soaking in facts? No. Constructivism is not a "type" of learning. It does not make sense to believe that today a student learns in a constructivist way, but tomorrow, in some different way. At its core, constructivism is a philosophy of learning that offers a perspective on how people—all people—learn, all the time.

Constructivism tells us more about learning than about teaching. However, it has important implications for teaching. Certain teaching practices might be more or less consistent with the beliefs of constructivism. For example, we could predict that we would have less success if we simply fed students information with no concern for connecting that information to knowledge they already have.

What Constructivism Is Not

Confusion about what constructivism does and does not mean has engendered a number of myths. Unquestioned, such myths dilute and pollute constructivism.

Myth 1: Students should always be actively and reflectively constructing. One powerful way to construct knowledge is through conscious, reflective construction. As educators, we too seldom give students appropriate time, tasks, and encouragement to think deeply and to talk about mathematical ideas.

Not all constructions are of that type, however, nor should they be. Our minds actively construct ideas without our "working at it" or even being conscious of it. For example, young children construct the idea of flying animals, which at first may include everything airborne, because their minds are actively building connections, with little formal "teaching" and even less "effort" on their part. Even when we are consciously working on a problem, we are not fully aware of all that we are learning.

There are times for many different types of constructing: time for "experiencing"; for "intuitive" learning; for learning by listening; for practice; and for conscious, reflective thinking. During all these activities, students construct valuable, but different kinds of, knowledge. We need to balance these times to meet our goals for students.

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The author would like to thank Mary Lindquist, Julie Sarama, Leslie Steffe, and Grayson Wheatley for their helpful comments on early drafts of this manuscript. Funding for this material was partially provided by "An Investigation of the Development of Elementary Children's Geometric Thinking in Computer and Noncomputer Environments," National Science Foundation research grant number ESI-8954664. Any opinions, findings, and conclusions or recommendations expressed in this publication are those of the author and do not necessarily reflect the views of the National Science Foundation.

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Myth 2: Manipulatives make learners active. A related myth is that when students are using manipulatives, then they are “actively learning.” Manipulatives can help students actively construct knowledge (Clements and McMillen 1996); however, teachers can also use manipulatives to impose prescribed procedures for routine problem types. Students then learn to use manipulatives only in a rote manner (Clements and McMillen 1996). So teaching with manipulatives is not necessarily “teaching constructively.”

Myth 3: Constructivist learners are lonely voyagers. “Constructing their own knowledge” does not imply that students build their ideas in isolation. Rather, the phrase means that one person cannot simply and directly transmit knowledge by means of words into the mind of another person. One can say words with intended meaning, but active listeners have to create their own meanings for the words they hear (Steffe, personal communication). In the words of the poet and philosopher, “If [a teacher] is indeed wise he does not bid you enter the house of his wisdom, but rather leads you to the threshold of your own mind” (Gibran 1989).

So students do not construct knowledge alone, even though each has to modify his or her own ways of thinking and acting. Further, although inventing mathematical ideas together is important, so is learning to better communicate these ideas to others. We must rethink social relations both among students and between student and teacher. For example, constructivist-oriented teachers must be skilled in structuring the social climate of the classroom so that students discuss, reflect on, and make sense of mathematics tasks.

Myth 4: Cooperative learning is constructivist. Students can work in groups in many different ways, many of which are consistent with constructivist views of learning. Some approaches to cooperative learning, however, are based on an absorption view. (For a discussion of different approaches, see Nastasi and Clements [1991].) The way students think and interact is more important than the size of the group in which they work. Just using cooperative groups does not necessarily make teaching more “constructivist.”

Myth 5: Everybody’s right! When we encourage diversity in students’ thinking, it is easy to go overboard. After receiving several estimates of the sum of 17 and 21, one teacher said, “What’s the right answer? Eight is right and thirty-six is right. Everybody’s right!” Every student may have valid reasons for his or her solution, but the goal should be building solutions that make sense within the system of mathematics that is socially constructed by the class and the wider community. Thus, everybody’s effort can be respected without abandoning the notion that some solutions are better than others and that some just do not make sense.

Unique Elements of Constructivism

Intertwined with these myths is the belief that constructivism is merely a rehash of past attempts at educational reform. Constructivism is not the only view that argues that children learn actively or that teachers attempt to understand students’ thinking. Constructivism is part of a distinguished intellectual history, including the work of Jean Piaget and John Dewey, and learning from that history is important. However, several distinguishing contributions of constructivism set it apart.

Beyond “discovery”

Constructivism is not the same as the “discovery” view promoted earlier in this century that, in one form, advised against telling students anything. Students can construct knowledge, even from lectures, if they listen to, and think about, what is appropriate for them. However, a difference exists between talking at and talking with students, both in giving students opportunities to invent mathematics and in encouraging positive beliefs about learning mathematics. One overarching goal should be that students become autonomous and self-motivated in their learning. Students should see their “job” not as finishing assigned tasks but as making sense of, and communicating about, mathematics (Clements and Battista 1990). Constructivist views place more demands on teachers and children than do “unguided discovery” approaches.

Beyond “active learners”

Having students work with manipulatives and on projects is consistent with constructivism but not unique to it. Constructivist views emphasize understanding and building on students’ thinking. Although accomplished in different ways, one main goal is for students to develop mathematical structures that are more complex, abstract, and powerful than the ones they currently possess (Clements and Battista 1990; Cobb 1988). No matter how ineffective or inefficient students’ ideas and methods might seem, they must be the starting points for instruction (Steffe and Cobb 1988). This idea implies that as teachers we need to learn from other teachers and researchers, and study our own students, to better understand how children think. We need to go beyond the general platitudes “children are active learners” and “start where the child is” when those merely mean where he or she is in the textbook. Instead, we need to study how children think about the particular mathematical topics we teach, and we need to work to understand our students’ thinking at a level deeper than everyday communication. To paraphrase Papert (1980), you cannot learn much about learners unless you learn about learners’ learning specific mathematics.
Beyond “active teaching”
As teachers, we also need to reflect on the developmental progression of children’s thinking to understand the wide range of thinking patterns of students in a class and to plan tasks for groups and individuals. In so doing, we move beyond traditional teaching and become curriculum builders (Steffe 1991). Both teachers and students become more responsible for learning.

Beyond mathematics in books and objects
All these ideas culminate in the belief that mathematics is not “in” textbooks or manipulatives. People create and recreate mathematics. Constructivism emphasizes active, living systems, not passive empirical data. For constructivists, mathematics is the activity of constructing patterns and relationships (Wheatley 1991).

Constructing Constructivism
Our decisions about teaching and learning should emerge from a solid understanding of educational philosophy. Constructivism is a philosophy of learning, not a methodology of teaching. By repudiating myths and understanding its unique elements, we can use constructivism to transform and improve our teaching.

References


Bibliography


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