Seymour Papert and Constructionism

Seymour Papert was a pioneering figure in the field of educational theory, particularly known for developing the concept of Constructionisr 1980s. Constructionism builds upon the earlier principles of Constructivism, established by Jean Piaget, yet distinguishes itself through its emphasis on learning through the creation of tangible artifacts. While Piaget focused on internal cognitive processes, Papert posits that lea excel when they engage in creating physical objects, such as computer programs, art, or models, that can be shared and discussed within a community. This approach highlights the importance of concrete experiences and social interaction in the learning process, contrasting wit traditional abstract learning methods.

Papert's ideas advocate for a learning environment where students are encouraged to explore and problem-solve through hands-on activit process he describes as "bricolage." This shift from an individualistic to a communal understanding of knowledge emphasizes the role of collaboration and discourse in education. Additionally, Papert introduced the term "mathetics" to represent the art of learning, suggesting focus should be on how students learn, rather than how they are taught. His work has had a significant impact on educational practices, particularly through the implementation of technologies like the Logo programming language, which fosters creativity and critical thinking learners. Overall, Constructionism continues to evolve, emphasizing the significance of diverse learning experiences and the social context education.

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This article is a summary of the theory of learning known as constructionism. Constructionism was developed by Seymour Papert in the 1980s, and while similar to Piaget's theory of learning known as constructivism, it differs in several significant ways. Both believe individuals learn by constructing knowledge, but Piaget emphasized intern processes, whereas Papert believes learning is facilitated by constructing actual artifacts or objects - whether a theory, a sandcastle, or a computer program - which can then be shared and discussed with others. Papert also values the concrete and emphasizes the social nature of learning, while Piaget valued the abstract and studied learning mostly a an independent activity. These differences are discussed in greater detail, as are Papert thoughts on the art of teaching in relation to the art of learning. Applications of constructionism in the classroom are discussed, as is the influence of the theory in the educational and research community.

Keywords Bricolage; Constructionism; Constructivism; Education theory; Instructionism; Logo; Mathetics; Papert, Seymour; Piaget, Jean

Overview

Bibliography

Suggested Reading

Subject Terms

Papert, Seymour, 1928-2016 (https://openurl.ebsco.com/results?sid=ebsco%3Aebsco.com%3ARS&bquery=Papert%2C%20Seymour%2C%201928-2016&link_origin=https%3A//www.ebsco.com)

Social constructionism (https://openurl.ebsco.com/results?sid=ebsco%3Aebsco.com%3ARS&bquery=Social%20constructionism&link_origin=https%3A//www.ebsco.com)

On the surface, constructionism and constructivism have much in common. Both theories of learning share the belief that individuals make meaning. In other words, knowledge is constructed through experience and is not something that can simply be transmitted from one person to the next (Kafai & Resnick, 1996). Both theories were developed by colleagues - constructivism by Jean Piaget, constructionism by Seymour Papert, who studied with Piaget in Geneva, Switzerland in the 1950s. Despite the many similarities, however, the two theories differ in significant ways. Before we investigate these differences, and define constructionism in further detail, we must first qualify this exercise with words of wisdom from Papert himself.

Many of Papert's essays on constructionism, and specifically those with the aim of defining or summarizing the theory, begin in the same way - with Papert playfully arguir that it is impossible, and indeed antithetical, for him to tell the reader what constructionism is. To do so, he claims, would "transgress the basic tenet" of his entire theory. He explains, "if one eschews pipeline models of transmitting knowledge in talkir among ourselves as well as in theorizing about classrooms, then one must expect that I will not be able to tell you my idea of constructionism. To do so is bound to trivialize it" (Papert, 1991, p. 1). Rather, his intention is to "engage [the reader] in experiences" so th we construct our own idea of constructionism that is "in some sense" like his idea of constructionism. Whether the following summary attempts to engage or transmit, is perhaps for you (or Papert) to judge.

Constructionism vs. Constructivism

The first - and what is arguably the most substantial - difference between constructionism and constructivism should be characterized less as a point of conflict o disagreement and more as a shift in emphases. While both theories agree that individuals construct knowledge, Piaget focused more on mental constructions, Papert on constructions as they are manifested in objects 'in the world.' Papert calls such constructions public entities. As Kafai and Resnick (1996) explain, "constructionism suggests that learners are particularly likely to make new ideas when they are actively engaged in making some type of artifact - be it a robot, a poem, a sand castle, or a computer program - which they can reflect upon and share with others" (1996, p. 1).

Papert further underscores the importance of this principle - learning-by-making - wher he retells the story of how the idea for constructionism was born. While visiting a junior high school in Massachusetts in the early 1970s, he passed an art class on the way to th math class he was scheduled to observe. This particular art class was carving soap sculptures, and after several days of 'dropping in' and admiring their art, Papert was struck by the difference between what was happening in art class and what was happening in math class. As he writes, "An ambition was born: I wanted junior high school math class to be like that. I didn't know exactly what 'that' meant but I knew I wanted it. I didn't even know what to call the idea. For a long time it existed in my head 'soap-sculpture math'" (Papert, 1991, p. 4).

The second point of emphasis of constructionism follows logically from the first - a valuing of the concrete over the abstract. Papert is highly critical of schools and educatc for what he calls a "perverse commitment to moving as quickly as possible from the concrete to the abstract" (Papert, 1993, p. 143). He further argues that the almost singular focus on abstract-formal knowledge impedes the learning of many students, ar even discriminates against some. His passion for this belief is best communicated again in his own words:

"This praise for the concrete is not to be confused with a strategy of using it as a stepping-stone to the abstract. That would leave the abstract ensconced as the ultimate form of knowing. I want to say something more controversial and subtle in helping to demote abstract thinking from being seen as 'the real stuff' of the working mind" (Paper 1993, p. 146).

Importantly, this point of emphasis again separates Papert from Piaget; Piaget valued th abstract and "emphasized how the average child...becomes detached from the world of concrete objects and increasingly able to internalize action and to mentally manipulate symbolic objects" (Ackerman, 1996, p. 26). Piaget equated development and cognitive growth with the ability to think abstractly.

When one shifts the focus of learning from the abstract to the concrete, Papert argues, the process of learning itself changes as well. Rather than being guided by a pre-set plar or formal rules of logic, a student is guided by his or her work as it proceeds (Papert, 1991). Furthermore, students seek to understand solutions to particular problems, without worrying about universals or generality. Papert, borrowing from the work of Lev Strauss, uses the untranslatable French word "bricolage" to describe this process. "Bricolage is a metaphor for the ways of the old-fashioned traveling tinker, the jack-of-a trades who knocks on the door offering to fix whatever is broken. Faced with a job, the tinker rummages in his bag of assorted tools to find one that will fit the problem at hand and, if one tool does not work for the job, simply tries another without ever being upset in the slightest by the lack of generality" (Papert, 1993, p. 144).

Constructionism turns conventional wisdom about intellect and learning on its head again with a shift in emphasis from the individual to the community. As Kafai and Resnic (1996) argue, "in the minds of many, Rodin's famous sculpture The Thinker provides the prototypical image of thinking: it shows a person, alone, in deep concentration" (p. 6). B constructionism - and more recently a wealth of other theories - bring more focus to the social aspect of learning. Indeed, Papert's emphasis on learning-by-making is important not only for the end-product itself, but because the product can be shared. It is the discussion, communication, critique with and by others about the product that is as important to the learning process as the making itself. Again, such emphasis distinguishes Papert from Piaget. According to Ackerman (1996), Papert's knowledge is situational and relational. She argues that "such an emphasis on the processes by which people shape and sharpen their ideas in context provides a rich counterpoint to Piaget's stage theory" (p. 27).

The main principles of constructionism suggest some corollary themes Papert has introduced when discussing learning in general. First and foremost, all of these principle - learning-by-making, communicating with others, problem-solving in specific and concrete circumstances - require time. "Giving yourself time," Papert (1996) exclaims "is an absurdly obvious principle" (p. 13). And yet, he believes, it is a principle that is blatant violated by schools as they are currently structured. Because schools "chop time," students can't sit with a problem the way they might do in a more natural environment. Secondly, Papert argues that part of the learning process is talking about learning itself. Again, he suggests that schools, and culture in general, discourage such disclosure. He even goes so far as to argue "In most circles talking about what really goes on in our minds is blocked by taboos as firm as those that inhibited Victorians from expressing their sexual fantasies" (Papert, 1996, p. 14).

Constructionism has as of yet had little to say about teaching, per se, and indeed the omission is intentional. In fact, Papert situates constructionism in direct opposition to instructionism, arguing that the more opportunities students have to create their own meanings, the less attention educators will need to give to the act of teaching. He qualifies, "I do not mean to imply that constructionists see instruction as bad. That woul be silly. But I do believe that changes in opportunities for construction would lead to improvements in learning more so than any new science about instruction itself" (Paper 1991, p. 7). Papert further questions the narrow-minded focus on methods of teaching when he rhetorically asks, "Why is there no word in English for the art of learning? Webster says that the word pedagogy means the art of teaching. What is missing is the parallel word for learning" (Papert, 1996, p. 9). Papert introduces the word mathetics as noun to indicate the art of learning; although co-opted by those who work with number mathetics has Greek roots in two words that refer to learning in general. Mathmatikos meant 'disposed to learn' and manthanein was a verb meaning 'to learn.'

Applications

Papert's lack of interest in teaching does not also mean he is uninterested in the application of constructionism to the classroom. On the contrary, Papert has dedicated his career to the practice of constructionism. For Papert, improving learning is about finding the tools that give students an opportunity to construct meaning. Much of his work has focused on the computer as one such tool, but constructionism is not limited t technological activities. As he explains, "The assertion that various constructionist learning situations...'work in one way' does not mean they are not very different. Indeed in form they are very different, and intellectual work is needed to see what they have in common" (Papert, 1991, p. 8).

Logo

Papert's name is probably most often associated with Logo, a computer programming language, that has to date been used by "tens of millions of school children all over the world" (Kafai & Resnick, 1996). As Stager (1999) explains, "While reasonable people may differ about whether Papert is the Father of Logo, he can surely be considered its loving mentor." Logo was first developed by Papert and his MIT colleagues in the late 1960s, and is probably best known for its floor and screen turtles. The former is a robot attache to the computer, the latter a screen cursor with a retractable pen, both of which execute programming commands. The specifics of the programming language itself are less important, however, than the learning environment it creates. According to Papert, computers, and Logo in particular, have such enormous constructionist potential because they give students the opportunity to design (Resnick & Ocko, 1991). Design, as opposed to analysis, allows students to explore, to confront problems by seeking a workable solution rather than a right solution. Resnick & Ocko (1991) provide specific examples of students learning math and science through Logo, but suggest the materia and tools are necessary but not sufficient for learning through design. Students must al be in control of their learning experience, choose activities that are meaningful to them, and work collaboratively with their peers.

Thinking About & Making Knots

A more obscure application of constructionism in the classroom serves to underscore th point that constructionist activities come in a variety of forms, and not all are technolog based. Strohecker (1991) used the activity of 'making knots' to demonstrate topology, a "branch of geometry concerned with properties of objects that are invariant when the

object is distorted or deformed" (p. 215). Strohecker's (1991) classroom project demonstrated several core constructionist principles: allowing the activity to evolve and change in response to new ideas that developed mid-project; respecting student's individual approach and style to meaning making; learning by making objects to be shared and discussed; and a valuation of the concrete over the abstract. The activity als demonstrates one of Papert's critiques of instructionism, mainly the "idea that the unique way to improve a student's knowledge about topic X is to teach about X" (Papert 1993, p. 141). By making knots, students learned about seemingly unrelated ideas.

Constructionism through Collaboration

Kafai and Harel (1991) combine the use of a technological tool - instructional software design projects (ISDP) - while taking advantage of the ways in which children learn by teaching others. In their classroom, each fifth grader was charged with developing a computer program to teach fourth graders about fractions; upon completion of the project, the fifth graders then became programming consultants for the fourth graders, who themselves were charged with developing a program to teach third graders. Throughout the project, Kafai and Harel (1991) discovered two different types of collaboration, both equally important: one in which students actually work together on a specified project, the other - which they refer to as collaboration through the air - in which students simply exchange ideas and thoughts freely.

Viewpoints

When Papert first developed constructionism, many of the ideas he proposed were unfamiliar. Educators typically thought of knowledge as something that could be transmitted from teacher to student, and not as something that is created by a student via her interaction with the world. Even if Papert - and others who were making similar claims at the time, like Piaget - were initially met with skepticism, some would argue the ideas have gained widespread acceptance today. "In the 1980s, many constructionist ideas were viewed as radical and out of the mainstream. But today, at educational research conferences, the idea that children actively construct new knowledge is taken almost as gospel..." (Kafai & Resnick, 1996, p. 2).

Educators writing within constructionist circles don't just mention the success of Papert theory as a sidebar, but go so far as to suggest that its own success is now its greatest challenge. Kafai and Resnick (1996) believe, for example, "in some ways, constructionist research is challenged by its success. The challenge is to continue to refine constructionist ideas, and to make sure that these ideas spread. .." (p. 2). Stager (1999) echoes such sentiments when he argues that constructionism has received "no serious criticism in academic circles." He continues, "People may disagree with a point or two in the books, but there has been no serious piece of scholarship arguing against [Papert's] ideas in Mindstorms."

But perhaps we might consider constructionism itself Papert's own 'public entity;' that is it is the end result of his own process of 'learning-by-making.' These products, as we've learned, are meant to be shared, discussed, debated, and revised by other learners. It is then somewhat ironic, and perhaps unexpected, that the "most sinister attacks on Logo are acts of omission" (Stager, 1999). In other words, people aren't talking about it at all. Stager (1999) continues, "As a university teacher I receive countless textbooks on the theory, history and practice of educational computing...The majority of these texts don't disagree with Logo research or the theories of Seymour Papert. They don't mention the at all."

The few voices who can be heard disagreeing with Papert offer criticisms that are logistical as opposed to theoretical in nature. Most teachers, Stager (1999) argues, criticize Logo or other constructionist activities because they take too much class time, they can't be easily evaluated, or they don't fit into a specific content domain. Stager (1999) believes, however, that "these are not criticisms of Logo as much as they are criticisms of school." Papert has also been criticized for his involvement in the marketplace; on the one side by those who disapprove of educators collaborating with companies whose objective it is to make money, and on the other side, by companies who believe Papert's products are "bad for business." "If kids construct their knowledge and express themselves in an environment designed to have 'no threshold and no ceiling', then you are not likely to buy lots of other software products" (Stager, 1999).

To suggest that constructionism is widely popular and free of criticism may be somewha misleading. While constructionism per se may not have generated a lot of debate, it is clearly situated on one side of a divided camp, the two sides of which have been battlin for centuries. Constructionism taps into larger epistemological questions about the nature of knowledge and knowing; since the times of Aristotle, Plato, and Descartes, philosophers have disagreed about whether truth is represented by an external reality, independent of the knower, or whether it is something generated by the knower. The debate has never been resolved, and thus constructionism, to the degree it fuels this conversation, has as many detractors as it does proponents.

In Conclusion

A summary of constructionism would be incomplete without mention of the ways it continues to evolve. As Kafai & Resnick (1996) explain, "constructionism is not a static se of ideas. Consistent with the theory we are writing about, we as researchers are continually reconstructing and elaborating what we mean by constructionism..." (p. 2). Recent trends in constructionism show a shift in emphasis toward ideas that, although part of the original theory, have been highlighted less than others. The role of community, for example, takes center stage in Kafai & Resnick's work titled "Constructionism in Practice: Designing, Thinking, and Learning in a Digital World." They also emphasize the importance of affect in learning, arguing that students are more like to engage when working on "personally meaningful" activities and projects. Finally, thos who continue to develop the theory stress the importance of diversity - diversity of learning styles and diversity of knowledge.

Terms & Concepts

Bricolage: An untranslatable French word Papert borrowed from the work of Levi-Strauss. In the constructionist framework, bricolage is a metaphor to represent a learne who, rather than following a pre-set plan, approaches a problem in context.

Constructionism: Constructionism is an outgrowth of constructivism. Constructionism emphasizes the situated, communal nature of learning, values the concrete, and holds that learning occurs best through the making of some shared entity - a poem, castle, or theory.

Constructivism: A theory of learning developed by Jean Piaget. Constructivism values th abstract, independent nature of learning. Most important, constructivism measures cognitive growth in terms of internal, mental structures.

Instructionism: For Papert, instructionism represents traditional teaching methods, th idea that knowledge can be transmitted from teacher to student. More generally, it is a term that represents that act of teaching itself. Papert believes student learning is a consequence of opportunities for construction, rather than a consequence of improved instruction. Rather than focus on the art of teaching, educators should focus on the art learning.

Logo: A computer programming language developed by Papert and his MIT colleagues i the early 1960s. Best known for its turtle graphics, Logo has been used in classrooms across the world. Papert argues that it is not Logo itself, or computers in general, that a important, but the opportunities and environments they create for learning-by-making.

Mathetics: The term Papert uses to represent the art of learning. Mathetics, although it evokes ideas about what we now know as 'math', derives from two Greek terms which refer to learning in general. Mathmatikos meant 'disposed to learn' and manthanein wa a verb meaning 'to learn.'

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