Thirty Years Radical Constructivism

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Looking back in order to unravel how you came to where you now think you are, is a step in the creation of history. It’s only a beginning, because proper history requires several people to compare recollections and sort out what is compatible among them. What I present here, is a personal account and lays no claim whatever to objectivity. It is simply what I remember.

Although I didn’t know it at the time, I became a constructivist towards the end of the 1940s when I joined the interdisciplinary group of friends who worked informally and unpaid with Silvio Ceccato at the debunking of traditional theories of language and knowledge. Ceccato, who had studied music at the Conservatory in Milan but, to please his father, had also got a doctorate in law, became curious about what it was that generated the appeal of musical compositions that were deemed beautiful. He read all he could dig up about esthetics but found no satisfactory answer. He went on to read epistemology but found the accounts given of knowledge and the functioning of language equally disappointing. It was only when he came across Bridgman’s operationalism that he saw a direction to develop his own thinking. To define the meaning of words by means of other words, he realized, could never show what meaning consists of. To find out, you had to uncover how it was made, you had to analyze the operations that produced it. This was tantamount to analyzing how knowledge could be constituted. Ceccato spoke of operational awareness, deliberately leaving implicit that he was focusing on the construction of knowledge.

The word “knowledge”, he felt, had to be avoided because it tends to lead to the notion of representation in the sense of replica of a pre-existing reality. Knowledge could mean only one thing to him: the reconstruction of results of prior operations. If the reconstruction matched them, it was true, if it didn’t it was false.

In 1955 Ceccato went to a conference in London and met Colin Cherry, the communication expert. Cherry suggested that the best way for an unconventional theory of language to make headway at that time was to apply it to machine translation. Shortly after that, Ceccato founded the Center for Cybernetics at Milan University and asked me to help with writing a proposal for research on machine translation. The research was sponsored by an office of the US Air Force, but lasted only for three years. Some time after it ended I moved to the United States with a small project of my own, still based on Ceccato’s theory of language (Ceccato 1969).

One cornerstone of Ceccato’s theory was that syntax could not be understood without analysis of conceptual relations and that the composition of sentences involved many more such relations than were recognized in traditional grammars. On the level of language, most of these conceptual relations were marked by prepositions, conjunctions, and particles of that kind. In English, for example, there are more than a hundred of these “parts of speech” and most of them are highly ambiguous with regard to the conceptual relations they indicate. In other languages the situation is similar, but the range of ambiguity of prepositions is different in each language. During the ten years that I worked in computational linguistics, the problem of translating prepositions kept turning up and continually reinforced my notion that the structure of the experiential reality we live in depends in many ways on the language we happen to grow up with. It was a simple confirmation of Whorf’s contention that concepts differ from one language to another (Whorf 1956).

“You know, much of what you suggest has been said by Piaget”

Jean Piaget coined the expression “the construction of reality” in the title of one of his fundamental books on cognitive development in children (Piaget 1937). It was ironical that Ceccato, although vigorously opposed to the Platonic notion of pre-existing eternal ideas, never came to see the importance of cognitive development for any theory of knowledge. When I asked him about a Piaget reference I had found, he told me not to bother because Piaget was concerned with children. Consequently I did not become acquainted with the work of the inventor of constructivism in the 20th century until my research project in the United States was terminated. Like many others it was the victim of
an internal upheaval at the sponsoring Air Force office. My team was adopted by the University of Georgia and I was assigned to the department of psychology. Charles Smock, one of the few members of that large department who were interested in cognitive psychology, very generously shared a couple of courses with me to introduce me to teaching (which I had never done except on ski slopes). He had spent several years at Geneva and as we began to talk about the problems of cognition, he said to me one evening: “You know, much of what you suggest has been said by Piaget.” So I began to read and to discover Piaget’s “genetic epistemology”. Fortunately Smock had nearly all the original French publications of the Geneva School and I could see how pervasive the notion of individual construction was in Piaget’s thinking. In the English translations I later had to use in teaching, this notion is much subdued if not eliminated, because most translators tended to assimilate everything to their conventional, realist views.

At about that time, Heinz von Foerster sent me a batch of his publications. We had met a couple of years earlier and found that some of the problems we were interested in were much the same. When I read his “An epistemology for living things” (Foerster 1972), it struck me as extraordinary that there were three people who had come to quite similar conclusions by very different ways: Cecatto, who had come to see the activity of knowing rather like a composer’s work of creating chords and then tones by combining notes in sequences that could be specified by a relatively small number of elements; Heinz, who came to constructivism by way of formal logical and neurophysiological considerations; and myself, who had been led to it practically by the differences among linguistic realities. All three of us, however, had been driven by unquenchable dissatisfaction with the traditional accounts.

In 1974 Smock and I put together a report with the title: “Epistemology and education: The implications of radical constructivism for knowledge acquisition”. I wrote a chapter assembling some philosophical precedents and presenting my interpretation of Piaget’s theory. It was the first time the epithet “radical” was used. It was intended in the sense that William James (1976) had used in his radical empiricism, i.e., meaning “going to the roots” or “uncompromising”. I chose it because at the time many developmental psychologists were mentioning Piaget’s constructivism but without going into its epistemological implications. What they called construction seemed to refer to the fact that children acquire adult knowledge not all at once, but in small pieces. I did not think that this was a revelation and therefore called their approach “trivial constructivism”. It was clearly no way to gain the friendship of traditional psychologists but in the long run it did not do much harm.

Smock collaborated in research with Les Steffe, who headed the Georgia section of the Follow Through Program for children in the first classes of elementary school. Steffe was a Piagetian and his specialty was mathematics education. During the first years of school, “math ed” is of course all arithmetic. On the basis of Piaget’s “clinical method”, which included interviewing children about what they were thinking, rather than merely observing what they were doing, Steffe was beginning to build hypothetical models of how children go about solving simple problems of addition and subtraction. He called the method “teaching experiments” and a crucial part of it was the use of videotapes, usually two or three minutes long. He, a graduate student of his, the philosopher John Richards, and myself would spend countless hours viewing these tapes and trying to agree on what we gathered from them. We had heated arguments and for all of us it was a powerful lesson, hammering in the fundamental fact that what one observer sees is not what another may see and that a common view can be achieved only by a strenuous effort of mutual adaptation. In 1983 we jointly published a book, which, by means of many protocols, illustrated our view of how children, through various stages of counting, develop a concept of number (Steffe et al. 1983).

The Follow Through report had practically no circulation, but the papers we had published during the preparation of the book and the book itself created a stir. In July 1987, at the meeting of the International Group of Psychologists in Mathematics Education (PME), Mimi Sinclair (long-term Piaget collaborator) and I defended constructivism against two prominent figures in the field. Their attacks were so un Scholarly and vicious that they produced the opposite effect: they helped to establish constructivism as a valid basis for teaching mathematics.

As approach to a theory of knowing, constructivism became established at the International Conference on the Construction of Realities that Heinz von Foerster organized with the help of Francisco Varela in San Francisco in 1978. There were very interesting presentations by Bateson, Goffman, Polanyi’s daughter, and others, and it’s a pity that Varela, who collected all the texts, never got round to publishing them. It was at this conference that I met Paul Watzlawick. He had developed his own constructivist ideas starting from Schopenhauer and through his practice in family therapy. The problems he was asked to solve, arose, he saw time and time again, from the fact that the realities individual members of a family lived in were not compatible with one another. Watzlawick asked me to expand and translate the talk I had given so that he could use it as the introductory piece to “Die erfundene Wirklichkeit” (The invented reality), a book he was about to publish in Germany. It came out in 1981 and has by now been reprinted 18 times. It has done more than any other to spread the notion of cognitive construction. An English version of the book was published in the United States by Norton in 1984, but as far as I know the first edition was never sold out and the book is no longer listed by the publisher. The geographic difference in dissemination has remained characteristic of constructivist ideas in general. In the United States and England, radical constructivism is mentioned in the field of science and mathematics education. In Germany, Austria, and Italy it has become the subject of lively discussions among philosophers, psychologists, educators, and therapists, and quite a number of books have been published on the subject.
The discrepancy of dissemination applies also to the works of Humberto Maturana (popular in Europe, but rarely if ever cited in the US). He calls his subject “Biocybernetics” and defines it as “an explanatory proposition that attempts to show how human cognitive processes arise from the operation of human beings as living systems.” It falls squarely among the efforts that try to explain knowing as the result of self-organizing construction, but he has never been comfortable with the term “construction” and prefers to speak of “bringing forth”.

We can only check the coherence of our constructs with other experiences

Maturana was a student of Warren McCulloch and Jerry Lettvin and in collaboration with them and Walter Pitts published the paper “What the frog’s eye tells the frog’s brain” (Lettvin et al. 1959). McCulloch called it the first step into experimental epistemology and it can be considered the first experimental confirmation of radical constructivism. The frog builds up the image of a desirable (i.e. digestible) insect from a pattern of neural signals, regardless of what may have triggered these signals.

Commentators, especially in Germany, have somehow come to believe that Maturana’s biological theory of cognition is the source and empirical justification of radical constructivism. This is a misconception. When Protagoras wrote “Man is the measure of all things” and added “being is the same as to appear to someone” (Diels 1957) he suggested that what we consider knowledge is of our own making. It has to be, because we cannot check what we experience with what lies beyond the experiential interface; we can only check the coherence of our constructs with other experiences. Radical constructivism is delighted to have biologists developing theories of autoepistemology and physicists developing theories of quantum mechanics that are compatible with a constructivist theory of knowing, but the theory of knowing does not depend on these more or less empirical findings. It is based on the simple realization that, as our thinking, our conceptualizing, and our language are developed from and in the domain of our experience, we have no way of incorporating anything that lies beyond this domain.

This last point is also what distinguishes radical constructivism from the “methodical philosophy” developed by Paul Lorenzen and others at the University of Erlangen (Lorenzen 1987). Much of what Lorenzen formulated agrees with radical constructivism, e.g., “The theory of concepts I have sketched is not a theory concerning existing things; it is not an ontology. Concepts as described here belong to our actions; they are interpreted here functionally rather than ontologically” (p. 12). But ontology still seems to enter into his system when, in his essay on the “Logical structure of language” (p. 105ff), he speaks of objects being “part of nature” and of “personal observation” as though the observed were externally given. That there are serious disagreements between radical and “methodical” constructivism is indicated by the fact that Peter Janich, the main present-day representative of the Erlangen School, vigorously attacked my way of thinking at the conference on “Reality and Worldmaking” (Fischer & Schmidt 1998, pp. 65ff).

...what we call knowledge can be “constructed” without reference to anything outside the experiential confines

There have been many others whose thinking contained constructivist elements – Rorty, Feyerabend, Bruner, Dewey, Brouwer, Fleck, Bogdanov, and probably some I have never heard of; but, apart from the radical constructivists I mentioned above, I know none who tried to model the generation of knowledge without reference to an ontic reality. Yet, if the skeptics are right – and two thousand five hundred years of Western philosophy have not been able to prove them wrong – neither the structure nor the texture of an ontic reality are accessible to human knowing. It therefore seems legitimate to try and conceive a model that may show how what we call knowledge can be “constructed” without reference to anything outside the experiential confines.

The notion of model, however, inevitably contains assumptions that lie outside the domain the model may explain. In the case of constructivism it is the assumption of a consciousness that is able to remember, to reflect upon experience, and to develop likes and dislikes. It is the least a model of cognition must assume.

As for the future, I would suggest that more work be done regarding the question where the notions of society and of other constructing subjects come from. They are needed to establish an intersubjective viability of conceptions. I have sketched a way in which a child could construct the notion of another entity rather like itself (Glaserfeld 1979, 1989), and there are hints in Piaget’s writings; but someone should systematically ask three-year-olds “How is the cat different from your teddy bear?” and six-year-olds “How is your sister different from the cat?” Clinical interviews would make the stories I invented more plausible.

Note

1. Psychologists, have known since Johannes Müller (1838) that the sensory signals in the nervous system may contain quantitative data about a stimulus but apparently no qualitative “information”; it is a source of puzzlement why so little effort has been made to unravel how the qualitative aspects of sensation originate.

References


Links

Further material on Ernst von Glasersfeld can be obtained from his new homepage at http://www.vonglasersfeld.com/

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