

# Why Constructivism Must be Radical<sup>1</sup>

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During the 20th century, Jean Piaget was in the forefront of the development of constructivism and the struggle to overcome conventional ideas about the acquisition of knowledge. In the course of Western history, most philosophers tackled the following epistemological questions: "What is knowledge? How does one come to know? Can knowledge be certain?" They arrived at their answers using a logic they considered to be universal and independent of human subjects. Piaget broke with this tradition by raising a question which appeared to be simpler and more pragmatic: "How does a child manage to acquire what goes by the name of knowledge?"

In the eyes of his philosophical contemporaries, Piaget's theory of knowledge involves the "genetic fallacy" and is tainted with the sin of "psychologism". The philosophical establishment therefore feels justified in ignoring the work of that "Genevan dilettante". For the general public, given Piaget's interest in children, genetic epistemology is merely a somewhat abstract theory for explaining cognitive development — an offshoot of child psychology.

This initial misunderstanding was compounded when Piaget's term "constructivism" began to be discussed in educational circles. It gave rise to statements such as: "It's obvious, after all, the children don't simply swallow all adult knowledge whole, they have to construct it!". Even today, a good many authors are convinced that they are constructivists, yet they have never put traditional epistemology in question. It was their naive interpretation that prompted me to add the qualifier "radical" to constructivism.

It was, indeed, radical to break away from the traditional way of thinking according to which all human knowledge ought or can approach a more or less "true" representation of an independently existing, or ontological reality. In place of this notion of representation, radical constructivism introduces a new, more tangible relationship between knowledge and reality, which I have called a relationship of "viability". Simply put, the notion of viability means that an action, operation, conceptual structure, or even a theory, is considered "viable" as long as it is useful in accomplishing a task or in achieving a goal that one has set for oneself. Thus, instead of claiming that knowledge is capable of representing a world outside of our experience, we would say, as did the pragmatists, that knowledge is a tool within the realm of

experience. Piaget (1967) expressed this by saying that knowledge does not attempt to produce a copy of reality but, instead, serves the purposes of adaptation.

In this connection, it is important to point out that in the case of a cognitive organism, adaptation proceeds on two levels. On the biological level, adaptation is aimed at survival; on the conceptual level, adaptation is aimed at producing coherent, non-contradictory structures.

I have explained elsewhere the reasons which appear to me to support such a radicalization, first in the domain of history of philosophy (Glaserfeld, 1978, 1985), then in connection with the functioning of natural languages (Glaserfeld, 1983, 1990) and then again on the field of cybernetics (Glaserfeld, 1979, 1981). For the purposes of this presentation, I will only take up a few basic points.

To understand constructivism, it is above all necessary to be constantly aware of the ambiguity in the ordinary use of the term “reality”. On the one hand, it refers to an ontological reality, that lies beyond all knowing; this reality is analogous to Kant’s *Ding an sich*, which he qualified as a heuristic fiction (Kant, 1787, p. 307ff; 1881-1884, p. 572ff). On the other hand, there is the lived, tangible reality of our experience, from which we derive all that we call “knowledge”, i.e. not only the conceptual structures, the actions and the mental operations which are considered viable, but also the patterns of action and thought that have failed.

The term “experience” is difficult to define because it requires consciousness — and at the present we do not have a viable model for that phenomenon. It would be tempting to say that everything which reaches our consciousness becomes experience, but of course such a definition would be too narrow. Under hypnosis, for example, it is possible to locate traces of sensations and even ideas of which we had been totally unaware until then. Nevertheless, I have decided to proceed with a working hypothesis, according to which experience is made up of sensations and the empirical and reflective abstractions of which we *are* aware.<sup>2</sup>

Second, the cognitive subject operates within the realm of experience, and this experience is always segmented and ordered as a result of the sequential mode of functioning that is inherent in the process of attention. Segmentation is basically the product of sensory and motor organs, but then it is shaped by the concepts the individual subject has already constructed. Hence, experience is always subjective. Nevertheless, it is important to point out that this elementary sort of subjectivity in no way hinders the development of “intersubjectivity” over the course of interactions which may be termed “social”..<sup>3</sup>

Third, rational knowledge always relates to the realm of experience and to the abstractions (concepts, relations, theories, models) which have been constructed in the attempt to create a more or less regular, predictable world. This quest for models with

predictive capacity is based on the belief that future experience will be similar to past experience, at least as far as the regularities which have proven viable until now are concerned (Hume, 1758).

Giambattista Vico was the first philosopher to speak explicitly of reason as a human activity that constructs scientific knowledge (Vico, 1710). Radical constructivism builds on his insights and makes a clear distinction between this knowledge and the intuitions of poets, artists in general, and mystics. Essentially, it is the same distinction that Cardinal Bellarmine suggested in order to save Galileo from an indictment of heresy. Galileo, he said, could simply present his theories as models designed to work out his predictions, but he was never to claim that they were a true description of an absolute reality, a reality to which only the Church had access through revelation.

Fourth, from the constructivist perspective, scientific knowledge is made up of theoretical models which have proved viable within a given area of experience. Even if a particular scientific model is the best available at the moment, it should never be viewed as the only possibility of solving the problems for which it was designed. Furthermore, whenever several solutions have been found, one of them may be preferred for reasons of economy, simplicity or “elegance”, but not because it is “true” in an ontological sense. Instead of “truth”, constructivism speaks of viability and compatibility with previously constructed models. In other words, scientific models are tools.

Obviously a tool that works in a dozen different situations is worth more than a dozen different tools that work in only one.. However, this unification of models has not always been achieved. At the present time, the most striking example of this difficulty is the nature of light. Physicists have to approach the diverse phenomena of light with the help of two conceptually incompatible models, one based on the concept of wave and the other on the concept of particle.

My last and perhaps most important point concerns language. Once again, the constructivist point of view is diametrically opposed to the tradition according to which linguistic communication is a means of “conveying” knowledge. In that view, speaking suffices to transfer ideas and knowledge — that is, conceptual structures — from one person to another.

It takes but a moment of reflection to realize that this notion of transmission is illusory. Perhaps the illusion arises from the fact that language seems to work quite well in practical, concrete situations. Therefore one does not raise the question, how the contents of a piece of language (which necessarily is the product of an individual consciousness) can be successfully transferred from one consciousness to another. To get a handle on this question,

it will be necessary to examine closely how the process called “communication” actually functions.

When you are engaged, as you are now, in reading what I have written, it can be said that communication is taking place. To be more precise, you are in the position of a receiver. Let’s take a moment to observe what goes on. To begin with, you have to be able to perceive a series of black marks printed on the page and to identify these marks, first as letters and then as combinations of letters forming words of a language with which you are familiar. You are familiar with a language whenever the meanings of most of its words hold some association for you. At that point, the perception of words calls up meanings in your head and you attempt to link these meanings together in order to develop larger conceptual structures that are related to the sentences of the text. If you succeed and manage to produce structures that appear reasonable to you, you feel that you have understood what the author intended to say.

Described in this way, the process would appear to be quite simple. Indeed, it seems obvious, because we are so very accustomed to it. As a rule, however, it involves an invalid hypothesis, namely that the meanings which the author associated with the words of his text are tacitly assumed to be the same that are now called up by these words in the reader’s head.. This is an unwarranted assumption. The meanings of words— and this also applies to every sign and every symbol — must be constructed by each user of the language individually, and this construction is based solely on the subjective experience of the particular person. Hence it stands to reason that the interpretation of a word or a text will always remain an essentially subjective operation.

Of course, when children are learning their mother tongue through their interactions with the users of that language, they are led to modify their word-meanings so that they end up being more or less compatible with other people’s usage. This creates the impression that meanings are “shared”, but it cannot be emphasized strongly enough that the compatibility that is necessary to communicate satisfactorily in everyday life, always remains at some remove from an exact correspondence. Moreover, we can never verify if the meaning which is associated by a given person to a particular word is absolutely the same as the meaning we associated with it. We can only say that so far it has apparently worked. This feeling of apparent compatibility of meaning, however, is always based on the experience of a limited number of situations.

With these remarks on communication, I believe I am touching on one of the most sensitive issues of teaching. If knowledge cannot be transmitted, but must instead be

constructed by each student individually, this does not imply that teaching must dispense with language. It implies only that the role of language must be conceived of differently. We can no longer justify the intention of conveying our ideas to receivers (as though ideas could be wrapped in little packages by means of words). Rather, we will have to speak in such a way as to “orient” students’ efforts at construction<sup>4</sup>. However, in order to orient someone, you have to have a starting-point. Even six-year-olds have something inside their heads. They have lived, made experiments, and they have developed ways of coping. They can interpret the actions and words of their teacher only according to the empirical and operative abstractions which they have worked out previously. This means that it is absolutely necessary for teachers to have some notion of their students’ conceptual networks. We call this a model. Obviously such models are and always remain hypothetical because it is impossible to get inside someone else’s head. But with experience and informed intuition, a teacher can come to make more or more useful assessments about what is occurring in the heads of students. This ability separates individuals who are gifted for teaching from those to whom it is merely a rule-governed job like so many others.

A certain degree of interest and sympathy are needed in order to develop your own mental model of another person. Unfortunately, the spirit prevailing in most schools springs from the notion of “transmitting” the knowledge outlined in course programs, as though it were actually possible to funnel knowledge ‘as is’ into the receptacle-like heads of students who are all the same. . It is this misguided illusion of passive learning which prevents teachers from taking students’ thinking into account. If a teacher is preoccupied with “correct” answers, he or she is unlikely to provide students with the possibility of explaining the conceptual route which *they* took to solve the given problem. Yet, analysis of the process which led a student to answer in a particular way is one of the best means available towards an understanding of his or her concepts and mental operations.

A last point. If we repeatedly tell children that their solutions to problems are wrong, we should not be surprised that their enthusiasm for tasks involving numbers dries up. If, instead, we ask children, “How did you go about getting this answer?”, we discover that in many cases they are capable of seeing for themselves that something did go wrong. At that point, children become aware that it is *they* who are capable of constructing solutions to problems and that they themselves can decide whether something works or does not. This is the beginning of self-regulation, of a feeling of autonomy, and, as a result, the start of a potentially active learning process.

My practical experience with applying constructivist ideas in classes is limited almost entirely to arithmetic in the first few grades of primary school. However, I have the impression that the general conclusions I have drawn from work in this area are relevant also for teaching physics and other school subjects. I am all the more convinced of this because our general approach is not a new idea. The notion of self-regulation was implemented by Maria Montessori, and it was stunningly illustrated in the book written by Ashton-Warner (1983), who described her work in a school in New Zealand. Indeed, some extraordinary teachers have always managed to foster their students' active understanding rather than making do with the repetition of "correct" answers. In order to achieve this, however, they had to rely on their intuition. Radical constructivism offers a theory of knowledge, communication, and the learning process, which could serve as a point of departure for all teachers who have not been blessed with the gift of exceptional intuition.



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## Notes

1. I would like to thank the students in the science teaching program whom I met during my stay at Laval University in the fall of 1991. It was their questions and preoccupations that prompted me to write this article. It was written in French and corrected by Françoise Ruel. The present text is an approximate translation.
2. This definition, however, poses yet another problem: the work that combines and transforms elements of sensation and which, as a result, creates objects of perception, processes and events, is work of which we are usually not conscious. Thus, each time a cognitive organism accomplishes this work in the face of its environment, I consider this as coming within the realm of experience.
3. For a constructivist this “intersubjectivity” is obviously devoid of objectivity or absoluteness. It is again the construction of an observer, that is based on the personal observations which he or she has made within the world of his or her own experience. In my opinion, this is what constitutes the major difference between radical constructivism and the recent current that goes under the name of “social constructionism”.
4. I borrowed the term “orientation” from Humberto Maturana, who was the first to introduce the notion of orientation in his analysis of linguistic interaction (see, in particular, Maturana and Varela, 1980).



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