

Curriculum and Epistemology II

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Although the connection between curriculum and epistemology was illustrated at length in part I of this article (FLM Vol. 4, No. 2), there are a few considerations which were not touched upon, or barely touched upon there, and invite a sequel

In the past, epistemologists were considered to be philosophers, specializing in how knowledge (intellectual knowledge) is made part of the human mind. Aristotle, Locke, Condillac are indeed classified among philosophers. Piaget wanted to change this by making it a laboratory science in which empiricism and the gathering of data preceded theorizing, although he did not quite manage to pull it off. His method of work only allowed him, and his students, to observe a small sample of people face to face and to analyze responses to questions put to them verbally or through some devices specially created to elicit responses.

In the late forties and early fifties, working in conjunction with Piaget on the themes which occupied him then, but through a different approach, I could gather data simultaneously from groups of children numbering 30 or even 40 per session sitting in classrooms in some London (England) schools. (In Volume 2 of *For the Teaching of Mathematics* (1963) I reproduced a dozen or so of the papers published during that period.) I was not a disciple of Piaget, although I taught a graduate course at the University of London Institute of Education in which I expounded his work that was not then available to any English-speaking audience. My interest in his work stemmed from my interest in epistemology which came naturally to me as someone self-taught from the age of sixteen. I had acquired knowledge then in many ways but needed criteria to feel secure in its use. Later, as a teacher expounding the curricula imposed by the certifying authorities, I asked questions, many questions, for which I could rarely find answers. I read epistemologists and philosophers of science and acquired their views even when I did not agree with them, or perhaps failed to understand them properly. My interest in the biological sciences, and embryology in particular, made me keen to couch my findings in evolutionary terms. I often asked myself how "finished thoughts" looked in their embryonic stages. Hence my readiness to look at Piaget's genetic approach as a possible route to meeting my persistent questions.

In 1939, I received J.E. Marcault's book, *l'Education de demain*, just published in Paris, and in it I found the first answer to my quest: a synthesis of the biological sciences with psychology and the application of the synthesis to

education. Forty-five years later this book remains the only one which tackles questions I consider vital for the future of mankind's education. In some respects it is no longer accurate, but this can be said of almost all books, including the Scriptures. Forty-five years later I can say exactly where my work differs from Marcault's and where it is an offshoot of his.

In a synthesis the special topics gain their light from the whole and contribute to the whole, but they are not the whole. When we come to consider epistemology, Marcault's synthesis allows us to see that biology has a place in it. Not the science of biology, but the fact that knowers have a body and that it may play a definite role in how they learn and what they learn: an *animated* body (which we call a soma), not only a brain. For Marcault, somatic development is exemplified by neurological development and he borrows from neurophysiology "the law of integration by subordination" which he uses to transcend the soma and go beyond biology into all aspects of human experience. He refuses to stop at the stage where the cortex subordinates the whole of the nervous system by integrating it and he proposes a subsequent "biological" evolution, which he calls that of *le Moi* in the case of Man and *species instinct* in the case of animal species. Bergson, early at the turn of this century, had already proposed that a special entity, *l'Esprit*, surrounded the cortex and made it do or think what it wanted. In Marcault's hands *l'Esprit* becomes *le Moi* and goes back to being a biological entity intimately connected with what is commonly understood as belonging to the realm of biology.

All this connects with the challenge encountered by those who attempt to understand human functionings, of which knowing is one. Whether we say that our sense organs transmit sensations of the outer world to the brain where somehow they are made sense of and organized in memory, or that our mind is present in the sense organs and selects the sensations which make sense to it, we are always confronted with the mind-body duality and need to sort that problem out first. Epistemologists, like other thinkers, are fascinated by the difficulties presented by monism or dualism since neither can be worked out logically to everybody's satisfaction.

Marcault's solution, to conceive of the "mind" as a biological integrative level of development which made him able to produce a wonderfully satisfying synthesis, still leaves a number of questions untouched. His model is more comprehensive than previous ones, but not yet comprehensive enough to allow us to put together all we can

apprehend of even as restricted a field as, say, memory or the mental functions of the brain. To relate to any model as if it were the ultimate defeats the purpose of model making, which is to make us able to give our diverse experiences some organic connections. Progress in science is equivalent to making more explicit the possibilities of a given model, or to suggesting a more comprehensive one which takes care not only of as many challenges as before, but also of some previously inaccessible.

In order to tackle what Marcault's model did not allow him to consider and to produce a more comprehensive model, it is necessary to blend together relativity and evolution; to start with energy and time, and to look for a way of reaching the ways of working of all scientists, dead or alive.

It would seem a tall order and better not attempted. But if it is attempted in order to find out what it yields, and if the successive yields appear to be justifying the attempt, all that we are committed to is to use this model as extensively as it allows, in whatever manners that are not too contrived.

So much of what we know before we are born and for the first three or four weeks after birth is not conveyed through the sense organs. Our activities during this period are concerned with proprio-perceptive yield—among other things forming a conscious “body-image” telling the “self” (Marcault's *Moi*) about all the sensory nerve endings which terminate over the inside surface of our skin. These include of course the buds which inform the self of pressures, heat variations, smells and tastes. During embryonic development knowledge of this kind develops, as well as knowledge about the delegation of the maintenance of a proper functioning of the tissues as they are being made to a somatic substitute of the self. We call this monitoring agent the “psyche.” When all is working well the psyche does not involve the self in the maintenance of health. Only when things do not work well is the self mobilized to restore the proper dynamics, either by shifting existing energies or involving new ones. For instance, in entering into a coma, the whole of the self is absorbed in the search for the needed balances. The phenomenon of coma is proof that the psyche alone does not know how to restore the proper functions. The knowledgeable self is needed here. And it will be needed again and again, even if a spectacular event like that of a coma does not make its appearance.

In our epistemology we do not accept that only impacts from outside generate knowledge; know-hows exist and precede the interpretations of the energy impacts from the environment. The self has had a long time in the womb to learn to know the instruments of knowledge by perceiving directly the variations of inner energy. To neglect that period of life and start epistemological studies after the sense organs begin to work (three or four weeks after birth) is to deprive ourselves of the insights we can gain by acknowledging this profound and extended preparation.

In our epistemology the brain is an instrument of the self, on a par with the liver and the heart, which are even more necessary for the maintenance of life. The brain is many things and needs to be taught by the self all through life (cf. my *The mind teaches the brain*). Produced in utero,

and growing even after birth, its contribution to a proper epistemology is not necessarily its role as a guide—which is the self's job—but as a retainer of impacts (inner and outer), and hence a part of memory, and as a complex exchange system linking almost anything to almost anything else. The hierarchical structure of the brain allows the self to know emotions, feelings, long before it can know colors or shapes or ideas. A proper epistemology cannot be constructed without taking account of these deep energy transactions whose repercussions on later apprenticeships, invisible from the outside, may be considerable even though almost never talked about.

It follows from the above that a proper epistemology is forced to center on:

- a. how much of the structure of knowledge gathered by investigators could have been foreseen by those who know the genetic structuration of the soma, and
- b. how much of that structuration guides the acquisition of knowledge as well as the invention of theories.

Classical epistemology suggests that all knowledge begins in the sense organs and that sensations (primary and secondary) are essential for the formation of all future mental constructs. A person without any sense organs cannot know.

Genetic epistemology also starts at the sensory-motor level and implies that two processes involving the brain—accommodation and assimilation—are needed to provide the basis for organized knowledge.

Since the brain does not know itself and needs the mind to find out how it works, we choose to begin our epistemology with that which knows itself and can know what it does, i.e. a self in each of us, the knowers.

A proper epistemology must accept to consider questions like the following: “What does it mean to know the various stages of one's evolution?” “Does knowing evolve through the process of knowing?” “Are there as many different ways of knowing as there are challenges to the self which the self can concentrate on?” “Does knowing necessarily end up by being knowledge?” “Is it more appropriate to study knowing and ways of knowing than to limit oneself to knowledge as it is found in the sciences and technologies?” “Do philosophers, biologists, social scientists, mathematicians, use different ways of knowing which condition what they define as knowledge, as well as where they bring in their personal epistemologies?” “If temperament is a function of certain somatic attributes known in utero when they make their appearance, does temperament condition one into becoming an algebraist, a geometer, a probabilist, an analyst? and are these branches of mathematics both imposed by nature as the field of predilection of mathematicians and the reasons for insuperable mental barriers between mathematicians considering each other's work?”

Moving to the field of teaching, is it possible to link curriculum and method to students' temperaments?

When some educators contemplated the different ways of working of the two cerebral hemispheres, it seemed

legitimate to excuse some errors in learning on the basis of the conflict between cerebral dominance on the one hand and ways of presentation on the other. There were educators prepared to bow to this ineluctable physical reality and create new curricula and methods of instruction taking the hemispheres into account. Temperament, being a function of the soma, may show itself in lateral dominance; but not only there. Temperament is a wider component and needs deeper studies than those of the brain alone to be given its rightful place in epistemological studies.

Although there are obviously many more items, elements, stresses, to be considered now than in classical or genetic epistemology, the reason for maintaining them all in our studies is that there is no point in working long and hard only to reach insufficiently helpful conclusions. Who would like to spend a life studying some things and find at the end that it has served no purpose? Science is strewn with such examples. Mathematics has its share too. Evoking beliefs in the exclusive reality of Euclidean geometry or the derivability of continuous real functions or the unacceptability of infinite sets will suffice here. That reasonable, successful, competent, scientists cannot stop themselves from believing that they know when they only believe, assures us that temperament indeed has its place in our ways of knowing.

How is it that Condillac's theory of knowledge is still discussed two hundred years later when its fantastic nature has been exposed by studies of animal and infant learning? How is it that so many people, called behaviorists—still dominating psychology in North America—give the environment all the power to generate knowing in the mind and remain insensitive to the role of their own selves functioning all day as creative entities?

Does this mean that temperaments are insuperable inner systems which categorically condition our knowledge? Or is it simply that we have not cared to be serious in these studies and have left out essential components which did not strike us? We can start again and put things right and develop in time an approach more in keeping with the complexities of the reality we perceive and which accounts much more for it as it really is. In particular, we can make epistemology into the science of knowing about knowing and not just a study of how intellectual knowledge came about and was developed in some particular cultures (ancient Greece and the West) during certain periods.

Knowing about knowing includes all the previous epistemological attempts which have been propounded until now. They are not discarded as wrong, only as dated and as displaying the beliefs and temperaments of those talking of them, not necessarily the reality they were supposed to uncover. A new epistemology is supposed to do at least as well as the old ones, otherwise why change in its favor?

The new epistemology we are proposing earns its validity by integrating the *ad hoc* learnings of the embryo and early childhood, not as approximations to some future better knowledge (as genetical epistemology suggests) but as *sui generis* handlings of meaningful challenges the self *must* tackle to construct its world and feel at home in it.

The new epistemology must be able to take on creativity and understand its function as the way humans know a

universe they help bring to life by processing its impacts and transforming them with their own substance. All knowledge is of course human. It is therefore never final or static. In so far as it is retained it is affected by what the retainer stresses and ignores. It is affected by the aptitude, or lack of it, to recall experience "as is." Forgetting this or that is natural with us. Sometimes forgetting is supplemented by "re-creation" of that which was to be remembered. If we can become aware of this aptitude we can encounter the mutual interplay of recall and re-creation, leading us to a better understanding of knowledge as it is transmitted by others. Knowledge is able to withstand those transformations which keep some things of the original while injecting something personal, perhaps singular and unique, stemming from each individual involved in the acts of recall and evocation.

Mankind, in its pre-written language eras, rewarded verbatim retention, promoting a way of being which met the challenge of maintaining the traditions valued by the tribes. Hence the practice of retention and oral fidelity generated another tradition: a stress on memory training. In recent decades we have learned to give that tradition its true place by finding that all we need to retain and remember is what we cannot invent, or re-invent swiftly, when it is needed. Memory is far less important than we have believed.

In the field of mathematics in particular we can now use the time in class to make students mathematize situations and discover how many chapters of mathematics can be deduced, induced, from a minimum of givens. Short films or computer courseware can do this work splendidly. The dictum, "Give students only what they cannot reasonably find by themselves and let them do the rest," has made it possible to devise a way of teaching entirely based on the new epistemology, auguring well for the future of mathematics teaching and throwing an interesting light on curriculum construction.

The new epistemology when seen by practicing educators becomes the subordination of teaching to learning.