CHILD EDUCATION THEORY AND PRACTICES: GENETIC EPISTEMOLOGY

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ABSTRACT

Part of the logic of Kantianism is that we know in advance of meeting the world a priori what anything we meet can essentially and necessarily and universally be. The categories of pure reason define the essential forms of that which counts as reasonable put it, "the a priori conditions of a possible experience in general are at the same time conditions of the possibility of objects of experiences." Differently put, the categories of pure reason construct objects in light of their own forms. The world becomes a reflection of the universality and necessity that I presume myself to already embody. This is the logic, of course, of colonialism. It is also the logic of the preemptive strike. Since I create reality by acting, I already know in advance what the world ought to think of such acting.

INTRODUCTION

The way we treat a thing can sometimes change its nature. There are no “pure facts” if by “facts are meant phenomena presented nakedly to the mind by nature itself, independently respectively of the hypothesis by means of which the mind examines them and of the systematic framework of existing judgments into which the observer pigeon-holes every new observation. The old unilateral options of gericentrism (appealing to the authority of age, convention, tradition, nostalgia) and pedocentrism (child-centered pedagogy) only produce monstrous states of siege which are irresponsible to the matters at hand, that is, to the question of how life is mediated through relations between old and young.

In educational theory and practice, we have a choice when it comes to how we might treat the generous legacy that Jean Piaget has handed us. We can start with the psychopathological individuality of the child and try to understand his or her developmental make-up: “where the child isat,” as goes the educational adage. On that basis, we can then break down the disciplines that are entrusted to educators into corresponding developmentally sequenced parts and make these developmentally appropriate materials available in developmental sequence to the individual child. With the child and the child’s developmental means at the center of our considerations, we can divideand arrange the world (of reading, of writing, of mathematics and so on) around the child, in accordance with our understanding of this individualized center. And, in the process of watching the

child work and testing the results of our intervention, we can more accurately "target" what to do next.

This way of treating the legacy of developmentalism can result in teaching practices that have a very recognizable, and, I suggest, pedagogically unsound, character. With reading, for example, we end up having files full of developmentally color-coded readers, each of which has been specifically designed to developmentally follow the others, but no one of which contains a story actually worth reading. It has come to mean, in practice, that we present children with sequenced mathematics worksheets, each geared to the development and practice of an isolated skill (adding, subtracting, adding two digit numbers and so on) when in fact, in the world of mathematics, no such isolation actually exists. In Faculties of Education, new teachers are inculcated, for example, with an image of mathematics that no longer has anything to do with the living discipline of which it is meant to be a reflection. I have run into teachers that believe that addition must be taught to children before subtraction, because that is how such matters are sequenced in curriculum guides. I've also run into teachers who, under the numbing influence of developmentalism, believe that the alphabet must be taught in alphabetical order.

In both these cases, the world of language and the world of mathematics are subjected to what could be called a developmental breakdown, the very sort of breakdown required by established science as its central "method of operation":

The object [reading, writing, mathematics] is disassembled, the rules of its functioning are ascertained, and then it is reconstructed according to those rules; so, also, knowledge is analyzed, its rules are determined, and finally it is redeployed as method. The purpose of both [of these analytical breakdowns] is to prevent unanticipated future breakdowns by means of breaking down the object even further and then synthesizing it [putting it back together in strictly in light of the demands of themethod of operation of established science]. This process of "breaking down even further" is precisely what has happened to the rich and vigorous legacy of Piaget's work. His legacy has, inmany schools, turned into rigid, lockstep developmental sequences in our understanding of children and their ways of knowing. In parallel, it has turned into equally rigid developmental reconstructions of the living disciplines entrusted to schools. By presenting to the developmentally isolated individual child materials that are developmentally geared to his or her developmental level, we have, in effect, "prevent[end] unanticipated future breakdowns" by having already broken down "mathematics" into its developmental parts and doled them out in a developmentally appropriate way—we have acted, one might say, pre-emotively. This or that mathematics worksheet is not too hard for this individual child, and not too soft. It's just right, just difficult and challenging enough to, in Piagetian terms, disturb the child's current assimilatory schemata and because the accommodationsrequired leading to the next level of equilibration, the next stage of development.

Once the developmental sequences (of mathematics and of the child's cognitive development) are set, there will still be future breakdowns, but they will no longer be precisely unanticipated. If something unanticipated occurs when the child works on certain problems in mathematics, that simply calls for analyzing the situation in more developmental detail--more accurate targeting of his

or her developmental skills, for further divisions or subdivisions of skills and stages, for more severe and systematic isolation of tasks, materials or expectations, for different, more accurate testing procedures, and so on.

All of these are real dangers, but we have another way to take up the grand legacy of Jean Piaget's insights. Let's try an analogy here. When I used to go out into the garden with my seven- year-old son, I didn't send him off to a "developmentally appropriate garden." I took him to the same garden where I was going to work, a garden full of a whole array of work to be done, things to be experienced, lessons to learn, tools to use, knowledge to apply and to cultivate and enrich. And so, too, worms came there, and ravens, and deer, and bears, each with their own ways, each with their own abilities and experiences, each with their own work to do. Now, once my son and I got to the garden and got to the work that place needed from us, of course we worked precisely as each of us was able. We are not identical in ability, experience, strength, knowledge, wisdom, patience, interest and so on. But both of us were working in the same place, doing some part of the real work that the garden requires, each cultivating the garden and ourselves in ways that are different and yet somehowbelong together—akin, one might say. That place where we met and worked together was rich and generous enough, full of enough possibilities of exploration and work, to embrace and hold together our differences in relations of kind (see Jardine, Clifford & Friesen, 2003, 111—12). It allowed my son's ways of working, knowing and experiencing—and mine—to fully show themselves. And, of course, I learned something about that place and my own ways of knowing and experiencing it by living in the presence of my son's ways of knowing and experiencing it (and vice versa).

Each person's work in the classroom can be treated in an analogous fashion. This or that particular child's ways of knowing and engaging in the work of understanding and exploring triangles or number sequences, for example, need not be treated as a subjective or interior possession.They can be treated as something that happens out in the whole world of mathematical relations— with others, in the presence of others and their work in this place. Each person's work, in all its individuality and uniqueness, is therefore taken up as adding to the richness of the place in which we find ourselves living together, in all our differences. We can fill the classroom and children's lives with generous, multileveled experiences of these mathematical fields, and we can, in and through thisdiverse place, allow the differences of individual children to appear not in (developmental) isolation, but in the midst and presence of all those participating in the work at hand.

In such a place, we can let go of "learning the ways of mathematics" as only an underdeveloped child's problem. We can recognize that mathematics itself is difficult and complex and multifarious, and that the struggles children have with this way of knowing are just like the problems adults might also encounter. This way of treating the Piagetian legacy allows us to experience children's struggles, not as developmentally isolated phenomena, but as belonging to a long, ongoing, intergenerational history, an ancestry of human work (see Jardine, Clifford & Friesen, 2003, p. 119), work to which we as adults and teachers, also belong, in our own ways.

ESTABLISHED SCIENCE

Here is a simply example of what we are confronting. After considering his fireplace imaginings of floating DNA helixes, James Watson's was lead to ponder "Pretty. And hopefully scientific." (www.phy.bme.hu/~hild/helix/helix.pdf) Within the methods of operation of science, the beauty of his image and the contingent circumstances in which he first imagined it are irrelevant. Also irrelevant is the long and complex history of the image of helixes, and how this image was available to Watson as a way of understanding what he was seeing—a way of understanding inherited in our language and in our imagination from Latin and originally from the Greek eilyein,"to wrap or roll." Equally irrelevant are the drawings that Watson might have been arguing over, trying to picture the shape of DNA; the blackboards full of diagrams; heated conversations with colleagues; long hours reading relevant literature, searching out and testing various experimental designs; the bodily tiredness and frustration; the sip of single-malt Scotch; the trouble maintaining research funding and finding suitable outlets for the publication of results; all the politically and economically and personality/status charged quarrels over who was "first author," all the hope, the despair, the joys, the breakthroughs.

So here is a paradox. Such messy, contingent, circumstantial, worldly things—such imaginable, bodily, concrete, speculative, economic, cultural, political, motivated and philosophical ways of knowing and experiencing—are not irrelevant to the actual eventual accomplishment of the scientific discovery of the double-helix shape of DNA molecules. Established science, despite its "self sufficient" (Piaget 1970b, p. 5) and "intrinsically intelligible" (p. 4) method of operation, doesits work right here, in the world. But the "circumstances" do not and cannot appear as part of that accomplishment, because established science demands that its accomplishments begin only once its "method of operation" is enacted. In established science's account of its scientific accomplishments, these surrounding worldly events—these other ways of knowing and living in the world that surround its work and make its work possible—do not and cannot appear. Such an appearance would despoil the logic-mathematical method of operation that defines the study as scientific. After all, that book that I've cited by James Watson is autobiographical, not "scientific."

Piaget is quite clear on this point: "Science begins as soon as the problem can be isolated in such a way as to relate its solution to investigations that are universally accessible and verifiable, dissociating them from questions of evaluation and conviction" (Piaget 1974b, p. 20). And, further, established science necessarily follows "the essential rule of only asking questions in such terms that [logic-mathematically framed] verification and agreement is possible" (Piaget, 1965, p. 12). However, the actual doing of established science as part of the human enterprise is itself not possible without all the complexity of ways of knowing and living and acting in the midst of which it operates.

The complex ways of knowing that Jean Piaget's work has identified (bodily, imaginable, playful, concrete, linguistically complex, ancestral), therefore, do not simply form a developmental sequence that (ontogenetically or phylogenetically) precedes established science. This complex array

of ways of knowing surrounds houses and makes possible established science in ways that Piaget himself does not particularly address.

At work here is what Hans Reichenbach, in Experience and Prediction: An Analysis of the Foundations and the Structure of Knowledge (1938), described as the difference between the "context of discovery" that surrounds established science and its self-defined, logic-mathematically delimited context of justification "Pretty" is part of the context of discovery, but it does not help justify the double-helix character of DNA as a scientific finding.

Perhaps Piaget's work does not give us a good picture of the development of the actual operation of established science as a human enterprise, but only a picture, so to speak, of its ways of justifying its results, a justification that has deliberately purged itself of the very complexity of ways of knowing that it in fact deeply relies upon. Or has it?

Rosalind Franklin, a micro-chemist, was the first person to discover the structure of the DNA molecule but as a female Jew in an all-male scientific organization, her colleagues, Maurice Wilkins, James Watson and Francis Crick, refused to give her credit. Wilkins gave Franklin's data to Watson and Crick without her permission and would not allow her to attend their meetings to discuss her results. Wilkins would not accept females in the doctoral program he supervised as late as the 1970s. Franklin was unable to share in the 1962 Nobel Prize with them because she died of cancer in 1958, and only living people can receive a Nobel Prize. Not only did she discover the helical structure of DNA, she showed Watson the mistakes in his original double-helix model which led to his award- winning conclusions. (Vare & Ptacek, 1988, 214–15)

So much for the lovely story about fireplaces and helix imaginings. Maybe this is a feminist exaggeration and distortion. Or maybe it's the truth finally out. Certainly it is no wonder that Piaget's work focuses only on what occurs within the confines of the method of operation of operation of established science. It may well be that, within the confines of sciences' self-justification, that "a single truth alone is acceptable when we are dealing with knowledge in the strictest sense" (Piaget, 1965, p. 216-7). However, what occurs beyond those confines is often difficult indeed, with no clear and controllable methodology to help us sort out once and for all what its "single truth alone" might be. This just may be precisely the sort of life-world "surrounding of established science"—how it is actually accomplished, only one part of which is its internal, logic-mathematical method of justification—that we want children to know about in our school curriculum. After all, coming up with a good hypothesis takes imagination, even though scientifically testing it does not. Cultivating children's ability to imagine is thus essential to their coming to master science, even though it is not essential to the ways of justifying scientific findings.

CONCLUSION

In my role in teacher-education, I have been talking with student-teachers about a disturbing and yet inevitable aspect of teaching: that the students you teach think about you in ways that you might not think about yourself, that they experience and know the world in ways that go beyond our

own. A first response might be, of course, bewilderment, paranoia, withdrawal, humiliation, anger, even violence. However, students are often able to read our hopes, intentions and experiences back to us in ways that have the potential to release us from the potentially deadly and deadening enclosures of our own self-narration.

This is a huge revelation for a new teacher: that we might listen to others, not only in order to understand them and what they believe better, but in order to understand ourselves better, to understand what we believe in ways that we could have never understood alone. It may be that it is precisely the release from the enclosures of our own self-narration that makes teaching and learning possible. Only in such release can we understand ourselves as living with others in the great, ongoing, sometimes terrifying, sometimes joyful conversation that constitutes being human. Our onlyhope just might be the realization that "genuine life together is made possible only in the context of an ongoing conversation which is never over yet which also must be sustained for life together to go on at all" (Smith, 1999, p. 139).

This, perhaps, is Jean Piaget's greatest and most troublesome gift to those of us in education: that we are not just knowing, but known. We are not just experiencing others, but experienced by them. Our ability to take up this challenge with love and affection—"kind-nests," one might call— despite all the sometimes overwhelming difficulties that challenge entails, might be the greatest test of our "maturity."

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