

READJUSTING DIDACTICS TO A CHANGING EPISTEMOLOGY

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Mister Chairman, Ladies and Gentlemen, dear colleagues, my presentation will focus on *some* aspects of the field of didactics as I view it today, after more or less thirty years of hard work on the teaching and learning of mathematics in a French context.

In preparing this short presentation, I looked up the expression “keynote address” used to label the main presentations in this congress; and I came across the following definition: “an address designed to present the issues of primary interest to an assembly (...) *and often to arouse unity and enthusiasm*” (italics mine). I’m afraid that I shall arouse neither unity nor enthusiasm. What I have to do is draw your attention to some facts that, up to a point, distinguish the science of didactics as I try to practise it, and as I advocate it – along with some other people, to be sure –, and that these aspects may run counter to some widespread views and beliefs pertaining to what didactics should be.

Let me first say first a few words about the *origins* of the field. The first argument that urged us to create a new field of study was a dual argument. On the one hand, we dismissed psychology, as Piaget had made it popular at the time, as a very partially relevant approach to the problems of teaching and learning. The reason was essentially the following – of course this is *my* version of the story. What a pupil would do, or fail to do, or even resist or elude is not determined only by some inner properties of his (we then said “of his”, not yet “of his or hers”, let alone “of hers”...). In his lecture series *The Sciences of the Artificial* (1969), Herbert A. Simon made an illuminating statement: “An ant, he wrote, viewed as a behaving system, is quite simple. The apparent complexity of

its behavior over time is largely a reflection of the complexity of the environment in which it finds itself.” Simon then substituted “man” for “ant”, thus suggesting that man’s behaviour was also largely a reflection of his environment. Another example. The maze explains how the mouse behaves much more than does its cognitive structure or its exposure to other factors (for example to classical music versus “hard-rock” music, see the *Washington Times*, 29 July 97, page C3: http://www.edu-cyberpg.com/Music/Mice_and_Music_Experiment_Mo.html). In the case of mathematics teaching and learning, this conclusion led to another question, about what the pupil’s environment was made of. The answer was: first and foremost, the environment on which the pupil’s behaviour depends so heavily is made up of the knowledge imparted *and* the way it is imparted. In analysing the pupil’s fate, one had to take into account not only the child, but also the teacher as a herald of the knowledge to be learnt, whose presence changed that knowledge into “taught knowledge” and made the child into a pupil. Taking seriously that there was a teacher led us to reject the psychologist’s oversimplified subject-object relation. On the other hand, we could no longer hold to the tepid creed of pedagogy in-so-far as it turned knowledge into a “false protagonist” of the play. Much to the contrary, we considered knowledge to be the main character and the true hero of the plot. Caring for knowledge, for its so-called “specificity” became the (French) didactician’s earmark. It was not that other approaches – save, it seems, for the pedagogue’s – denied the importance of the specificity of knowledge. However, the basic principle of the didactic view of learning and teaching was that knowledge is not something given, *out there*, so to speak, but something to be explained, and, in turn, something that is at least part of the explanation of a multitude of learning and teaching phenomena! That knowledge was more or less the explanation of the pupil’s behaviour was carefully elaborated by Guy Brousseau in terms of *didactic situations* – a magnetic concept around which French didactics still revolves. Knowledge is potentially encapsulated in

situations, and it is in going through those situations that the pupil, or whoever, can learn. This view of learning as “learning from the situation” (much more than from the teacher, which is the institution’s orthodox view of it) remains central to French didactics, at least regarding the learning of mathematics. In their turn, however, didactic situations were questioned – about their genesis. Where do they come from? How, and by whom were they shaped? What is their degree of effectiveness in promoting learning? This questioning led to a rather unexpected answer which, to some people, sounded – to use the old Freudian terminology – like a narcissistic wound. The answer is known as the theory of the didactic *transposition*. Knowledge is not a given, the theory says, it is built up, and transformed, and – such was the keyword – *transposed*. The wound was twofold. For some people, especially for teachers, the statement was a threat to the unconscious belief that the world of knowledge was, so to speak, homogeneous, isotropic and indefinitely unblemished – therefore unquestionable. The problematic character in the play was the pupil, not the knowledge taught. To others, who, I presume, identified with the playwright, not with any of the protagonists, including the teacher –, and who regarded themselves as the true masters of knowledge, to them, the transposition principle came as a repudiation of their as yet unchallenged authority. To put it in proper terms, the masters of “scholarly knowledge” realised with awe that, if the didactic transposition theory was right, they were no longer the princes of *all* knowledge, in so far as they were ignorant of the knowledge transposed at school for example, which proved to be crucial to the social diffusion of the knowledge of which they considered themselves the natural legatees.

The main point in the didactic transposition theory is that it considers knowledge as a changing reality, which adapts to its institutional habitat where it occupies a more or less narrow niche. One conclusion of this ecological approach to the social dynamic of knowledge was that the classic description in terms of pupils,

teachers and knowledge to be taught and learnt *was not enough*. Behind the persons, and the knowledge, there appeared the *institutions*, to be regarded on a par with the persons, in the light of a dialectic between persons and institutions. Persons are the makers of institutions which in turn are the makers of persons. Generally, however, institutions come before those persons – their “subjects” – thanks to whom they will continue to exist and change. So that, in order to understand what persons are made of, we have to understand how institutions live, develop or recede. This is, in my view, one of the main breakthroughs of didactics as I understand it. While a large number of people continue to think about teaching and learning in individualistic terms, the view to which we arrived was quite opposite. In recent developments relating to teacher education, for example, one does not look first and foremost at what this or that teacher knows, or ignores, or can do or fails to master, but addresses the problem of what the *profession* as an institution – not its individual members – knows or ignores, or can learn, or, for the time being, seems unable to learn. For example, what does a French mathematics teacher know about mathematics? Essentially, she knows what her profession knows; and she can learn what the profession is able to learn. The social world is replete with “institutional idiosyncrasies”, which are the main determinants of the individual’s behaviour, on which *personal* idiosyncrasies operate as second-order corrections. Once you reject what Freud called the “narcissism of small differences” (in a 1917 paper titled *Das Tabu der Virginität*, the taboo of virginity), you can dismiss all the fuss about the individual’s uniqueness. Not that I deny uniqueness, which, if I understand well, is a plain fact. However I very much doubt that what makes one unique will prove centrally relevant in determining his or her response in such or such situation. What will prove relevant remains indefinitely open to scientific inquiry, even if I am inclined to believe that we know a little more about that than we did a quarter of a century ago. Of course, all this comes as another narcissistic wound. However, sticking to the suggested principle soon

reveals phenomena which we usually put out of our consciousness. It is thus a striking fact that so many people implicitly think of the functioning of a class in terms of a *radial* model, in which knowledge “radiates”, so to speak, from the teacher directly to the pupil – a view which purposefully supports the widespread whim about individualised teaching (including its latest form, home-schooling). In fact, the way knowledge spreads through a class is not that simple: far from radiating directly from teacher to pupils, it percolates through the class along unintended but necessary trajectories. One learns at least as much from other pupils in the class than directly from the teacher – because so many pupils, for varying reasons linked to their personal relation to society, to authority, to knowledge, and so on, cannot resist the symbolic pressure exerted by a face-to-face exchange with the teacher. Their encounter with knowledge is thus mediated by the class or, more exactly, by some of their peers – an unexpected but fundamental form of “peer mediation”.

To go deeper into what some of us – in France as well in some Spanish-speaking countries, among others – are trying to do, I have to raise yet another fundamental question. The universe described until now is a narrow one, much too narrow, in my opinion, to permit a proper understanding of most didactic facts. To be complete here, I must clarify what a didactic fact is – a moot point since no comprehensive agreement about such a definition seems to exist. What I therefore call a *didactic fact* is any fact that can in some way be looked at as the effect of a socially situated wish to cause someone to learn something. This wording is fairly general. But I need a yet wider definition of *didactics* itself: I define it – provisionally – as the science of the *diffusion of knowledge* in any institution, such as a class of pupils, society at large, etc. More particularly, didactics is the scientific study (and the knowledge resulting thereof) of the innumerable actions taken to provoke (or impede) the diffusion of such and such body of knowledge in such and such institution.

In widening the scope of didactics, as I suggest to do, we also have to generalise its object: didactics not only cares for the knowledge recognised as such by some authoritative institutions – e.g. the institutions of higher learning –, but it has to broaden its object of study, just because in the life of institutions, bodies of knowledge appear intricately linked, from the point of view of ecological analysis, with entities that some authorities would *refuse* to call knowledge, although we need to take them into account in order to explain the fate of “true” knowledge. In the framework of what has come to be known in some circles as the *anthropological theory of the didactic* (ATD), these entities are called *praxeologies*. A “body of knowledge” is simply a praxeology (or a complex of praxeologies) which has gained epistemic recognition from some culturally dominant institutions, so that mastering that praxeology is equated with mastering a “true” body of knowledge. (Blowing one’s nose, for example, involves a praxeology which very few people, I suspect, would call knowledge!) Essentially a praxeology is made up of two parts, the *praxis* part and the *logos* part. Each part in its turn consists of two components. The *praxis* part is the union of a *type of tasks* (such as solving quadratic equations, blowing one’s nose, composing a fugue, for example) and a *technique* – a way of doing – which purportedly allows one to carry out at least *some* tasks of the given type – those in the “scope” of the technique. The *logos* part is the union of a whole set of notions and arguments arranged into a more or less rational “discourse” (*logos*), the so-called *technology* of the technique, which is intended to provide justification for the technique – why does it work (at least sometimes), where does its effectiveness come from?, etc. – and a more abstract set of concepts and arguments arranged into a more general “discourse”, the praxeology’s *theory*, supposed to justify the technology itself.

I shall not comment any longer on the concept of praxeology – I shall simply use it in a very few seconds. For it is time now for me to comment briefly on the

title of my speech – readjusting didactics to a changing epistemology. The epistemology that is supposed to undergo changes here is not only school epistemology, but, more comprehensively, the epistemology of the man in the street, that is, the *layman* epistemology. In the old paradigm of education, knowledge was a quasi sacred reality that only authorised persons, themselves quasi clerics, could *show* to the multitude – “to teach” meant originally “to show”, just as today the Spanish verb *enseñar* means both “to teach” and “to show”. How can we characterise the modern relation to “knowledge”, or more precisely to praxeologies? It seems to me that this relation to “knowing” essentially boils down to a simple but fundamental cognitive pattern: in social life, a *question* is raised, in some institution, and persons in that institution try to do something in order to provide an *answer* to that question. The question is not intended to belong to any established field of study – it can be anything relating to any social practice. Now the answer that is being looked for has the structure of a praxeology, or of a fragment of a praxeology, or is a piece of a praxeological complex. Loosely speaking, therefore, the answer *is knowledge* in the broad sense I advocate. It should be clear that the question/answer pattern is the heart and soul of the social diffusion of knowledge – I mean, of praxeologies –, both among the cognoscenti and the lay public – it applies quite well, for example, to some current uses of the Internet. And of course, for very good reasons, there is a shift taking place at school towards making this pattern central to education. Now didactics is no fashion victim: it simply follows the changes that affect its object of study. This is why the newest developments in the field have been directed to the study of an incipient form of school study, for which we have coined the expression of “Study and Research Course” (SRC), following the French “parcours d’étude et de recherche” (PER) – in Spanish, “Recorrido de Estudio e Investigación” (REI). In such a course of study and research, a group of students is supposed to study a question with enough “generative power”, in the sense that the work done on it by the group is bound

to engender a rich succession of problems that they will have to solve – at least partially – in order to reach a valuable answer to the question studied. This, for sure, is a minimal description of what an SRC is intended to be. But time evades me, so I shall stop here. Thank you very much to all of you.