

“Quaderni di Ricerca in Didattica (Matematica)”, *Supplemento n.4 al n. 19, 2009.*
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NOTES ON THE OBSERVATION OF CLASSROOM PRACTICES

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Abstract: *This article presents some results obtained thanks to the observation of classroom practices carried out in a specialized establishment: the COREM¹. Making certain effects of the didactical contract evident made it possible to predict and follow for 25 years the development of an uncontrollable phenomenon unleashed by massive direct evaluation. But naïve observation itself also played an important role in this process of degradation in teaching conditions. Inspired by the example of the COREM, this text prepares the introduction of a genuine deontology of classroom observation.*

I. A specialized institution for observation: the COREM

a) The COREM was an institution created to permit mathematicians to carry out different sorts of systematic and sustained observations. It was made up of three contractual entities: a research laboratory, a technical team and a whole school (14 classes) with an adapted status. The school was the complete system of optimal size to be created and stabilized. In order for the school to function correctly and naturally in spite of a heavy load of arrangements for observation it was necessary on the one hand to establish and regulate its relationship with its environment and on the other to neutralize the internal effects of the special arrangements designed to make the characteristics of its real functioning apparent. [Salin & Greslard, 1998]. The situation for observing was conceived on the same theoretical model as the mathematical situations proposed for the students [Brousseau, 1978]. It aimed to permit observers to pick out behaviors while influencing them as little as possible, but above all it aimed to *make it necessary* on their part to produce didactical knowledge *subject to a pragmatic restriction* for a short term on the part of the system observed.

Thanks to the IREM² and the community of mathematicians, the COREM was able to establish numerous important experimental and theoretical results. It developed original and appropriate methods of research and contributed to the training of numerous researchers. It also left an imposing collection of video recordings and documents produced by the students and the teachers which the ViSA Project³ is going to make available to researchers.

The longevity (25 years) and stability of the COREM demonstrated the value of its conception, and despite the very specific character of the institution it seems to me that the principles that assured this longevity could be a subject for useful reflections for all forms of observation.

b) To insure the best scientific value of the results of observations, one must be able to *insure the authenticity of the facts* observed. On the other hand, given the observers' obvious insufficiency of theoretical knowledge one must allow the practical knowledge of the teachers to be expressed and ultimately leave to them the responsibility for insuring the best for their students. These two principles could lead to using

¹ COREM Centre d'Observation et de Recherches sur l'Enseignement des Mathématiques (Center for Observation and Research on the Teaching of Mathematics), created by the IREM (Université de Bordeaux).

² IREM Institut de Recherches sur l'Enseignement des Mathématiques (Institute for Research on the Teaching of Mathematics)

³ Projet ViSA: Vidéo de Situations d'enseignement et d'Apprentissage, Base de données d'enregistrements, Institut National de Recherches Pédagogiques, Paris.

only “passive” observation so as to prevent the observers from having any influence on the classroom practices. But this type of observation is known to be an illusion; it is deceptive and very little is gained from it. Furthermore, everything observable takes place in a chain of conditions and intentions, most of them implicit or not known even by the teachers themselves. We therefore envisaged events in the classroom and the school as *manifestations of a system*, of which the observer is a part. In this case, the observation of isolated indications and variables often reflect only the *a priori* ideas of the observers. Hence it was necessary to *organize an appropriate design* to make the reciprocal influences of the participants apparent, to control them, and to contain them. This option required the development of some original methods, but it was the source of our best results.

c) Many of the options of this project were contrary to the ideas that were current at the time. They are nonetheless rigorously deduced from principles or facts that were indisputably imposed on us. We have to satisfy many constraints like general principles of scientific observation, rules of educational institutions, methods of observation, quality and the stability of the functioning of the school... which necessitate theoretical elaboration and experiments.

The complex inventory of these designs and the demonstration of their coherence is beyond the limits of this communication [M.H.Salin 1998]. We will present just a few aspects.

II. Certain classroom practices as the effects of the didactical contract

The objectives of observation of didactical sequences

Thanks to the COREM, we were able to make dense observations of the teachers’ strategies when they perceived or noted an insufficient or failed attempt to teach some determined piece of knowledge. In order to classify these classroom practices, we modeled them in such a way as to enable us to put the progress of the lessons in sequences. The sequences are delimited by the decisions of the teachers between which an a-didactical phase develops at the discretion of the students. The decisions of the partners are themselves related to models of situations.

For example, we identified various possible outcomes: the teacher abandons the project, he ignores the failure and proceeds, he points out the error, in which case he may or may not correct it without commentary, may or may not comment on it, refers it to something already taught and/or gives an example and/or gives a new closely related exercise, etc. We observed that these reactions vary as a function of factors like the amount of time available to the teacher or how important he feels the error is, etc. The importance itself depends on various factors such as how close the error is to near-by preceding or future lessons, the proportion of students who made or might make the error, etc.

These observations brought out a set of intentions and techniques that is much more complex than that habitually reserved for classical descriptions of teaching. For example, the same piece of knowledge is treated differently depending on whether it is

- Present in the situation (for the teacher) but not used (perhaps not known to the students) one or several times
- Identified (formulated, for example) with an environment of unclassified circumstances, for example by an introductory problem
- Introduced as factual knowledge with an environment of definitions, properties and examples
- Explicitly referred to as institutionalized knowledge, useful in a new situation or field
- Used as an everyday object, without explicit reference except in the case of incorrect use.

The independent activities of the students take place between these critical events. The teacher can evaluate them as his failure or his success. He can interpret them and respond to them with decisions like the ones mentioned above.

3. Teachers spontaneous responses to the failure of a didactical attempt

Observation of practices and discussions with teachers made it possible to reveal not only isolated decisions but also genuine rhetorical strategies.

We considered them to be the “*effects*” resulting from contradictory requirements of the “*didactical contract*”. Here are a few examples. The teacher can put the error on trial: he compares the faulty answer with the knowledge of the students with the intent of getting the right answer and reference to the knowl-

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edge that determines it; or perhaps he proceeds, trying to explain the error, that is attributing its production to one or more “causes” that will eventually be the object of a new teaching sequence (an additional subsequence); or then again he may put the partners in the situation on trial: the student or students, himself, etc. But he may also resume the failed teaching in a variety of modalities:

An identical repetition consists of restarting the teaching sequence in its initial form. Sometimes the teacher reduces the uncertainty of the student by removing the artifices and superfluous information from the problem, but leaving what’s essential,

The **“decomposition of the question”** effect: the teacher breaks up a mode of resolving the question posed into steps that furnish a new series of “simpler” questions. The succession of steps rests on a decomposition of knowledge. The elements succeed each other in accordance with rules borrowed from various repertoires: mathematics, logic, epistemology, methodology, heuristics, etc (for example from the sufficient to the necessary condition, from the simple to the complex, from the general to the particular, from the concrete to the abstract, from cause to effect (or their inverse), etc.

The **“Topaze”** effect: the teacher requires of the student a formally accurate answer, but he obtains it by reducing his uncertainty by highly illegitimate means, with no relationship to the goal knowledge. (He whispers the answer to the student.)

The **“Jourdain”** effect: is a variation of the preceding one. The teacher not only accepts an answer the student has obtained and justified by valueless means, but also accepts and validates those means.

The **“abusive use of analogy”** is a variation of the preceding. The teacher obtains the right answer from the student by mentioning a ‘similar’ problem: the student reproduces a behavior not because he sees it as well adapted to the problem, but because it conforms to the model given.

The effect of **“meta didactical slippage”**: the teacher takes a means of teaching (the whole situation, or part of it, or its resolution) as a new object to be taught. For example, he explains his explanation, or he teaches a meta language for teaching a language. Abusive use of analogy is a form of such slippage. This effect will be studied below.

Even in the course of his interventions other practices appear, such as the effect of **“didactical permeability”**: the teacher wants to much to clarify things for his students that he unduly, and often without even noticing it, introduces knowledge, concepts and language of the knowledgeable professional that helped him but are of no didactical use and can only be badly understood by his students. Inversely, in reaction, some teachers hide their own knowledge and end up losing the use of the knowledge for validation.

The effects of these practices on learning and teaching

These effects were first presented to us in no particular order, and we interpreted them as slippages or errors. But very soon they appeared to us as a system of legitimate, if ineffectual, responses to the contradictions of a “contract” assumed in classical teaching to be clear. In fact, not one of these choices has the effect of transmitting the goal knowledge. Some have no virtue other than the avoidance of some yet more undesirable effects. For example, under the Topaze effect, the teacher and the student accept, or pretend to accept, that each has accomplished the assigned task. This trick enables them at the end to maintain the didactical relationship, to proceed to another step and to delay without saying it to new attempts in the future, without butting heads in discouraging and in any case ineffectual confrontations.

These methods that appeared in classroom practice in fact reveal those that every institution in a didactical position adopts in our societies. It is possible to observe meta-didactical slippages that concern a whole society and extend uncorrected through many years.

Offering a series of “false solutions” is the only strategy that effectively permits successful teaching so that a certain proportion of failures is inherent in the process. The proportion depends on a variety of variables, among them teaching time, but it doesn’t depend in a monotone fashion: in certain conditions, giving more time does not improve the result [Chopin 2007]. Moreover, excessive reiteration of each effect leads unavoidably to failure at the end. So that one of the main inconveniences of this system comes from the fact that nothing indicates the limits of these reiterations. Worse, certain “theories” pro-

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pose them as legitimate means of teaching and learning, and thus encourage their perverse effects (for example the use of analogy in the Diènes method). The conditions in which didactical decisions might use the results of research in cognitive psychology or sociology are never taken on by these domains.

The effects of the didactical contract were studied by the daily observation of classes. Modeling them made it possible to predict their effects in the long term, using historical research as well. For instance we study how the development of universal testing influence classroom practices and we preview their consequences: Public opinion and political circle interpret directly and naively the results of school, neglecting professional interpretations and scientific specific knowledge. Their decisions are generally inadequate..

We will now discuss the results of some research on the manner in which classroom practices react to conditions exterior to the class.

III. Effects of observation itself on the practices of teaching

Even observation that claims to be “passive” influences the behavior of teachers and students and can lead to errors. Here are two of the many examples of consequences resulting in part from poor control over the observations of classroom practices. The first has to do with a single class, the second with numerous advanced countries.

a) Example. A sociologist observed the videotape of a lesson and reported an imbalance in the number of interactions teacher-pupils depending on the sex of the students: a mean of 9.5 for a girl, 13.6 for a boy. This result, consistent with a large number of other observations, is incontestable. But it was interpreted as an indication of sexist behavior on the part of the teachers. The school where the videotape was made is situated in an area where many of the children are of North African origin. Its teachers wage daily battle against the manifestations of the extremely unjust traditional conceptions that these students have of boy-girl relations. Ignoring this fact, the publication of the result of this observation in a book, blaming teachers for sexual discrimination, caused the teachers much distress – they couldn’t hand the chalk to a child without worrying about the balance of their choice, to the detriment of their didactical work.. In fact the analysis of the sociologist were superficial and her conclusions false The analysis was redone on other lessons. It turned out that if one connected the interactions to their cause – and in particular to their didactical nature – the balance was reasonable. The sociologist had been unable to distinguish between interventions motivated by maintaining discipline and interventions that were genuinely at the discretion of the teacher. This slant was due to the fact that the behavior of the other students, which the teacher could see, was not recorded by the video-camera, which was focused on the didactical action in progress. Now, calling on an overactive student to participate rather than issuing a reprimand is a common and beneficial classroom practice. The fact that boys are more overactive and have a stronger desire to be called on is not a variable that is under the teacher’s control. This example shows how taking an isolated piece of information and neglecting the functioning of the system as a whole can lead to erroneous conclusions. On the side, it shows how the publication of such results can in return influence teaching itself. Three conclusions result: observers of classroom practice need to envisage their object of study as a system, insure its anonymity and be conscious that they themselves are part of a larger system.

b) Perverse effects of the diffusion of observation of the behaviors of children ... in conjunction with several other causes

The following phenomenon illustrates the same idea, but it is less innocuous. We detected it from the late ‘60s and denounced it by the end of the ‘70s. Most of the research of the COREM attested to one or another of the processes composing it. It reached an extreme amplitude in the 2000s. Today the disastrous consequences are being reported [Nichols and Berliner, 2007].

1) For forty years innumerable quasi-psychological studies of the mathematical behaviors of children have provided a very large number of ingenious tests for evaluating all sorts of their capacities. They have considerably renewed and augmented the body of “evaluative” tests of the results of learning. But they have furnished very little knowledge about the means of improving students’ performance on these tests.

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2) By neglecting to establish theoretically and experimentally objective relations between certain conditions of learning and the effects expected, these studies have in effect simply enlarged the collection of means of demonstrating supposed “defects” in the educational system.

3) These tests have been interpreted and accepted as objectives, and progressively confused with those of teaching. They have substituted themselves for some of them, while in fact they are only an extension and a deformed image. Anything produced by teaching but not measurable by the methods chosen has been neglected, above all the forms of knowledge that manifest themselves exclusively in the possibility of pursuing learning and teaching.

4) The requirements for teaching have then been augmented by the use of requirements from all sides, often baseless from the didactical practice point of view, such as, for example, requirements of general “skills”.

5) The proliferation of these “objectives” first led mechanically to a systematic undervaluation of the results of students declared to be “failures” relative to these contradictory norms.

6) The evaluation tests were then used as a means of teaching.

7) This led to a subdivision of knowledge and activities which in the end give a poor representation of mathematical activity and lengthen the time required for study.

8) In the vain hope of facilitating their action, the teachers then formed “homogeneous” groups of students, which leads progressively to the individualization of teaching and an individualist conception of acculturation to mathematics that is difficult to put into action and poorly motivated.

9) Under-evaluation and individualization also provoked a strong augmentation of the time necessary for the teaching and learning of classical knowledge.

10) The fact of having to neglect the results that are hidden in evaluation tests in order to concentrate on “basic” learning made the learning itself more difficult and slower, even for the exercises that appear the most repetitive. The superimposition of requirements has led to a variety of uncontrolled phenomena such as meta-didactical slippage (replacement of an act by its description, then by the explanation of the description, commentary, etc.)

11) This results on the one hand in increased pressure first on the students and then on the teacher, and on the other, in response, to demands for reduced requirements or tolerance for larger and larger amounts of failure.

12) The results evaluated as well as the real ambitions have thus been lowered.

13) And the cycle begins again. The process is recursive: failures provoke proliferation of testing; the reinforcement of inadequate methods and the lowering of their results refuels the process. In the absence of sufficient knowledge about the process of teaching, these pressures have accrued even as they produce effects opposite to their objective.

Today the consequences are coming to light: no improvement has appeared in response to the most coercive measures based on erroneous didactical conceptions.

c) Clearly, this process is the product of a very complex set of conditions.

It should above all be noted that it is not the result of a defect in any one of its actors. It is by locally optimizing their actions that teachers, administrators, organizers, scientists enclosed in their domains and even students produce the veering off course described. The process doesn’t reflect on their competence nor on their good will. The blame lies with the collective epistemological conceptions and didactical knowledge very approximate overall, and false in every specific occurrence. These conceptions uncontrollably impose on each actor views and options that are summary and inappropriate. They appear to be contrary to what a person sees, but their obligatory use reorients her/his knowledge, to the point where there is at times a complete divergence between what he is actually doing and what he thinks he is doing. Local progresses are condemned, excessive, violent and unconsidered reforms appear.

It would be good management to develop scientific research as swiftly as possible and at the same time to limit the premature influence of the theses being studied on classroom practices. There again a new difficulty arises, because one would need to develop the knowledge of the public while avoiding having it

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used with the desire of instantly modifying the educational system in the illusion of its power and current knowledge⁴.

IV. Some arrangements of the COREM for observation

Organizing observations leads to merging within the same systems two subsystems whose goals and means are very different and sometimes in opposition or contradictory: the design for teaching and the design for observation of teaching. The best pairing will be the one that permits the best autonomous functioning of each of the two subsystems, with the only interactions being those necessary for observation or experiment. It's necessary to respect clearly and professionally the responsibility, the works, the persons and their dignity. That independence is difficult to obtain and maintain. It is not spontaneous, it result of a common work very complex.

Here are some examples of that difficulty: the task of the teaching design has at all times priority over that of the research design. But the desire to improve the teaching they do leads the teachers and the researchers to want to benefit the students by using all the resources that observation offers them. Inversely, depending on the credit they have with the teachers, the researchers can reorient the teaching according to their beliefs or knowledge. Now, unconsciously or not, a teacher has the possibility of showing or masking the thing that is expected if she knows about it. This remark is fundamental: “mirror” effects can and must be eliminated.[Salin, Greslard 1998].

To effectively assure and limit the legitimate priority given to teaching, one must arrange a whole range of precautions, made explicit and agreed to in advance. Defining the division of responsibilities between each subsystem and the rules of maximal autonomous functioning are the first condition of mutual respect that the participants owe each other.

For ethical and deontological reasons, the observer, like the anthropologist, must no intervene in the evolution of the object of her observation. Moreover, it is in her interest not to intervene, first in order not to destroy the objective value of her observations and then because of the subordination that that intervention establishes *a priori* in the observer/observed relationship. Now, most often nothing justifies that subordination.

Observers have a tendency to confuse the objective: for example they prefer to notice singularities in the behavior of the actors. These singularities are only facts of didactical observation if they result from reproducible conditions, a model the observer should conceive. Their interest for didactical research depends on the importance of their consequences to the extent that the observer believes that they will not be corrected by the educational system. A fact that one can only explain by characteristics that are personal and/or impossible to modify does not advance didactical research. These private episodes should never reach the actor observed or even be published. Without deontological precautions lots of observations of classroom practices arise from pure voyeurism.

It can happen *in the case of an exceptional event* that the observer desires or feels obligated to intervene conspicuously after or even during the process of the event. It would need to be really urgent and legitimate. It can be shown that even the observer, even if experienced and legitimate, is not in a position to claim to have better means than the teacher for developing or rectifying his actions. The claim of the observer to have the right to intervene in the teaching design are often based on an *a priori* assumption of competence superior to that of the institutional actors that is generally not objectively justified, and if it

⁴ In fact, every negative report raises the criticisms. A cacophony of experts – but in other domains – collects sparse observations as sufficient support for the most extravagant diagnostics. Civil society: politicians, industrials, businessmen, clergy, media ..., collect and aggravate the fruits of the agitation without offering any alternative, due to ignorance or interest. The history of teaching shows that recognizing errors is not enough for learning to correct them. The evaluation of the learning capacity of our society in teaching materials is pitiless: 30 years without even learning to distinguish the precautions that should be taken, while flurries of improvised reforms gather and burst upon us.

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were it would not be legitimate. In the case of an intervention, the observation contract is broken, often for good.

For all that, the principle of non-intervention is illusory: the presence of the observer does modify the behavior of the teacher and the students no matter what precautions he takes. The result is that passive observation is impossible and that the influence of the observer on the observed system should be taken into account in the organization of the design, both as an object of observation, and as a means of regulation. The observer is not outside of the system, she must model it in her arrangements. The quality of her research depends on her knowledge, on the control that it gives her over her own actions, and on what she retains.

Non-intervention extends to the whole system. The observer should rid himself of the intentions to influence the educational system by his “discoveries”, which are necessarily partial in the current state of our knowledge. We know enough to know that currently our direct influence will be necessarily slanted and largely uncontrollable.

It is not possible to describe here all the designs that we had to put in place in order for 25 years to keep running a project that was supposed to live “like an ordinary school” within its environment, and to do so was supposed to “keep out of people’s attention” unusual supplementary personnel always present on the site, and keep people from remembering the important results that were being elaborated there.

VI. Conclusions

The results presented in this article demonstrate the necessity of setting out principles of deontology for the observation of students and of classroom practices. Some of those that we have mentioned are very much in opposition to those commonly practiced, expected or even desired. It follows that individual morality, though essential, is insufficient. It must find an echo in the relations of societies with their educational systems and their students. Deontology of observation should even apply further, in order to better manage the spontaneous didactical relations that are multiplying under modern means.

Modern technology offers more possibilities for the diffusion of errors than of serious results. The deontology of teaching and that of research command us to improve our knowledge rather than claiming to apply it and make developments in it prematurely.

It is indispensable to develop research centered on classroom practices. They are the essential, complex and fragile heart of the design of teaching. It is also essential to adapt our frequently blunt intrusions to the possibilities and limits of our current knowledge. Applying the principle of precaution is not reserved for medicine and ecology. The educational system is a complex, living and fragile body which can’t handle the intrusion of awkward scalpels. Certainly the requirements of our societies with regard to school are large, both in the measure of their ambitions and also of their general ignorance of its real possibilities. In this domain we are in the process of discovering the circulatory system and society, used to the successes of more advanced sciences and of technology, requires us to undertake immediately to cure a heart attack.

Researchers and teachers together should set against this impatience the diffusion of serious knowledge and especially that of our material, scientific and ethical limits.

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