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# THE SOCIAL CONSTRUCTION OF MEANING IN MATH CLASS INTERACTIONS

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In previous publications we have presented data concerning the role of social interactions in the development of cognitive skills and operatory structures (Perret-Clermont 1980, Perret-Clermont & Schubauer-Leoni 1981, Perret-Clermont 1982). In a current research project we are examining the content of communication between teachers and pupils dealing with mathematics within the school context. We find ourselves at a crossroads between the sociology of educational institutions and curricula, the social psychology of individual strategies and the psychology of learning. But at the same time, we want to take into account the specific nature of what is supposed to be learnt in this communicative process: mathematics, a corpus of knowledge and skills loaded with many more symbolic values than we are commonly aware of.

## 1. Inidividual learners and individual teachers within a structured social context

### a) A structured social context

Schools are social institutions with legal foundations, roles and norms defining the nature of the professional roles of their agents, the time and space of the activities and the curricula of lessons and examinations.

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Educational institutions are part of a wider social and cultural project. Traditions and political choices define the nature and forms of the adult-child relationship, the rights and obligations of different socializing agents (schools, professional training, parents, media,etc.), and the knowledge (its nature, form and uses) which is thought worth transmitting from generation to generation. Mathematics are part of this cultural transmission.

These institutional, social and cultural factors produce (more or less) explicit definitions of school math (its nature and symbolic values) as well as definitions of the formal roles of teachers and pupils.

b) Many elements of the social context remain implicit

However, norms, values and expectations of the social context are not always explicit nor conscious, especially when they belong to larger social role configurations (i.e., sex, class or professional roles).

Concerning mathematics, we find that the mathematical tradition as well as the pedagogical tradition have cultivated a series of habits and styles that seem to constitute a type of "ethos" which is never made explicit (e.g.: what do mathematicians mean when they refer to "elegance"?).

These norms, rules, values, habits, and "ethos" define the teaching and learning process. They constitute the web of implicit "didactic contracts". That is, within the school context, pupils and teachers interact according to (more or less) tacit social contracts which define their respective social roles, the form of their mathematical "encounters" and the content of their communication (Schubauer-Leoni 1986).

However, the social context is not the only determinant of the terms of these "encounters" between pupils and teachers. These persons as individuals (and/or as members of families or larger social groups) elaborate strategies aimed at gaining benefit from their school experience or, at times, just surviving it! The balance of "costs" and "benefits" in these strategies can vary from case to case. Individuals

entering into negociation processes within the above mentioned "social contracts" do so according to their aims and strategies.

Thus we have observed (in teacher and pupil discourse, in classroom observations and in experiments) that mathematics are very seldom considered "in abstracto" in school. Adults and children always think of mathematical concepts and tasks within the specific classroom context.

## 2. Mathematics are not considered "in abstracto"

### a) On the pupils' side

In a series of investigations (Schubauer-Leoni & Perret-Clermont 1980,1985), we have repeatedly found that 7 to 8 year old children, who can easily deal with elementary arithmetic additive and substractive problems within the classroom, seldom use the formal arithmetic notations whien asked by a psychologist to write down what happened in a problem dealing with candy, flowers or dice. The formal mathematical "code" taught in schools was only used for those tasks when the setting was such as to explicitly suggest to the children that, in accordance with the habitual "didactic" social contract, they were faced with a "mathematical problem".

In another series of research (Schubauer-Leoni 1986b), pupils who were asked to prepare mathematical problems for their cohorts seemed to concentrate more on inventing problems that would assure their supremacy in the "teacher's" role (controlling the mastery of the solution, the difficulty of the task,etc.) than on formulating interesting problems (an idea they never seemed to have thought of!).

### b) On the teacher's side

Interviews with primary and secondary school teachers suggest that these profesisonals only consider mathematical concepts within the context of their teaching; i.e., in relation with specific pupils and curricula. For instance, teachers talk more easily of the chances of success and failure of solving given algebraic problems by specific groups of pupils than of their aims in presenting those problems to their pupils. When asked their criteria for choosing a given

exercise, they refer to the history of recent classroom interactions with their students. For these teachers, mathematics is essentially considered as a set of information and tasks which require presentation followed by learning assessments. They tend to insist that this has to be done in a very systematic way, in accordance with the (more or less) implicit "didactic contracts" that regulate their interactions with their students. They know that pupils consider the "didactic contract" transgressed if they are tested on a matter which has not been taught to them by their current teacher or if the test uses unfamiliar notation or wording. This results in the development of a kind of idiosyncratic "jargon" between the teacher and his pupils that serves as a metalanguage in dealing with "school math". When pupils change math teachers, the "jargon" then has to be verified, updated or redefined!

Teachers also adapt their perceptions of what mathematics are in accordance with their representations of the learning difficulties of perceived types of students in their classroom. They seldom speak of the difficulty of a math problem without refering to some idiosyncratic characteristic of a specific pupil who they are thinking of at the moment.

3. Being a student in math class: a specific socio-cognitive skill

It seems that skills learned in math class are specific to the local context of the teacher-class and teacher-pupil interaction. The learning of appropriate algorithms of responses to specific sets of school tasks seems to be the result of, on the one hand, strategies for school success within very detailed and refined sets of norms, expectations and "jargon" that regulate the modalities of social and cognitive performance and on the other, the individual's capacities to manage the emotions elicited by the encounter of two distinctive sets of strategies: that of the teacher and of the pupil within the wider classroom, school and socio-cultural context.

References


Perret-Clermont A.N. (1980) Social interaction and cognitive development in children. Academic Press, London & New-York.

Perret-Clermont A.N. (1982)Approaches in the social psychology of learning and group work. In : P. Stringer (Ed.): Confronting social issues Academic Press, London & New-York, 203 -234.

Perret-Clermont A.N. & Schubauer-Leoni M.L. (1981) Conflict and cooperation as opportunities for learning. In : P. Robinson (Ed.) : Communication in development, Academic Press, London & New-York,203-234.

Schubauer-Leoni M.L. (1986a) Le contrat didactique : un cadre interprêtatif pour comprendre les savoirs manifestés par les élèves en mathématiques. European Journal of Psychology of Education , Lisboa, 1, 139-153.

Schubauer-Leoni M.L. (1986b) Maître-élève-savoir. Analyse psychosociale du jeu et des enjeux de la relation didactique.Doctoral dissertation. University of Geneva.

Schubauer-Leoni M.L. & Perret-Clermont A.N. (1980) Interactions sociales et représentations symboliques dans le cadre de problèmes additifs. Quelques données expérimentales. Recherches en Didactique des Mathématiques,1,297-350.

Schubauer-Leoni M.L. & Perret-Clermont A.N. (1985) Interactions sociales dans l'apprentissage de connaissances mathématiques chez l'enfant. In : G. Mugny (Ed.) Psychologie sociale du développement cognitif, P. Lang, Bern, Collection Exploration, 225-250.