LECTURE 9

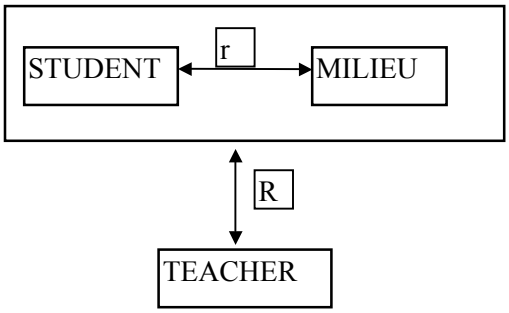
DIDACTIC VARIABLES. WHAT TO OBSERVE IN A CLASSROOM? HOW TO PRESENT A TEACHING PROJECT?

1. DIDACTIC VARIABLES

Let us ask the question:

What is a teaching situation a function of?

To answer this question we must first decide what we shall understand by a teaching situation. In the theory of situations, the teaching situation is a game between the teacher and the system composed of the student and the milieu:



Thus, the teaching situation depends on

- the personal characteristics of the TEACHER; in particular his or her personality, beliefs about what it means to teach and to learn at school (i.e. his or her 'epistemology'), his or her mathematical knowledge, cognitive style,…
- the personal characteristics of the STUDENTS; in particular the stage of their cognitive development, their cognitive style, their personalities (affective, motivational),…
- the composition and arrangement of the MILIEU; in particular, the task proposed to the students (exercise, open-ended problem, project, …), the resources and tools put at their disposal such as texts, game boards, geometer's kits, calculators, computers, pens and pencils, crayons, scissors, paper, exercise books, desks and chairs, the arrangement of the desks and chairs in the classroom,…)
- the RELATIONS r between the students and the milieu; in particular
    - the students' relation to the task (school problem vs taken-as-own problem)
    - the students' contact with the task (mental vs physical)

- the students' relations with the resources and tools (in particular, the students can be using a calculator as a computational device only, or as a heuristic tool)

- the RELATIONS R between the teacher and the student - milieu system; in particular

- proportion of teacher's interventions with respect to students' time on task

- the subject of teacher's interventions (organizational vs mathematical)

- the kind of teacher's interventions (presentation of task, hints, genuine questions (e.g. tell me how you solved this problem), rhetorical questions (i.e. questions to which the teacher knows the answer), questions meant to maintain the contact and students' attention (e.g. 'Are you with me here?' and the teacher continues his or her lecture without waiting for a reply), exposition of theory, solving exemplary test problems, discussion with students, etc.

I have thus listed a large number of variables on which a teaching situation appears to depend. But not all of them will be called 'didactic variables'; only those that can be controlled by the teacher, not as a person, but as an element of the didactic system. From this point of view, the didactic variables will be those related to R, r and MILIEU. Variables related to the Teacher and the Student as persons are excluded, not because they are not important in the process of teaching but because they would qualify rather as psychological and sociological variables and not as didactic variables. The assignment of values to didactic variables in the design of a lesson must take into account the sociological and psychological variables but it has no control over them.

2. WHAT TO OBSERVE IN A CLASSROOM? HOW TO ANALYZE AN OBSERVED LESSON?

When you are sitting in a classroom observing, take note of those facts that are pertinent from the point of view of the didactic variables. Make sure you are able to answer questions like:

- What were the tasks proposed to the students?
- What were the resources and tools put at the students' disposal?
- How was the classroom furniture arranged and how were the students and the teacher positioned?
- What were the students' relations to (a) the task (b) the tools and resources ?
- What was the ratio of time of teacher talking to students talking or working on tasks?
- What kinds of interventions did the teacher use?
- What did the students do?

When analyzing the data obtained through observation, ask yourself questions related to the mathematical content of the lesson:

- What mathematics did the teacher appear to want to teach the students?

- Were the didactic means he or she used likely to help him or her to meet this goal? (Why yes or why no?)
- What were the students learning?
- How would you change the lesson if you yourself were to teach the same mathematical topic?

3. HOW TO PRESENT A TEACHING PROJECT?

In presenting your teaching project, first describe the mathematical knowledge that you expect your students to develop through participation in the proposed activities. Then describe the organization of the MILIEU and *explain why do you think that this organization can help the students to develop the target knowledge*.

To describe the organization of the milieu means to assign values to the didactic variables, and thus this description should contain answers to questions related to the variables M, R and r:

- What are the tasks proposed to the students?
- What are the resources and tools put at the students' disposal?
- How is the classroom furniture arranged and how are the students and the teacher positioned?
- What are the expected students' relations to (a) the task (b) the tools and resources ?
- What is the teacher's role in the situation and what kinds of interventions is he or she expected to make?
- What are the students expected to do?

The justification of your choices in regard to these questions should be guided by your aim of teaching the students the assumed knowledge.