"TYPES AND SCALES" OF MATHEMATICAL DISCOURSE IN THE CLASSROOM: ANALYTICAL FRAME

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Introduction

The research is related to mathematics teacher mobility; e.g. teachers travel abroad to teach through the students' mother tongue. The necessary condition is that teachers and students do not share the same mother tongue. The present contribution is written from the perspective of text linguistics and deals with the different types of discourse in the mathematics classroom.

Theoretical framework

Observations of representative audiovisual corpora of concrete real data (Villani et al., 2000) bring evidence of a complex variety of mathematical discourse in classroom.

Each linguistic variation is strictly connected to determinate external (non linguistic) *macro-parameters* (***type*** of school, academic level, age of student, specific mathematical topic, general attitude of the teacher, methodology, etc.). Macro-parameters are usually considered from a general, static point of view in order to obtain linguistic taxonomical lists and classifications.

It is possible to assume another perspective from which macro-parameters do not appear labels of linguistic domains but dynamic forces in action, linguistically determinant in the classroom.

The authors refer to such determinative forces as to *micro-parameters*, to be related to a variety of objectives identifying individual steps or stages in a mathematics lesson.

The ***types and scales*** analysis proposed by the authors sketches out a linguistic frame which seems adequate to grasp the basic mathematical discourse variations in classroom dynamic phases that depend on micro-parameters. Four basic types of mathematical discourse in classroom can be distinguished: *dialogic/regulative – descriptive – argumentative*.

In the *types and scales* hypothesis the linguistic correlates of dynamic micro-parameters are individuated not only on the ground of structural or pragmatic description of types but also according to ***complexity scales*** (Slobin, 1985/1992/1997).

Linguistic complexity moves from an informal linguistic pragmatic polarity up to a more formal syntactic, lexical, and morphological one: *dialogic* → *descriptive* → *argumentative* (Givón, 1991).

Examples of data

In the *types and scales* hypothesis, mutual integration of complexity sequences of linguistic phenomena creates the following analytical frame, more adequate to mathematical classroom discourse:

Ordinary and technical-informal language (direct discourse and dialogue with minimal technical lexicon)

Used in a sufficient amount in order to manage basic steps of the lesson: *Today, we will deal with ...*

Used by the teacher especially while the students work in groups. It enables comprehension and participation: *Why are you not sure? Have you written the equation; have you got solutions? – Practise in groups of four.*

Technical-semiformal language (rich amount of descriptions, fragments of argumentative syntax with dialogical interpositions, sequential process *theme-exposition-(rhetoric) question-answer*)

Used especially to involve students and get their active participation and collaboration in classroom activities, it also develops the selected topic: *The first (equation) offers a solving strategy for a concrete problem. And what about the second? – You should distinguish between equation and equality.*

Frequently used with the support of visual aids: *Everybody agrees. The equations are equivalent. – Put a ring round the best alternative.*

Formal language (argumentative in hypothetical-deductive form, well definite lexicon, regulative-directive language)

Used to formulate general definitions, to get synthesis, to get abstraction: *Given three positive integers, we say that they are a Pythagorean triple if the square of the biggest among them is equal to the sum of the squares of the two other ones – Given an equilateral triangle… – If I would apply the distributive property, I should write…*

References

Givón T. (1991). *Syntax: a functional-typological introduction*. Amsterdam: Benjamins.

Slobin D.I. (1985/1992/1997). *The crosslinguistic study of language acquisition*. vol. 1-5. Hillsdale, NJ: Erlbaum.

Villani V., Favilli F., Mariotti M.A., Zan R. (2000). *La matematica a scuola – Un'analisi al microscopio*. 3 CD set. Roma: Ministero Istruzione, Università e Ricerca.

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