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Assia Nechache

► **To cite this version:**

Assia Nechache. Signs and validation in the teaching of geometry at the end of compulsory schooling in France: A case analysis. CERME 9 - Ninth Congress of the European Society for Research in Mathematics Education, Charles University in Prague, Faculty of Education; ERME, Feb 2015, Prague, Czech Republic. pp.606-607. hal-01287036

HAL Id: hal-01287036

<https://hal.science/hal-01287036>

Submitted on 11 Mar 2016

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Signs and validation in the teaching of geometry at the end of compulsory schooling in France: A case analysis

Assia Nechache

Université Paris Diderot, Laboratoire de Didactique André Revuz, Paris, France, assia.nechache@hotmail.fr

In the first part of the communication, we present the research question, as well as the theoretical framework and methodology used to answer this question. In the second part, we describe a task given to students and provide a detailed analysis of some extracts from the session we observed. Based on the results obtained from the analysis, the last part provides a practical answer to our research question.

Keywords: *Geometry, geometric work space, validation.*

DESCRIPTION OF THE POSTER CONTENT

Section 1 – Introduction and the research aim

What is the place of signs in the validation process in geometry at the end of compulsory schooling? This question is the starting point for my communication. From the beginning of primary school, students are confronted with various geometric situations, such as: recognition and comparison of geometric forms, and reproduction of figures with drawing tools. Through these activities, they can identify invariants which are directly perceived on figures and then develop a conceptualization of geometric objects through characteristic properties. Then when they enter college, students are initiated to deductive reasoning, and thereafter engage in the transcription of this reasoning as a demonstration.

Section 2 – Research questions

- What is the place of signs in the process of validation in geometry in ninth grade?
- How does the teacher use the semiotic approach in the process of validation?

In French secondary education, teaching and learning validation (reasoning, argumentation, evidence and demonstration) represent a specific central mathematical issue (Balacheff, 1982). This teaching is initiated into the geometry field from the entry to college. Moreover, the teaching of validation is mainly based on the various registers of semiotic representation as a support to help build up a proof. This is where we use the theoretical framework. On one hand, it is necessary to consider the place of signs in the process of validation in geometry. On the other hand, we will analyze how the teacher uses the semiotic dimension in the process of validation.

Section 3 – Theoretical framework

Our analysis is mainly based on the theoretical framework of Mathematical Working Spaces (Kuzniak, 2011) and the use of the concepts of geometrical paradigms (Houdement & Kuzniak, 2006). With this framework, “style” validation adopted by teachers will be described, and particularly the way they integrate the semiotic approach in the discursive and deductive reasoning.

Section 4 – Data collection methodology

Our central question is the use of signs in the process of validation in geometry by secondary school teachers. To answer this question, we have chosen to analyze a ninth grade class session. In this session, students have to solve an exercise (chosen from the textbook used in class) using the concept of Thales’ theorem and its reciprocal.

This session analysis is conducted in two steps: an “a priori” task analysis to identify paradigms at stake, as well as the validation process expected by the textbook authors. Secondly, using the geometric working spaces diagram (Kuzniak, 2013) the geometric work

done during the activity is identified, allowing to see how the teacher leads the validation.

Section 5 – Results analysis

A specific working was highlighted during the validation process. In fact, the teacher uses the semiotic dimension (in a particular figure) and sets up a “maieutics” didactical contract in order to carry out his teaching project. We also notice that the mathematical work of validation put in place by the teacher himself is different than the one suggested in the textbook. This difference of validation work leads to a misunderstanding and mental blocks among students.

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