

The use of perspectographs in primary school: artefacts, instruments and semiotic mediation

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The experiment presented here sits within a long-term project, which started with Grade 4 students and is currently being carried out in a 5th Grade classroom (primary school). This project, about a Desarguesian form of geometry, centres on the study of cognitive processes of semiotic mediation through the use of tools (perspectographs). At the beginning the students are presented with a perspectograph and by the end they are required to construct a device to do perspective drawing. This poster illustrates the key elements of the beginning of the experiment, focused on identifying the basic components of the artefact (ocular, glass).

First lesson – The perspectograph

A perspectograph contained in a box is brought into the classroom. Only the ocular is visible (it is the perspective drawing of a cubic frame, drawn on a glass panel placed between the frame and the plane with the oculars; there are three oculars, but only looking through the one in the middle you can see the drawing superimposed to the cubic frame). In the first phase, the teacher asks the pupils to imagine what is in the box, in the second he asked what the artefact may be used for and how it works. At the end of the session (the third phase) pupils are asked to use the machine: each student looks through the oculars and compares the different images he/she can see from the different oculars. The main point of the first phase is the fact that students' personal senses are made explicit. The extract illustrated in the poster elicits three different 'senses', strictly linked to the fact that the activity is introduced by the mathematics teacher. In the second phase, when the perspectograph is taken out of the box, pupils pay attention to the necessity of using only one eye to see objects in perspective. Looking back at their previous experiences, some pupils remember and perform the gestures to do perspective drawings of real objects, when they had to keep one eye closed in order to get an image matching reality as close as possible. In the third phase of the session, the focus on the functioning of the machine evokes previous experiences with other objects having a monocular vision and allows paying attention to the importance of the point of view (which is the position that implies coincidence between the drawing and the cubic frame).

Second lesson – Pupils' drawings

In this lesson, pupils are asked to draw the perspectograph which sits on the teacher's desk. Most of the pupils' drawings show that they see what the basic elements of the artefact are. Four types of drawings can be identified: reproduction of the perspectograph as seen from pupils' desks, reproduction plus some very simple labels

for the basic elements, representation of the action of using the perspectograph or of a snapshot of that, reproduction of some parts of the machine.

Bartolini Bussi M.G, Mariotti M.A., 'Instruments for perspective drawing: historic, epistemological and didactic issues', in Goldschmidt G., Porter W. & Ozkar M. (eds.), *Proc. of the 4th International Design Thinking Research Symposium on Design Representation*, III 175-185, Massachusetts Institute of Technology & Technion – Israel Institute of Technology.