

ARGUMENT CONSTRUCTION AND CHANGE WHILE WORKING ON A REAL ENVIRONMENT PROBLEM

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ABSTRACT

The process of collaborative construction of arguments about environmental management by 11th grade students working in small groups is studied. The question explored is the evolution of the students' positions and arguments along a sequence shaped around an authentic – and real – problem: the impact of a drainpipe in a wetland of high ecological value; whether students kept their initial positions or changed them and the corresponding reasons. The collaborative construction is explored in terms of the *dialogic voice* (Mortimer & Scott, 2003). The participants were the 37 students in an 11th grade group and their teacher (the second author). The sessions were recorded in audio and video, and the data also include the students' portfolios and essays. In this paper the transcriptions are analysed and the arguments represented using Toulmin's (1958) layout. The analysis shows changes in the positions of 22 students, either radical, from positive to negative assessment, or shifts to balanced views. The causes for the changes and the co-construction of arguments are also discussed.

1. DIALOGIC ARGUMENTS: COMMUNICATION AND ARGUMENTATION IN SOCIO-SCIENTIFIC ISSUES

The relevance of studying the communication system in the classroom, the classroom discourse, in order to understand learning processes is being acknowledged in educational research. Studies exploring processes in actual classrooms, as meaning construction by students, expand the knowledge gained with work about students' ideas. One of the objectives of such studies is to make visible or “external” those processes that by nature are internal (as proposed in the cognitive apprenticeship perspective by Collins, Brown & Newman, 1989) and to make cognitive and metacognitive processes accessible through discourse analysis. The importance of communication has been highlighted by the sociocultural perspective which acknowledges the relationships among mental processes and the cultural context (Wertsch, 1991), following Vygotski who drew attention to the role of social interaction in cognitive development. Our study is framed in educational constructivism, viewing students as active participants in learning, and in the

Science-Technology-Society (STS) perspective: scientific issues are viewed in a broader social context. We explore decision-making by students that is not only a technical issue (Aikenhead, 1985), but also requires consideration of values and social consequences.

One of the classroom (and science) coexisting discourses is argumentation. By argumentation we mean the communication and evaluation of knowledge claims, the justification of claims by appeals to data, and the strategies for resolving issues opposing alternative positions. Like Toulmin (1958), we are interested in studying argumentation in natural conversation which is different from ideal argumentation in Logic. The focus is the *dialogic argument* in a context where students engage in decision making about a socio-scientific issue, environmental management in a wetland of high ecological value. Argumentation studies explore epistemic dimensions, processes in knowledge construction, and co-construction. By *dialogic argument* we understand:

- Arguments are co-constructed in a collaborative effort among two or more participants.
- Arguments are produced by one person, but take into account other participants' statements, either to support or to contradict them.

This means that we consider an argument *dialogic* even when a single speaker produces it, using the notion of Mortimer & Scott (2003) of dialogic voice as one also taking into account the listeners' perspective. Driver, Newton, and Osborne (2000) also refer to dialogical or "multivoiced" arguments in social groups. The capacity to take different perspectives into consideration is thus considered as a criterion for argument quality.

A favourable learning context for argumentation is solving authentic problems which have, among others, these features: they are relevant for the lives of the students; they involve methods related to scientific work, and they are ill-structured, having no straightforward "right" solution. The problem used for this teaching sequence is not only authentic but also real, and students could follow the controversy in the media, simultaneous with their debate.

The question explored is the evolution of students' positions and arguments along a sequence shaped around the impact of a drainpipe in a wetland, a problem chosen for its complex, controversial nature. In a previous paper (Jiménez-Aleixandre & Pereiro, 2002), we analysed the content knowledge components in the warrants; here the focuses are the changes, in claims or in justifications, of individual and group arguments collaboratively constructed. The capacity of changing a position is important as it seems that exists a resistance to change (in students as well as in adults), and people tend to take into account mainly evidence which supports their opinion (see, for instance, Kuhn *et al.*, 1995).

The research question is: *Do students' arguments on environmental management evolve during the sequence?* The question has been split into two:

- Do students' positions and arguments (as individuals or in groups) change along the sequence?
- What are the causes of change, data or other people's arguments?