Proceedings of the 19th International Conference for the Psychology of Mathematics Education

PME 19

Recife - Brazil
July 22 - 27, 1995

VOL. 1

Universidade Federal de Pernambuco
Graduate Program in Cognitive Psychology

"Algebraic" word problems and the production of meaning: an interpretation based on a Theoretical Model of Semantic Fields

Romulo Lins*
Geraldo G. Duarte Jr.*

In this paper we present both theoretical and empirical support to a view on people's cognitive functioning. In particular, we argue that people's approaches to the solution of "algebraic word problems" is crucially related to the objects they constitute and deal with in that process. The key notions are those of knowledge, Semantic Fields, objects and interlocutors, notions which are constituted as part of a *Theoretical Model of Semantic Fields* (**TMSF**) (Lins, 1992, 1994). From the point of view that theoretical framework, an interpretation of data drawn from two interviews is produced.

Within the **TMSF**, *knowledge* is understood as a pair (*statement-belief, justification*), rather than as in the traditional view, according to which "knowledge" has the status of a proposition, "that which one knows to be the case" (cf. Chisholm, 1989). For instance, according to the traditional view "2+3=5" would be "knowledge." But within the **TMSF** this is a *text*, not *knowledge*. The enunciation of *knowledge* establishes three things: (i) the subject believes in what he is stating, implying that, (ii) he believes to be entitled to have that belief; and, (iii) it constitutes *objects*.

The other key construct in the **TMSF** builds precisely on the constitution of *objects*, and provides the means to account for that process in a more general way. Any *Semantic Field* has a *kernel*, in relation to which particular *objects* are constituted. In the case discussed above, one might speak of a *Semantic Field of fingers*, possibly with a *kernel* consisting in two hands, "concrete" or schematic. Within that *Semantic Field* one can constitute *objects* and operate on them; numbers from 1 to 10 would be such *objects*. Other *Semantic Fields* could develop around a scale-balance, wholes and parts, function machines, areas, money, *number* as a measured collection, or Algebraic Thinking. *Knowledge* is always enunciated to some *interlocutor*, who may be physically present, remotely present or even fictional; the *interlocutor* may be "internal" or "external." It is the subject of *knowledge*'s expectation that his *interlocutor* will be able to: (i) produce *meaning* for the *text* of his *statement-belief*; **or**, (ii) produce *meaning* for the *text* of his *statement-belief* within the same *Semantic Field* from which the *knowledge* was enunciated.

Two Brazilian sixth-graders (12-13 years) were asked to solve verbal problems which potentially involve the manipulation of "algebraic relationships." The scripts and the transcription of the video tape were then analysed in order to determine: (i) the *objects* with which pupils were dealing; and, (ii) the role played by choices of *interlocutors* both in the solving process and in the subsequent attempts to explain what they had been doing.

A FULL VERSION OF THE PAPER WILL BE AVAILABLE TO THE PARTICIPANTS OF THE SESSION.

References

Chisholm, R.M. (1989) Theory of Knowledge. Prentice-Hall, NJ, USA.

Lins, R.C. (1992) *A framework for understanding what algebraic thinking is*. PhD Thesis; Shell Centre for Mathematical Education, University of Nottingham, UK.

Lins, R.C. (1994) *Eliciting the meanings for algebra produced by students: knowledge, justification and Semantic Fields*. Proceedings of PME XVIII; (eds.) J.P da Ponte & J.F. Matos. Lisboa, Portugal.

---

* Mathematics Department, UNESP-Rio Claro, Brazil. The work reported has been partially funded by CNPq grant no. 530230/93.3 (Brazil) and through an Academic Link sponsored by the British Council. The authors want to thank Rosamund Sutherland and Luciano Meira for their insightful comments on the inteviews; we also want to thank the other members of our research group.