

**THE RELEVANCE OF TAKING INTO ACCOUNT THE SEMANTIC,  
SYNTACTIC, SEMIOTIC, EPISTEMOLOGICAL AND PRAXEOLOGICAL  
DIMENSION IN DIDACTIC STUDIES: CASE OF HIGH SCHOOL ALGEBRA  
AND THE LOCAL APPROXIMATIONS AT THE BEGINNING OF THE  
UNIVERSITY**

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This conference is divided into two parts. The common thread retained is the reference to the framework of logical semantics developed in the work of Tarski (1972) and, in particular, the articulation of semantic dimensions and syntactic based on a multidimensional approach (Kouki, 2018) to intersect these dimensions with others, semiotics (Duval, 2006), praxeology (Chevallard, 1992) and epistemology (Durand-Guerrier & Arsac, 2005) to study teaching / learning algebra and limited developments respectively in teaching high school and at the start of college.

The first part presents a re-examination of the complexity of teaching and learning algebra from a multidimensional analysis model through dimensions shown above. Based on an ecological approach from the TAD, macro-didactic analyzes of the evolution of algebraic praxeologies in the different Tunisian programs and school textbooks, drawn up from 1976 to the present day, highlight evidence of the praxeological evolution during the various curricular reforms, in particular the evolution of the institutional relationship to algebra moving from a conceptual object to tool status in the service of problem solving. Completing the macro-didactic analysis, the micro-didactic analysis highlights the relevance of the dialectic semantics / syntax at the intersection of several frameworks and associated semiotic registers.

The second part shows the potential of the logical approach to conduct analyzes didactics of the process of transposing the concept of limited development to the interface between algebraic analysis and analysis as a field of approximation. A historical study shows that the development of this notion interweaves semantic, syntactic and semiotic dimensions (Kouki & Griffiths, 2020), in varied proportions and dialectics according to the periods and the authors, and this contrasts with the syntactic domination shown by institutional analysis associated with introductions which in no way seek to shed light on the rationale behind this notion.

## References

- Chevallard, Y. (1992). Concepts fondamentaux de la didactique : Perspectives apportées par une approche anthropologique. *Recherches en Didactique des Mathématiques*, 12 (1), 73-112.
- Durand-Guerrier, V. & Arsac, G. (2005a). An epistemological and didactic study of a specific calculus reasoning rule. *Educational Studies in Mathematics*, 60 (2), 149-172.

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- Duval, R. (2006). Quelle sémiotique pour l'analyse de l'activité et des productions mathématiques. *Revista Latino americana de Investigacion en Mathematica Educativa*, (número especial), 45-81. México : Universidad Autónoma del Estado de México.
- Kouki, R. (2018). L'articulation des dimensions syntaxique et sémantique en algèbre du secondaire. *Recherches en Didactique des Mathématiques*, 38 (1), 43-78.
- Kouki, R., & Griffiths, B. J. (2020). Introducing Taylor Series and Local Approximations using a Historical and Semiotic Approach. *International Electronic Journal of Mathematics Education*, 15(2), em0573.
- Tarski, A. (1972). *Logique, sémantique, mathématique : 1923-1944* (vol. 1 et 2). Paris: Armand Colin