

HOW TRANSPOSE THE TEACHING OF THE SYNTACTIC MANIPULATIONS SEEN IN THE NEW GRAMMAR TO IMPROVE THE SKILLS OF MATHEMATICS STUDENTS: DEVELOPMENT OF A THEORETICAL FRAMEWORK

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We introduce here the first component of research seeking to determine what would be the impact of the use of a meta-language relative to syntactic manipulations in the appropriation of a mathematical concept. To do this, after having drawn a parallel between certain elements of the new grammar (as taught in francophone high schools) and mathematical activity, we will show that these syntactic manipulations, although explicit in French, remain implicit in mathematics. Finally, we will seek to pose a terminology specific to mathematics in order to adapt a teaching sequence and to design a "similar" didactic sequence in mathematics.

Generative words: *Syntactic manipulations, reformulations, symbolic and natural languages*

INTRODUCTION

In natural language, reformulations are based on syntactic manipulations. Even if they cannot be transposed immediately into symbolic language (as per the meaning of Duval, 1995), it seems possible to identify syntactic manipulations in symbolic language. Making this parallel constitutes one of the first objectives of our article. We observe that these syntactic manipulations are taught explicitly in natural language as evidenced by the progression of learning in Quebec secondary schools (MELS, 2009). They are used as indicators of the functioning of the language by calling upon grammatical reasoning (Chartrand, Aubin, Blain, & Simard, 2011). Instead of procedures based on questioning that caused a great deal of confusion among students and teachers (Gauvin, 2011), academic programs emphasize the use of various types of manipulations in order to verify what class a word or group of words is part of, and what role it or they play in the sentence. However, they remain implicit in the mathematics classroom.

For example, in the reduction of fractions, addressed by the use of elementary fractions in the third cycle of primary school (in reference to the Quebec curriculum, MELS 2009), we find a method close to the substitution seen in natural language when the syntactic group "the show" was pronominalised and replaced by a definite pronoun. At the college and university level, we again find these manipulations, specifically when we resort to the different properties of the logarithm - and its exponential reciprocal - in solving exponential equations in order to transform the

expression. As we will determine, we will speak here of an *addition*, because the original significant units were not changed: the only changes consist of an addition of significant units.

RESEARCH OBJECTIVES

Our intention is to determine to what extent the didactic sequences used by French teachers are transposable to the mathematics class in order to observe what the effects would be on the skills of mathematics students. Our overall research question can thus be formulated as follows: *are the syntactic manipulation teaching methods suggested by the new grammar manuals (specifically those described by Gauvin, 2011, Boivin, 2009, Gauvin & Boivin, 2012) transposable to the teaching of mathematics? To what extent would a teaching sequence based on this transposition enhance the acquisition of mathematical concepts by students? Is it possible to construct and lead a didactic sequence focusing on the explicit teaching of syntactic manipulations in mathematics in primary, secondary or college level classes?* The objective of this article is to take a first step in this direction by proposing a theoretical framework and by establishing terminology that is specific to syntactic manipulations in symbolic language.

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