

EXPLORING PATTERNS IN ALGEBRAIC THINKING

António Borralho, Elsa Barbosa

Education and Psychology Research Centre, University of Évora, Portugal

Nowadays algebraic thinking has become central to the mathematics curriculum. The development of algebraic thinking is seen as essential to the mastery of algebra. The transition between numbers and a higher level of abstraction is not trivial and in moving from arithmetic to algebra students experience genuine difficulties (Barbosa and Borralho, 2009 and Sinistsky, Ilany and Guberman, 2009). Teachers should diversify strategies, allowing their students to develop algebraic reasoning and symbol sense (Arcavi, 2006). Considering the classroom environment, the present study aims to understand the use of patterns in a context of research tasks as a way to improve the progress of algebraic thinking. We started out with two main research questions focused on: (1) algebraic reasoning and (2) mathematical communication.

Keywords: mathematics education, investigations tasks, patterns, mathematic reasoning, Algebra, algebraic thinking.

INTRODUCTION

The transition between numbers and a higher level of abstraction seems to be one of the thorniest stages in the mathematics teaching-learning process. Therefore, it is essential to choose adequate strategies that allow students to broaden and deepen their understanding of the algebraic language.

Algebraic equations may have multiple solutions, giving students the opportunity to explore different solution paths. This view acknowledges the crucial role played by teachers, in what concerns encouraging and exploring varied solutions; that is, helping students to improve algebraic thinking.

Orton and Orton (1999) claim that patterns are a possible way to approach algebra and, consequently, develop algebraic thinking. According to Bishop (1997), when a student identifies the relationship between quantities and patterns he/she acquires important mathematical knowledge, for example, the concept of function. This means he/she is learning to investigate and communicate algebraically. Solving research tasks related to patterns emphasizes, on the one hand, investigation, conjecture and proof. On the other hand, and no less important, these tasks need to be interesting and challenging to students (Vale and Pimentel, 2005). Finally, they need to promote the communication of mathematical ideas (Barbosa, 2007). In short, they need to promote a patterning approach to algebra furthers mathematical skills as it interconnects itself with exploration and investigation tasks.

METHODS

A qualitative and interpretive method was chosen, where a class was considered the unit of analysis in what concerns research tasks involving patterns. The study was carried out in an eighth-grade class (13-14 years old) and between two of its students, considering definite criteria, and aimed a descriptive and analytical outcome. The methodological option in conducting this research led to a qualitative and analytical study case.

CONCLUSIONS

Our study confirms Orton and Orton's results (1999) that the study of algebra may be initiated through inquiry and generalization of patterns. We found that exploring patterns in a context of investigative tasks enables the development of algebraic thinking and that such tasks are interesting and challenging to students. However, at the same time, teaching practices must be changed, leaving behind a "traditional" teaching that promotes routine and an "isolated" learning experience of contents, and move to teaching practices that give rise to meaningful and contextualized learning.

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