The mathematics anxiety: a transcultural perspective

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Abstract

The results of relevant cross-cultural research related to academic performance have shown that the field of mathematics learning is the one with higher rates of school failure in relation to other areas of learning. Mathematics learning can produce stress for some students and it is also shown that this anxiety about mathematics learning has a strong correlation with performance in this area. The aforementioned studies show relevant variables—both in terms of gender of students and teaching strategies—in attitudes coping mathematical tasks by the students. Therefore it is highlighted the scope of mathematics as the one with the highest percentage of students with problems in their learning at international and transcultural level, and the role that academic resilience can develop toward this difficulties through an interactive process between development factors and socio-educational context.

Keywords: Math anxiety; learning difficulties; formative assessment; transcultural analysis.

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1. Introduction

The construct of mathematical anxiety have a long way, and continues to attract the interest of research as an important influence on math performance (Ramirez, Chang, Maloney, Levine & Beilock, 2016).

According to the obtained data about academic performance studied in relevant cross-cultural research as the Programme for International Student Assessment (PISA), belonging to Organization for Economic Cooperation and Development (OECD) or the Trends in International Mathematics and Science Study (TIMSS), mathematics learning show the higher failure percentage facing the rest of learning areas. Concretely the average of students with mathematics learning difficulties reached 7% of the population of students from 50 countries which took part in the TIMSS 2011 study (Mullis, Martin, Foy & Arora, 2012). According to PISA 2012 study (OECD, 2013a) 23% of students didn’t reach the basic level (level 2) in mathematics evaluation.
Education on mathematics is influenced by multiple factors interfering in the teaching and learning process. Focusing on the factors referred to students, we must cite McLeod (1988) pioneer studies. McLeod drew a distinction between attitudes, beliefs and emotions, which constitute the so-called mathematical affective domain.

Maths can generate negative emotions such as anxiety and stress and it is shown that this anxiety strongly correlated with performance in this area (OECD, 2013b), as "a feeling of tension and anxiety that interferes with the manipulation of numbers and solving mathematical problems" (Leppävirta, 2011).

2. Methodology

This paper aims to conduct a transcultural educational analysis of the mathematics anxiety through a systematic review work from the data obtained in the most important international research in this area.

2.1 Databases

- The Programme for International Student Assessment (PISA) 2012.
- The Trends in Mathematics and Science Study” (TIMSS) 2011.

3. Results

The most important transcultural study on math anxiety is the Programme for International Student Assessment (PISA) 2012. This study has provided the most comprehensive empirical study of mathematics skills developed in school that has never been available before.

PISA 2012 measured the anxiety of students towards maths through questionnaires and the answers provided to questions about how they felt when they were planning math exercises, when valued their future performance in math class and they tried to solve maths problems. 59% of students in OECD countries reported frequently fidget with the belief that it would have difficulty in math class; 33% he reported to be very tense at math homework; 31% said get very nervous in front of solving math problems; 30% said they believed unable to solve a math problem; and 61% expressed concern about school failure in mathematics.

In all countries at least one third of the students reported frequently fidget believing that would have difficulty in mathematics learning.

It is emphasized the variable course level as relevant. According to this idea other studies (González-Pienda et al., 2006; Maloney, Risko, Ansari & Fugelsang, 2010; Warrington, Younger & Williams, 2000) reveal that as long students advance within school they develop more negative attitudes towards mathematics learning. The inferred relationship may be that as students diminish their confidence in mathematics performance it can concatenate a low interest in this learning content, causing negative feelings and emotions which can generate a significant level of anxiety towards mathematics learning tasks (Valle et al., 2006).

Regarding to gender differences women showed higher anxiety levels to mathematics tasks than men in the most of participant countries in the PISA 2012 study (least than nine of them). This gender difference became at least 20 percentage points in some countries.

In 38 of the 65 countries participating in the study girls perform worse in math compared to boys. In the OECD countries girls show an average performance 11 points lower than boys. However, this difference between the average of 15 year-old boys and girls reveals even greater differences between more and less able students. In most countries, even girls who performance better obtain less performance than boys who have higher mathematics competencies and abilities.

One gender differences are particularly concern in relation to motivation and confidence in mathematics learning. From 30% of students who reported their beliefs about inability to solving mathematical problems, 25% were boys and 35% girls.

More descriptively the cited results showed that in a situation of equal performance, girls show less perseverance and openness in resolving problems, lower levels of intrinsic and instrumental motivation to learn mathematics, lower self-confidence and higher levels of anxiety at math’s tasks than boys on average.
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