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## Innovative Classroom Strategy: Impact on Students' Mathematics Motivation, Anxiety and Achievement in Pre-University Studies

*Farah Lijana Azizan, Nur Fazliana Rahim, Emmerline Shelda Siaw, Kartini Abd Ghani, and Saratha Sathasivam*

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# Innovative Classroom Strategy: Impact on Students' Mathematics Motivation, Anxiety and Achievement in Pre-University Studies

Farah Liyana Azizan, Nur Fazliana Rahim, Emmerline Shelda Siaw, Kartini Abd Ghani, and Saratha Sathasivam

**Abstract**—One aspect that influences mathematics achievement is students' mathematics motivation, which is closely related to their mathematics anxiety. This study aims to incorporate a classroom intervention strategy using a brain-based teaching approach (BBTA) with technological tools to improve students' mathematics performance in pre-university studies. BBTA was used in the classroom to increase students' mathematics interest and minimise their mathematics anxiety to increase mathematics performance. Two hundred and six (206) pre-university students were exposed to both BBTA and conventional instructions during their Statistic lessons. Questionnaire comprises of motivation and anxiety-related questions as well as pre and post mathematics tests were administered to these students. Based on the findings, students with low anxiety appeared to have more self-confidence when studying mathematics, which simultaneously improved their examination results. These two elements are critical in students' learning of mathematics because students who have low levels of anxiety and high levels of motivation in learning mathematics attain high achievement in mathematics.

**Index Terms**—Brain-based teaching approach (BBTA), mathematics motivations, mathematics anxiety, mathematics performance, pre-university, technological tools.

## I. INTRODUCTION

In a classroom setting, students regard mathematics as a difficult topic, and they have difficulties in attempting to solve mathematical problems in the formative assessment or examination. When faced with issues involving counting and numbers, some students experience anxiety. Among all forms of anxiety that students have experienced, mathematics anxiety is the most common [1]. Mathematics anxiety is a state of diminished emotions, perplexity, and dissatisfaction in mathematical thought and comprehension [2].

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Nervousness and discomfort caused by mathematics in high school students occur when students lack self-confidence [3]. Since anxiety in mathematics is often posed inside mathematical problems [1], it is an obstacle that students must resolve because it affects their mathematics achievement [4].

Students' mathematics anxiety is a reliable predictor of their achievement in the subject as students who are continually grappling with mathematics often experience negative impacts of this form of anxiety [5]. A number of investigations have been performed to see whether there is a connection between the learners' mathematics anxiety and their mathematics achievement. Mathematics anxiety affects daily classroom activities such as circumstances in which students must answer mathematics questions in front of the class, assessments, and multiple classrooms learning evaluations [6]. Those with high levels of mathematics anxiety performed badly in mathematics tests [7]. However, some discussions show contrasting results. Recent researchers discovered a positive correlation between mathematics anxiety and arithmetic anxiety on learners' mathematical outcomes where students with high anxiety levels were found to perform well on mathematics examinations [8], [9].

Mathematics motivation is closely linked to mathematics anxiety and plays an important role in mathematics learning. Motivation is heavily influenced by self-efficacy. Low mathematics self-efficacy for university students can lead to a lack of desire to learn mathematics, thus, leading to poor mathematics achievement [10]. Emotional factors which influence how students learn mathematics must be considered by mathematics educators in universities. It is generally believed that highly motivated university students are more prone to perform better than less motivated students. Educators can change their instructional methods with little effort, which might cause increased enthusiasm and decreased anxiety level in their students. Four sources of evidence support motivation confidence assessments: mastery of one's past achievement, momentary experiences of seeing others succeed, process and results that one retains certain capacities and physiological states. Approaches such as evaluations of others as models and emotional awareness were used in the classroom to maximise the results of such sources, resulting in students who are more confident in their academic abilities, have less anxiety and have higher motivation to learn mathematics. The efficient output of the activity builds a sense of motivation, while ineffective achievements threaten the development of self-efficacy [11].