

A CROSS-SECTIONAL STUDY ON MATHEMATICS ANXIETY AND MATHEMATICS SELF-EFFICACY AMONG HIGH SCHOOL STUDENTS USING FUZZY CONJOINT ANALYSIS

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Abstract

Mathematics anxiety and self-efficacy are acknowledged as key predictors of students' attitudes and performance in mathematics. This study examines the levels of mathematics anxiety and self-efficacy among 62 secondary school students from SMK Ketereh, Kelantan. Data were collected using the Mathematics Self-Efficacy and Anxiety Questionnaire (MSEAQ) and analyzed using the Fuzzy Conjoint Analysis to determine the membership degree of each attribute based on predefined linguistic levels. Spearman's Rank Correlation was applied to examine the relationships between key variables. The results indicated that students experienced high levels of mathematics anxiety, particularly related to fear of failure and concerns about performance. Despite this, students also demonstrated high levels of confidence in their mathematical capabilities. Comparisons between lower and upper secondary students revealed minimal differences in perception. Additionally, a weak positive correlation was observed between self-efficacy and achievement, as well as between anxiety and achievement. A weak negative correlation was found between anxiety and self-efficacy. The findings highlight the importance of enhancing instructional strategies and providing targeted support to help students manage anxiety and build confidence in mathematics.

Keywords: *Anxiety, Self-efficacy, FCA, Spearman rank, Secondary School Students*

1. Introduction

Mathematics anxiety negatively affects students' ability to engage with mathematical tasks and can lead to poor performance and low confidence. Conversely, self-efficacy is associated with greater persistence and improved academic outcomes. This study focuses on understanding the relationship between mathematics anxiety and self-efficacy among Form 2 and Form 4 students in SMK Ketereh, Kelantan. The objectives of this study are to analyse and compare MA and SE levels between lower and upper secondary students, and to measure the correlation among MA, SE, and math achievement. Understanding these relationships provides insight into psychological barriers that hinder mathematics learning.

2. Methodology

The study used a cross-sectional design and a questionnaire-based survey. The Mathematics Self-Efficacy and Anxiety Questionnaire (MSEAQ) by May (2009) was used to collect data from 62 students. It includes 29 items rated using a 5-point Likert scale. Fuzzy Conjoint Analysis was applied to transform responses into similarity values for each linguistic category, such as "agree" or "strongly disagree". This method captures students' perception using fuzzy logic, which allows for uncertain or vague responses (Kasim et al., 2023). Spearman's Rank Correlation was used to evaluate relationships between anxiety, self-efficacy, and academic performance. This non-parametric test is suitable for ordinal data and does not assume normal distribution (Gupta, 2025; Ali & Al-Hameed, 2022).

3. Results / Findings

The results indicated that students experienced high levels of mathematics anxiety. Among lower and upper secondary students, attributes "I worry that I will not be able to get an 'A' in my mathematics course", and "I worry that I will not be able to learn well in my mathematics course" showed the

highest anxiety score. This indicates that students at both levels are mainly anxious about achieving good grades, understanding mathematical content, and managing the overall learning process. Despite this, students also demonstrated high levels of confidence in their mathematical capabilities. Lower secondary students showed the highest self-efficacy in the attribute “I believe I can complete all of the assignments in a math course”, while upper secondary students “I believe I can learn well in a mathematics course”. This shows that lower secondary students are more confident in completing tasks, while upper secondary students are more confident in their ability to learn mathematics effectively. Comparisons between lower and upper secondary students revealed minimal differences in perception. Additionally, Spearman’s correlation showed a weak negative relationship between MA and SE ($\rho = -0.1484$), suggesting that higher anxiety slightly reduces confidence. However, weak positive correlations were found between both MA and achievement ($\rho = 0.0187$), and SE and achievement ($\rho = 0.1808$). The findings highlight the importance of enhancing instructional strategies and providing targeted support to help students manage anxiety and build confidence in mathematics.

4. Novelty of Research / Product / Project

This research introduces a novel application of Fuzzy Conjoint Analysis (FCA) in investigating mathematics anxiety and self-efficacy among rural secondary school students, specifically SMK Ketereh, Kelantan. Unlike previous studies that focus on university students as the sample population, this research targets secondary school students aged 14 and 16, offering fresh insights into emotional and cognitive learning barriers at an earlier stage. By using FCA, this study handles uncertainty and subjectivity in students’ responses more effectively. The use of fuzzy set-based similarity ranking allows for more accurate insight interpretation of attitudes, while integration with Spearman rank correlation adds statistical depth. This method captures both perceptual patterns and their links to achievement, offering a new framework for assessing psychological factors in education. The localized focus and combined methodology make this study a valuable reference for future work on student impact in STEM education (Rozgonjuk et al., 2020).

5. Conclusion or Future Work

This study shows that high anxiety in mathematics and self-efficacy coexist among students simultaneously. Both have to be treated to improve outcomes in teaching. Future research must cover more schools and employ longitudinal designs to track trends over time. The combination of FCA and Spearman correlation analysis provides a useful tool to trace student attitudes in mathematics.

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