# An Exploratory Study on Enhancing Senior High School Students' Mathematics Learning through the Use of the 4F Reflection Framework in Mathematics Learning Portfolios

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## Abstract

This is an exploratory qualitative study aimed at evaluating the effectiveness of the 4F reflection framework (Facts, Feelings, Findings, Future) in reducing the difficulties faced by senior high school students when writing mathematics learning portfolios. It also seeks to explore the potential relationship between this reflective activity and students' improvement in periodic assessment performance. The participants were two first-year students (10th graders, one male and one female). A qualitative case study method was adopted to organise and preliminarily interpret data from students' learning portfolios and periodic assessment scores. The results indicated that the 4F framework helped students reduce psychological burdens and challenges related to organising written content when composing their portfolios. It also assisted them in clarifying learning experiences and integrating mathematical concepts. Notably, both students showed improved performance in periodic assessments on topics involving slope and regression analysis—compared to their formative assessment results, indicating a positive shift. Future formal research should aim to collect complete student writing samples across all four dimensions of the 4F framework to serve as the basis for semantic and cognitive process analysis. It is also recommended that teachers provide concrete writing examples when implementing the 4F framework in classrooms to enhance students' depth of reflection and quality of written expression.

## Keywords

4F Reflection Framework, Mathematics Learning Portfolio, Senior High School Mathematics Education.