**link;** http://www.pertanika.upm.edu.my/pjssh/browse/regular-issue?article=JSSH-9569-2025

# Visual Thinking in Fractions: Exploring Elementary Students' Conceptual Understanding through Representation Strategies

Sirajuddin, Mutmainnah, Syekh Adiwijaya Latief, Arie Arma Arsyad, and Yusra Yunus

*Pertanika Journal of Social Science and Humanities,* Volume 34, Issue 2, April 2026
DOI: https://doi.org/10.47836/pjssh.34.2.21
**Keywords:** Conceptual understanding, elementary mathematics, fraction operations, visual representation
**Published on:** 2026-04-30

Abstract

This study explores fifth-grade students' use of visual representations in their understanding of fraction operations and what their drawings show us about their underlying conceptual understanding. A new and comprehensive exploratory qualitative collective case study was carried out with 15 students from three public elementary schools in Makassar, Indonesia. Data were obtained through a visual fraction addition representation task, think-aloud problem-solving, and semi-structured student and teacher interviews. Based on a thematic analysis by interactive methods, the study discovered various strategies of representation, including area diagrams, number lines, bar models, and hybrids of the diagrams and bars. Students made good use of visual representations consistently and in numbers, especially area diagrams and combined representations and had a strong concept for fraction equivalence, common denominators, and magnitude and had a higher flexibility in transitioning between representations. Students who could not keep the unit consistent or scale proportionally consistently often resulted in critical conceptual errors, on the contrary. The results imply that visual representation is not something we can just use to decorate a diagram when reasoning about fractions, but rather it needs to form an intrinsic part of students' brains' thinking toolkit to help students interpret and apply fractions. The research thus suggests a need for targeted teacher professional development that is focussed on the design, interpretation, and scaffolding of visual models for fraction instruction, which allows teachers to scaffold deeper conceptual understanding and support students' overall mathematical literacy.