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**Orginal Article**

# Analysis of the Components of Integrated Teaching of Verbal Problems in Third-Grade Mathematics in Relation to Concepts of Visual Arts: Integrating Visual Experiences with Mathematics

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## Abstract

Fractions are among the most widely used concepts in mathematics, and currently, understanding and solving verbal fraction problems remains one of the major challenges faced by elementary school teachers. Accordingly, the present study aims to explore the components of integrated instruction for third-grade verbal fraction problems based on visual and perceptual experiences and aligned with fundamental concepts of visual arts. The study adopted a qualitative meta-synthesis research approach. The statistical population included all national and international studies related to the research topic published between 2013 and 2023. Relevant keywords were examined using purposive sampling along with inclusion and exclusion criteria. Data were collected through a qualitative meta-synthesis design following the seven-step framework proposed by Sandelowski and Barroso (2007). Ultimately, 38 articles were selected and analyzed using a three-stage coding process (open, axial, and selective). The findings revealed that conceptual knowledge, drawing, modeling, and part–whole structure are the main shared components in interdisciplinary integrated instruction between verbal fractions and the foundations of visual arts grounded in visual and perceptual experiences. By providing practical opportunities for integrated learning, these components can foster deep, sustainable, and real-life–related learning among students and improve their understanding and problem-solving of verbal mathematical problems.

**Keywords:** Concepts of Visual Arts, Instruction in Verbal Fractions**,** Integrated Instruction**,** Visual Experiences

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# Extended Abstract

## Introduction

Introduction Teaching the concepts of integrating visual experiences with mathematical concepts in elementary education is a complex challenge that necessitates innovative approaches to help students grasp foundational concepts. Research shows that understanding these problems involves multiple stages, particularly relying on visualization and mental representation. Integrating visual arts into mathematics education can enhance this learning process, as studies indicate that students with strong visual memory are better at solving verbal math problems. Visualization and concrete drawings help make abstract concepts more accessible. However, there is limited research on using concrete visualization specifically for teaching fractions. This study aims to explore the integration of the concepts of integrating visual experiences with mathematical concepts, making education more comprehensible and sustainable for learners. The findings could enhance learning and develop both mathematical and artistic skills among students.

## Method

The present study adopts a qualitative synthesis research approach, using a meta-synthesis strategy that involves inductive content analysis and integration of findings. Following Sandelowski and Barroso's (2007) framework, the research comprises seven steps: defining the research question, conducting a systematic literature review, selecting relevant articles, extracting information, analyzing qualitative findings, ensuring quality control, and presenting results. Data extraction included both direct and indirect forms, leading to a thematic analysis in the interpretation phase. Quality control was achieved through peer review and external auditing. Ultimately, the study identifies common components between visual arts and the concepts of integrating visual experiences with mathematical concepts, providing detailed explanations that highlight meaningful connections between these two domains and enhance the research outcomes.

## Results

In this study, four common components were identified between the concepts of visual arts and the concepts of verbal fractions in elementary mathematics. First, conceptual knowledge emphasizes a deep understanding of fundamental concepts and relationships, aiding students in connecting words and images for effective problem-solving. Second, modeling involves

transforming real-world issues into mathematical problems and includes both internal and external aspects, enhancing problem-solving and artistic skills. Third, drawing shapes focuses on the ability to visualize and represent geometric forms, which facilitates understanding through creative engagement with mathematical concepts. Finally, the part-whole structure encompasses both deductive and inductive approaches, contributing to a better grasp of concepts and artistic creation. The analysis revealed 20 core categories and 60 open codes, highlighting the significance of these components in the learning process and their interconnectedness between mathematics and art.

## Discussion

The present study investigates the common components between the concepts of visual arts and the concepts of verbal fractions in elementary mathematics, focusing on four key elements: conceptual knowledge, shape drawing, modeling, and part-whole structure. Findings reveal that enhancing conceptual knowledge through reasoning and communication, along with shape-drawing skills, improves understanding in both fields. Modeling includes internal aspects, related to personal understanding and visualization, and external aspects, concerning tangible representations. The part-whole structure helps in understanding relationships between components, emphasizing the importance of visual details in art and fraction comprehension in mathematics. This research suggests that integrating the concepts of visual arts with the concepts of verbal fractions can deepen students' understanding and enrich the learning process, enhancing cognitive and visual skills.

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