Selecting and Implementing Manipulatives for the Elementary Mathematics Classroom

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Introduction

- **Purpose**
  - To investigate teachers’ selection of manipulatives (concrete or virtual) in the elementary mathematics classroom and how teachers implement selected manipulatives.

- **Phase One**
  - Qualtrics survey sent to teachers to learn about types of manipulative access, frequency and implementation criteria.

- **Phase Two**
  - Three blindly selected teachers from the survey who participated in semi-structured interviews (Loesch, 2002) and classrooms observations.

Research Questions

1. How do elementary teachers select manipulatives for their mathematics lessons?
2. How do elementary teachers implement manipulatives during mathematics lessons?

Survey Results

- **Teachers’ reported survey answers from the Major Urban District, Major Suburban District, and Other Central City District (n=15).**

Survey Findings

- Even within each district there was not a common consensus amongst how teachers select manipulatives (Figure 1).

- Teachers’ responses to survey questions about selection (Figure 2) and implementation (Figure 3) of manipulatives aligned closely with the student researcher’s initial codes for teacher selection and implementation of manipulatives.

- **Criteria alignment:** Student-Centered, Manipulative Attributes, and Pedagogically Appropriate

- Virtual manipulative use was much lower than concrete manipulative use, which aligned with current research findings.

Interview and Observation Results

- **Results for teacher selection of manipulatives for the elementary mathematics classrooms.**

Interview and Observation Findings

- **Variation** amongst selection and implementation criteria:
  - Selection and implementation criteria could be discrete.
  - Lessons are more student driven, which skews the data, or
  - Teachers’ are selecting manipulatives without implementation consideration.

- **Frequency of use was not a common criteria; therefore, it may not be as critical of a selection criteria as hypothesized.**

- Mathematical Knowledge for Teaching (MKT) was much more critical of a selection and implementation criteria than originally hypothesized.

Methods

- **Participants and Setting**
  - Survey Participants— Mathematics teachers from 30 schools across 3 different sized districts: 1 Major Urban District, 1 Major Suburban District, and 1 Other Central City District (TEA, 2018).
  - Interview and Observation Participants
    - Major Urban District: 5th grade, sixth year departmentalized mathematics TESOL teacher
    - Major Suburban District: 3rd grade, second year self-contained mathematics teacher
    - Other Central City: 1st grade, twenty-seventh year self-contained mathematics teacher

- **Data Analysis**
  - Used descriptive statistics (Mills, 2018) to analyze the survey data.
  - Used constant comparative method (Bogošić, 2002) to analyze data from field-notes and the transcribed interviews to identify initial common patterns and themes.

- **Initial codes:**
  - Pedagogically Appropriate, Frequency of Use, Manipulative Attributes, Student-Centered, “Other”

Survey Findings

- **Variations:**
  - MKT: 43%, phase: 51%, accessibility: 13%, limitations/bars: 6%

- **Limitations/Barriers**
  - Frequency of use
    - Small number reporting; only 16 out of 556 responded from the three school districts (one teacher declined to participate in survey).
    - Frequency of use was explicitly asked on the survey and may not have been noted in the observations and interviews if not directly asked otherwise.

- **Observations**
  - Teachers may have felt judged during observations.
  - Teachers may have felt pressure to use a manipulative during observations where they may have otherwise not used one.
  - Limited number of observations, so it was challenging to get an idea on frequency of manipulatives.

- **Conclusions**
  - Each teacher may have a different definition of what a manipulative is according to their experiences.

Limitations

- **Survey**
  - Small number reporting; only 16 out of 556 responded

- **Observations**
  - Teachers may have felt judged during observations.

- **Interviews**
  - Each teacher may have different definitions of what a manipulative is according to their experiences.

References