Title: Solving Problem Using the Tower of Hanoi: A Grounded Theory

Authors: Cynthia C. Honrales, Mark N. Abadiano

Objective:
- To generate a theory that explains the learning experiences of students when solving problems using the Tower of Hanoi puzzle
- Research questions focused on how students learn/behave, how they master the puzzle, and how they feel after learning through the puzzle

Methodology:
- Qualitative study using grounded theory approach
- 17 freshman Bachelor of Science in Information Technology (BSIT) students from Samar State University in the Philippines
- Purposive sampling - criteria was taking a GE course and ability to solve the Tower of Hanoi puzzle
- Data collected through:
  - Semi-structured interviews with open-ended questions, audio recorded
  - Observations of students solving the puzzle, recorded in memo pad
  - Other math instructors invited to observe students as well
- Interview data analyzed using thematic analysis:
  - Researcher immersed in data by listening to recordings multiple times
  - Line-by-line coding to identify concepts related to research questions
  - Codes grouped into categories/themes using constant comparison
  - Themes used to generate theory
- Ethical procedures followed including informed consent and confidentiality

Key Findings:
- Demographics:
  - 17 students, 9 male 8 female, aged 18-20 years old
  - All single marital status, Roman Catholic religion except 1 Protestant

- 4 major themes identified from interview responses:
  1. Active Learning - students must actively engage in solving puzzle
  2. Procedural Learning - follow sequence/pattern, focus on rules
  3. Repetitive Learning - repeated practice leads to mastery
  4. Enjoyable Learning - puzzle was fun, addictive, stress reliever

- Sample participant quotes provided as evidence for each theme

- Hypotheses derived from themes:
  - Repetition and mastery lead to successful problem solving
  - Following procedures solves problems accurately
  - Puzzles coupled with positive attitude provide meaningful learning

- Honrales Solving Problem Theory generated:
  - Repetition, accuracy, puzzles and positive disposition are necessary skills for successful problem solving activities

Conclusions:
- Tower of Hanoi is a useful problem solving tool for active, procedural, repetitive and enjoyable learning
- Study provides baseline data to support incorporating puzzles in teaching
- Future research could further explore student experiences with Tower of Hanoi

Recommendations:
- Incorporate Tower of Hanoi and similar puzzles into teaching math and problem solving
- Introduce the puzzle to both college and high school students