

PEDAGOGICAL CONTENT KNOWLEDGE OF MEASUREMENT THROUGH THE ANALYSIS OF ASSOCIATIVE COGNITIVE NETWORKS

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INTRODUCTION

Measurement estimation is a first-order mathematical competence closely linked to number sense, spatial thinking, and problem-solving in real-world contexts. It constitutes a critical bridge between mathematics and science education.

Despite its importance, estimation occupies a marginal place in teaching, often reduced to routine procedures without conceptual justification. Pre-service teachers frequently lack solid mental images of measurement units.

AIM

To analyze the structural organization of pre-service teacher's **Pedagogical Content Knowledge (PCK)** using an **Associative Cognitions Network (ACN)** approach to identify key conceptual Gap

METHOD



Participants

31 third-year pre-service primary teachers.



Instrument

Open-ended questionnaires covering estimation tasks and instructional design.



Analysis

Qualitative content analysis (68 subcategories) modeled as nodes in an ACN.

RESULT & DISCUSSIONS

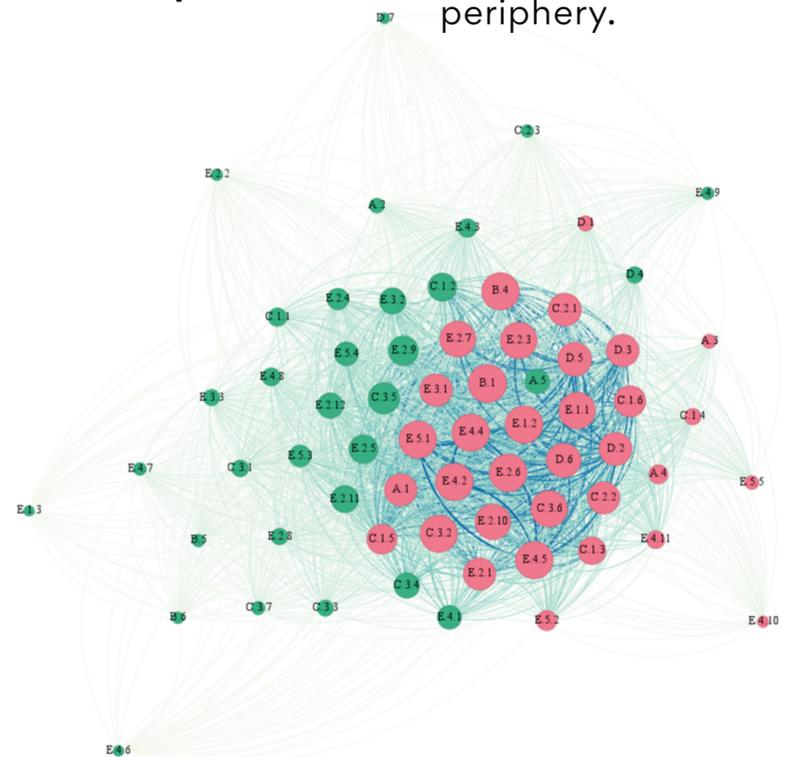
MACRO-SCALE: COHESIVE TOPOLOGY

Graph analysis revealed a highly cohesive and efficient network dominated by a **hyperconnected core** of procedural ideas and practical instructional decisions

MESO-SCALE: TWO COMMUNITIES

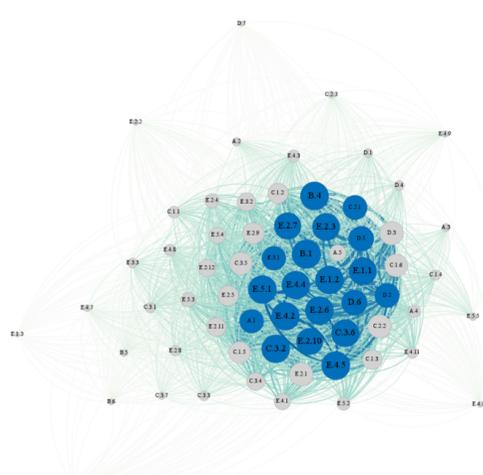
Community detection suggested two interdependent domains:

- Didactic-Operational** Highly integrated central core.
- Peripheral Conceptual Belt** Fragmented formal periphery.



MESO-SCALE: TWO COMMUNITIES

Procedural skills act as central hubs. Formal mathematical notions (**proportionality, transitivity**) occupy isolated peripheral positions with weak bridging capacity.



CONCLUSIONS

Findings reveal a **structural gap** between practical teaching knowledge and formal mathematical principles. While teachers possess a strong repertoire of procedural actions, they lack the interconnected conceptual scaffolding required to justify estimation plausibility or to teach it as a robust STEM modeling tool.