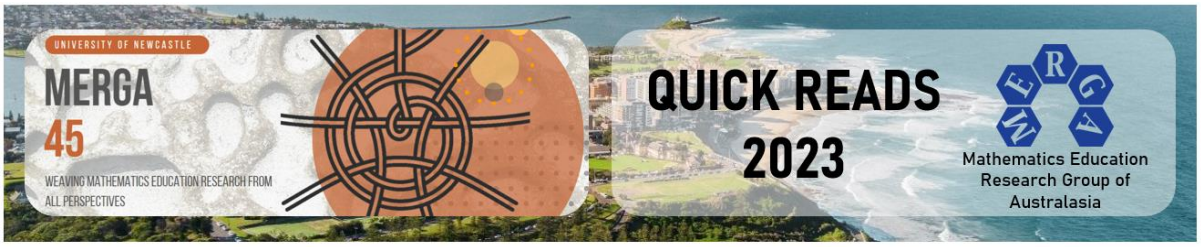

Mathematical Connections in Secondary Students' Concept Maps on Transformations of the Parabola

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Mathematical connections are relationships students make among mathematical concepts or ideas, which allow them to explore and understand the interdependencies of different mathematical concepts (García-García & Dolores-Flores, 2018). They facilitate the transfer of knowledge between different domains of mathematics and enable students to perceive the unity within the subject, leading to meaningful and coherent learning experiences. This study focuses on the mathematical connections related to transformations of the parabola and their associations with other mathematical ideas. It sheds light on the intricacies of mathematical connections woven within students' concept maps, paving the way for enhanced pedagogical approaches that foster deeper mathematical understanding and proficiency.

Employing concept maps as a data collection tool, the study engaged four sixteen-year-old Year 10 General Mathematics students as participants. Through rigorous analysis of concept maps and using mathematical connections definitions in the current research literature, the findings illuminated a spectrum of mathematical connections present within the concept maps. These included meaning, different representations, part-whole relationships, procedural, features, and reversibility connections (García-García & Dolores-Flores, 2018). For instance, to some students, "transformations of the parabola" meant *movement* of the parabola, changing its position on the Cartesian plane, which can be categorized as a meaning connection.

Methodologically, the concept map was a useful tool to understand students' capabilities in making mathematical connections. Its efficacy, however, can be substantially augmented when coupled with detailed elaborations and interviews. For example, concept map elaborations revealed some misconceptions held by the students, such as a participant referring to the domain as the base of the parabola. This combination of tools can enrich the data collection process and allow a more comprehensive and nuanced determination of the students' conceptualisations. Practically, the findings bear important implications for mathematics teachers. The discerned mathematical connections can aid in identifying prevalent misconceptions and bridging gaps in students' understandings. By unravelling the multifaceted interpretations that students attribute to formal concept definitions, teachers can potentially tailor their teaching strategies to address individual learning needs more effectively.

References

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