

Maker-Based Learning in Secondary Mathematics: Investigating Students' Proportional Reasoning Understanding through Digital Making

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Abstract : Student digital artifacts were investigated, utilizing a qualitative exploratory research design to understand the ways in which students represented their knowledge of seventh-grade proportionality concepts as they participated in maker-based activities that culminated in the creation of digital 3-dimensional models of their dream homes. Representations of the geometric and numeric dimensions of proportionality were analyzed in the written, verbal, and visual data collected from the students. A directed content analysis approach was utilized in the data analysis, as this work aimed to build upon existing research in the field of maker-based STEAM Education. The results from this work show that students can represent their understanding of proportional reasoning through open-ended written responses more accurately than through verbal descriptions or digital artifacts. The geometric and numeric dimensions of proportionality and their respective components of attributes of similarity representation and percents, rates, and ratios representations were the most represented by the students than any other across the data, suggesting a maker-based instructional approach to teaching proportionality in the middle grades may be promising in helping students gain a solid foundation in those components. Recommendations for practice and research are discussed.

Keywords : learning through making, maker-based education, maker education in the middle grades, making in mathematics, the maker movement

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