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How competition and heterogeneous collaboration interact in prevocational game-based mathematics education.

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Summary: The present study addresses the effectiveness of an educational mathematics game for improving proportional reasoning in students from prevocational education. Though in theory game-based learning is promising, research shows that results are ambiguous and that we should look into ways to support game-based learning. The current study explored two factors (i.e., collaboration and competition) that have been associated with motivational and cognitive effects, and have potential to optimize game-based learning. In a fully crossed design, four conditions were examined: collaboration and competition, collaboration control, competition control, and control. It was found that, over all, gameplay did improve students' proportional reasoning skills but that learning effects did not differ between conditions. However, when students' ability levels were taken into account, an interaction between collaboration and competition was found. For below-average students, the effect of collaboration was modified by competition, showing a negative effect of competition on domain knowledge gains in a collaborative learning situation. In contrast, for above-average students, the data demonstrated a trend that suggests a positive effect of competition on domain knowledge gain in a collaborative learning situation.

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