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How science, technology, engineering, and mathematics (STEM) project-based learning (PBL) affects high, middle, and low achievers differently: the impact of student factors on achievement.

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Summary: The purpose of this study was to investigate whether participating in science, technology, engineering, and mathematics (STEM) project-based learning (PBL) activities effected students who had varied performance levels and to what extent students' individual factors influenced their mathematics achievement. STEM PBL has been a critical challenge to be embedded in schools, thus the effect of STEM PBL should to be examined. Teachers in 3 high schools attended sustained professional developments provided by 1 STEM center based in a Southwestern university and were required to implement STEM PBLs once in every 6 weeks for 3 years (2008 through 2010). The participants were 836 high school students in these 3 schools who took the Texas Assessment of Knowledge and Skills (TAKS) test and had scores at least in the initial year. Hierarchical linear modeling was used to analyze the data using student's mathematics TAKS scores and demographic information for the longitudinal study. STEM PBL instruction influenced student achievement in mathematics by both student demographic backgrounds and performance levels. Low performing students showed statistically significantly higher growth rates on mathematics scores than high and middle performing students over the 3 years. In addition, student's ethnicity and economic status were good predictors of academic achievement. Results of the present study implied that STEM PBLs in schools benefitted low performing students to a greater extent and decreased the achievement gap.

Classification: D30 D40 C30 M50 M60

Keywords: academic achievement; longitudinal HLM; performance level; project-based learning; STEM
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