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Using example generation to explore students' understanding of the concepts of linear dependence/independence in linear algebra.

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Summary: Linear algebra is a basic mathematical subject taught in mathematics and science departments of universities. The teaching and learning of this course has always been difficult. This study aims to contribute to the research in linear algebra education, focusing on linear dependence and independence concepts. This was done by introducing student-generated examples regarding the concepts. With the help of these examples, we have analysed students' understanding of linear dependence/independence and determined the effect of the example-generation process on student understanding of linear algebra. In addition, we identified some difficulties that were experienced by students learning the concepts of linear dependence/independence. In this study, APOS (action-process-object-schema) theory is the main tool utilized to explain students' written responses. It was also used with regard to the interview questions that were posed to students with the purpose of identifying possible difficulties with linear dependence/independence and observing the adequacy of the relations that students might form between different elements of the genetic decomposition of linear dependence/independence concepts. The findings of this study confirmed that many students do not have appropriate mental structures at object and schema levels. Moreover, in order to ensure the success of such exercises, students must be encouraged to review and validate their responses to the example requests.

Classification: H65 D45 C35

Keywords: APOS; linear algebra education; linear dependence; student-generated examples; linear independence

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