

Seeing the Forest: Linear Algebra Application Project

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Context: Out of class; Linear Algebra

Keywords: mathematics project, applied mathematics

Student Activity Time: 6-8 hours

Students reflected on the course material in linear algebra and identified how the concepts and theories are applied in their field of interest.

Introducing the Reflection Activity

The transition from applied mathematics to more abstract mathematical concepts can be difficult for students, especially those who are taking their math courses to fulfill requirements for another major. One educator uses a project in a linear algebra course to prompt students to reflect on the course material and make meaning of the material in their discipline of interest. The purpose of this activity was to ignite students' curiosity in mathematics, learn the relevance of linear algebra for their field of study, and to help them increase the value they associate with theoretical concepts in linear algebra.

Near the end of the term, the educator assigned a project centered around reflecting on the entire linear algebra course. Students were first prompted to find one concept, method, or theory taught in the course that applied to their major or field of study. The 2-3-page assignment required students to explain the context of their project and the concept from linear algebra, and provide a conclusion that included a reflection on what they learned from the project. The educator encouraged students to look beyond systems of equations and consider topics such as Eigenvectors or linear transformations that would be applicable to their field of study. The educator used a rubric to grade the assignment, which counted for 10% of the course grade.

After completing the project and writing a thoughtful reflection about the project, students are able to answer for themselves why linear algebra theory and methods are helpful for various STEM disciplines. Students are also equipped to address the more complicated, disciplinary questions that linear algebra can be used to answer.

Recreating the Reflection Activity

	Description
1	Assign a linear algebra project at the beginning of the term.
2	Provide students 3 weeks to complete the assignment.
3	Collect and grade student projects.
4	Offer students an opportunity to reflect on the many applications of linear algebra.

In the words of the Educator: Tips and Inspiration

Point students to the textbook examples to start. It's easy for students to go to the examples in the textbook, but remind them that it's only a place to start. I want their projects to be more detailed and a little more out of the box. The students find lots of interesting projects and I enjoy having them teach me the application to their particular field.

Remind students to provide ample background information. A lot of students slack on it, but it's really important for them to explain the science behind their project. I remind students that I'm a mathematician, so if they are doing an engineering application, they need to offer me more than a couple definitions, and explain what is happening on the engineering side of it. They need to write so that a layperson can read it and understand what they are talking about and how linear algebra applies.

What was the inspiration for the reflection activity? I always get the question "how is this useful?", so I came up with this activity as a way for students to answer this question for themselves. It's really a way for the students to see the forest for the trees in this course and get the big picture of the course material. The point is not for them to go out, do a lot of research, and write a dissertation. It would be fine if they just go to their teacher in engineering or chemistry and ask how linear algebra applies to the field. I could teach the class so that it was more application driven, but then some of the elegance of the subject is lost. I still want to recruit future mathematicians and also teach linear algebra as a powerful and useful subject.