MATLAB GRADER ENHANCED ASSESSMENT AND FEEDBACK

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SUBTHEME: Assessment

PROBLEM

To ensure our mathematics graduates are ready to engage in transdisciplinary problem solving, and to enhance their employability, they must see real computational tools and practice using them in authentic modelling contexts. Asking students to consider equations that arise from modelling contexts, and to solve them numerically using well-established mathematical techniques, is a form of authentic learning and assessment that addresses this issue.

PLAN

We use MATLAB Grader as an online assessment tool in many of the courses taught in the Mathematical Sciences Institute. In this presentation, we concentrate on how it has benefited the first-year teaching programming. Grader is a tool for formative assessment, as well as a means to explore the mathematical principles underlying different application areas. Students additionally get a gentle introduction to writing mathematical functions in a programming language.

ACTION

For example, we developed Grader questions that help deepen our students' understanding of *matrix transformations,* while working in the context of computer graphics. We have written a Grader assignment question where students enter the matrix corresponding to a given transformation, and Grader plots a teapot before and after applying the transformation. For example, if a student is asked to give a matrix that corresponds to a reflection in the x-axis, students can see if the teapot is indeed reflected in the x-axis (or horizontal line). Observe that the students can also use the plots to check their answer.

REFLECTION

MATLAB is a programming language designed to be used by mathematicians and engineers. Concepts are expressed in a format that is intuitive to mathematicians. Consequently, it was easy to introduce MATLAB into our course structures by enhancing pre-existing examples with minimal impact on the lecturer's and student's workload.

We piloted Grader in one of the first-year courses in Semester 2, 2021, but it was not a resounding success. Students expressed frustration that they lost marks due to coding errors. In Semester 1, 2022, we used the "pretest" feature in Grader to warn students of potential issues related to syntax errors. This reassured students that it is their mathematical skills, not their programming skills, that are assessed and eliminated complaints about being "forced to do coding in a mathematics course."

Of course, feedback strongly impacts a student's learning experience. Drawing from several years of data, we recently made inferences about common mistakes and modified the Grader questions to detect common mistakes, then respond with appropriate feedback and links to learning material.