

GIFTS - Integrating MATLAB Grader into an Engineering Computing Course

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Introduction

This GIFTS (Great Ideas for Teaching Students) paper discusses implementing MATLAB Grader into a first-year engineering computing course. MATLAB Grader is an automatic grading platform for MATLAB files. It assesses student code in the form of user-defined functions or scripts through various instructor-created tests. The tests typically check the values of variables, the inclusion of keywords or functions, the absence of keywords or functions, or custom code with assessments created by the instructor.

Implementation Approach

MATLAB Grader was introduced at the University of Notre Dame, a medium-sized, private, Midwestern, residential university with approximately 500 students in the Spring 2023 and 2024 semesters. MATLAB Grader replaced the grading for smaller active learning activity assignments, which are assignments started before the end of a given lecture and completed before the start of the following lecture. The assignments are a means to promote retrieval learning and ensure that the concepts from the previous lecture are reinforced before the next lecture. MATLAB Grader is used for problems including variable assignment, mathematical operations, loops, conditionals, data structures, cell arrays, user-defined functions, plotting, arrays, and vectors. MATLAB Grader was not used to replace the longer homework assignments.

Results and Discussion

Based on student feedback, students preferred MATLAB Grader over a traditional approach of grading (in which the students submitted code and received feedback typically within a week). Table 1 illustrates student preferences over the last two academic years.

Table 1. Response Rates of Submission Preference

Response	2023 (% of Students)	2024 (% of Students)
Strongly Prefer MATLAB Grader	44%	47%
Somewhat Prefer MATLAB Grader	28%	28%
No preference	17%	12%
Somewhat Prefer File Submission Through Canvas	6%	7%
Strongly Prefer File Submission Through Canvas	5%	6%

Based on written responses, students appreciated the instantaneous feedback from MATLAB Grader and the hints it provided on how to fix their code through the feedback provided after a failed test. One complaint was that grading could be very particular regarding required variable names or methods (although if the directions are written well, this can reinforce the importance of following directions). One student assistant grader noted that (i) instantaneous feedback can immediately correct misconceptions that otherwise would not be caught until potentially a week, and (ii) MATLAB Grader provides financial benefits by saving grading time and money. The author also has observed that student assistant graders can return homework faster and with more feedback when MATLAB Grader is used on these smaller assignments.