

## **Self-paced learning in an undergraduate MATLAB course**

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I teach at a primarily undergraduate institution in a program—marine science—that draws students with high motivation and interest in their field of study but not necessarily strong preparation in math and programming. Our students often realize upon graduation that employers and graduate advisors value computational skills as much as content knowledge. To help set students up for success in the next phase of their career, we are in the process of redesigning our curriculum to increase focus on quantitative skills. Through this effort, I designed a new MATLAB-based course on an introduction to programming and scientific visualization.

Based on working one-on-one with research students, I anticipated that students would climb the MATLAB learning curve at different rates. I used that as an opportunity to try out a (partially) self-paced method of instruction with a specifications grading scheme<sup>[1]</sup>. Students complete modules that work through skills such as creating matrices, loading and plotting data, if-statements and for-loops. The module assignments are graded as “excellent” (scripts run with no errors), “complete” (minor errors) or “incomplete”. Incomplete assignments can be submitted as many times as necessary to achieve a grade of complete. Final letter grades are based on module completion levels.

My first trial run of the course resulted in high levels of procrastination followed by high end-of-semester stress. The second time that I offered the course, I added a weekly check-in assignment in which students submit a draft MATLAB script that they are working on and I give advice on the first error message that pops up. This small assignment has helped students stay on track with weekly work on modules and improving their attention to common sources of coding errors such as typos and incorrect function syntax. By fixing small errors before submitting an assignment, the students learn that they receive my assistance with the more challenging parts of the assignment.

Development of this MATLAB-based course is still in progress, but the course framework has demonstrated some success at achieving the goals of improving student preparation for computational-based work. At least 50% of the students that completed the course went on to use MATLAB or similar programming software in independent research with faculty or off-site internships. Several students who have since graduated informed me that the skills that they learned in this course were important selling points in their job or graduate school applications. I use these student successes to address another challenge—recruiting students to take an elective course that involves computers instead of boats.

<sup>[1]</sup>Nilson, L.B. 2015. Specifications Grading: Restoring Rigor, Motivating Students, and Saving Faculty Time. Stylus Publishing, Sterling, Virginia, USA.