Student Reflections on Learning as the Basis for Course Grades

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Abstract:
This paper examines the impact of an ungrading approach to classroom assessments on students' perception of their learning experience in two freshman level courses. We discuss the interviews conducted at mid-term and end of term with our students in order to determine course grades and promote self-reflection and metacognition. The interview process was central to how we adopted ungrading (Blum 2020) as an assessment method for our courses and was the primary tool for determining course grades. All students involved were first year STEM students enrolled in either Intro to MATLAB programming (n=36) or First year composition (n=37). Ten (10) students were enrolled in both courses. Early findings from this approach found that students expressed an improved sense of agency and independence when it came to their course work and in the MATLAB course and used language that suggested the foundation for life-long learning. The grade conferences provided an opportunity for student-teacher calibration in terms of course expectations and self-reflection among the students. While it is still a developing field, the ungrading approach provides an alternative to the traditional classroom that allows for student agency and increased involvement in the learning process while decentralizing authority. The power shift away from the instructor impresses upon the student their responsibility for taking control of their own learning.

Introduction
Since the fall of 2021, we have been using ungrading approaches (Blum 2020) in our respective classrooms (Introduction to MATLAB taught by Dr. X for the Biomedical Engineering department, and first-year composition taught by Dr. Y for the Humanities, Social Sciences, and the Arts department). Despite our divergent disciplines, our impulse to go gradeless came from a shared belief that students should have a more active role in their learning and how they are assessed. It is documented that grades often do more harm than good, focusing students on scores rather than on deep learning. A study that tracked student learning in relation to grades and feedback given found that interest and overall performance were highest when students received feedback in the absence of grades (Butler, 2011). When students received a grade or a grade in addition to feedback, the presence of that grade seemed to undermine student interest in the course material and overall performance in the class. When future grades were anticipated, high achievers did maintain engagement; however, the general population of students responded best when feedback was given in isolation (Butler, 2011). Additional studies have demonstrated that indeed grades have three predictable effects on student behavior: students show less interest in learning, show preferences for easier tasks, and demonstrate shallower thinking (Grolnick & Ryan 1987;Kohn, 2021) By encouraging students to engage in the grade assessment process and redirecting their focus away from the grades themselves and more towards the feedback provided and subsequent improvements, we expect that students will develop more agency and self-awareness with regards to their ability and performance.

While we are advocates for the adoption of gradeless strategies, we understand that the initial shift to going gradeless is sometimes difficult for educators who must relinquish control. The move is, however equally, if not more, challenging for students who have been raised in an environment

where they have very little autonomy regarding the classroom experience and how they are assessed. In the case of our classes, we eschewed conventional grading, replacing the traditional approach with a midterm and final assessment conducted via interview. We hoped to have deep, reflective conversations with our students about their learning and their progress over the academic term. In this pilot paper, we share the process we developed for midterm and final assessment, use collected data to demonstrate the impact of the assessment on students' grades, and consider students' growth as seen in their own reflections as a result of an ungraded experience.

Methodology:

Midterm and Final Grade Conferences
Two four (4) credit hour freshman level courses: Introduction to MATLAB (36 students) taught by Dr. X for the Biomedical Engineering department, and First-year composition (37 students) taught by Dr. Y for the Humanities, Social Sciences, and the Arts department) were used for this experiment. Both courses are compulsory (MATLAB for the biomedical engineering curriculum and composition for all freshmen students). The courses were conducted over a 10-week quarter and included regular meetings, assignments, and assessments. Students were evaluated in a gradeless (ungraded) fashion whereby frequent rich and substantive feedback was provided for each submission, but no numerical grade was included. In many circumstances, students were given the opportunity to revise and resubmit their work or complete a similar assignment in response to the feedback they received. It should be noted that 10 students were enrolled in both courses. These students were not evaluated separately; however, the overlap was noted.

While both of the classes were gradeless throughout the academic term, instructors submitted midterm and final letter grades for the students as per the institutional requirements (this institution uses an A-F with + (plus) grades system. No - (minus) grades are used in this system. Typically, faculty assign grades based on the 10% scale with 90%-100% earning an A, etc. Plus (+) grades usually range from the top 50%-20% of a 10% range). Beyond these midterm and final grades, no grades were used or mentioned to students throughout the academic term.

At the midterm and final points of the term, the instructors met with each student individually to interview and discuss course performance. In a collaborative effort, the instructor and the student decided together on the grade submitted. Students were asked to assign themselves a grade supported by evidence (evidence could include instructor feedback; examples of growth, improvement, and independence such as learning a new skill or concept beyond the scope of the class; and the students' own sense for their mastery of the course material). The following protocol/procedure was used by both instructors for the interviews. First, in an online survey (posted on Google), students were asked to respond to the following questions:

1. If you had to give yourself a grade for this course, so far, what would it be?

2. Please justify this response with evidence from your work so far. I [the instructor] am asking about more than just the feedback you've been given, but also your own sense for your understanding of the material and the effort you've put into learning.

Independent of students' self-assessment, each instructor selected a grade for each student without first looking at the student surveys. Each instructor then met with every student individually to have a conversation about the grade they assigned themselves and their evidence for earning that grade. The grades as expected by each faculty member were compared to the student expected grades. At the end of these conversations, the instructor and student came to an agreement about the course grade granted. At the midterm point, the instructor also gave feedback about what needed to happen going forward with regards to course performance.

The final grades assigned were then compared to both the grades expected by the instructor and the student prior to the meetings at the midterm and final points of the academic term. These comparisons aimed to evaluate the students' abilities to self-assess and engage in metacognitive activities.

Student Written Reflections
In addition to the survey data collected, anonymous written reflections in each course were collected, and evaluated. These written evaluations were compared to control courses from the previous year that were not conducted using the ungrading format. Each faculty member reviewed the written work from their own class and identified emergent themes from them that occurred in the ungraded versions. Two of these themes (student agency and self-efficacy) were overlapping between the two courses. The third theme (developing life-long learning) was only present in the MATLAB course. Representative student comments were chosen as examples for the overall themes identified. While many of the student qualities discussed from this section below cannot be directly measured, the comments are representative of the general trends observed.

Results:

Midterm Grade Conferences
At midterms, there was 55% (20/36) and 38% (14/37) agreement between instructor and student estimated grades for the Intro to MATLAB programming and First year composition courses, respectively. 8% (3/36) students estimated their grades to be a half letter grade lower, 8% (3/36) estimated their grades to be a half letter grade higher, 11% (4/36) estimated 1 letter grade higher, 5.5% (2/36) estimated 1.5 letter grades higher, 5.5% (2/36) estimated 2 letter grades higher, 2.7% (1/36) estimated 3 letter grades higher, and 2.7% (1/36) estimated 4 letter grades higher than the Intro to MATLAB instructor. 1 student did not participate in the ungrading process. (Figure 1)

For the First-year composition course, 19% (7/37) estimated their grades to be a half letter grade higher, 24% (9/37) estimated 1 letter grade higher, 2.7% (1/37) estimated 1.5 letter grades higher, and 5% (2/37) estimated 2 letter grades higher than the instructor. 4 students did not participate in the ungrading process (one of whom was the same student that did not participate in the Matlab course ungrading process). (Figure 1)
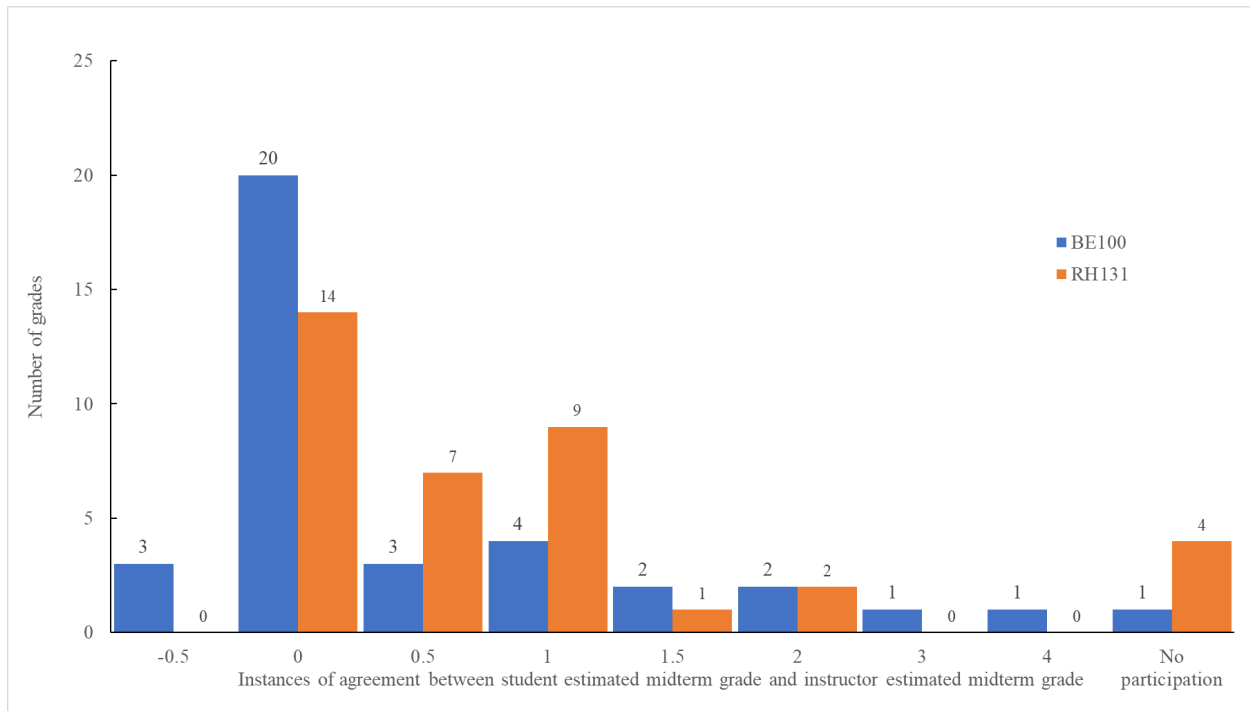
Figure 1: Student versus instructor midterm grade estimations prior to the midterm conference sessions for BE100 (MATLAB) and RH131 (First-year composition). The horizontal axis represents the difference in grade estimation by half letter grade increments and the vertical axis represents the number of grades.

Following the conferences 61% (22/36) and 57% (21/37) of the midterm grades assigned matched the original instructor estimate for the Intro to MATLAB programming and First year composition courses, respectively. For the Intro to MATLAB programming, 16% (6/36) of grades increased by half a letter grade as compared to the original instructor estimate, 16% (6/36) of grades increased by a full letter grade as compared to the original instructor estimate, and 2.7% (1/36) of grades increased by two full letter grades as compared to the original instructor estimation. (Figure 2)

For the First-year composition course, 19% (7/37) of grades increased by half a letter grade as compared to the original instructor estimate, 13.5% (5/37) of grades increased by a full letter grade as compared to the original instructor estimate, and 0% (0/37) of grades increased by two full letter grades as compared to the original instructor estimation. (Figure 2)
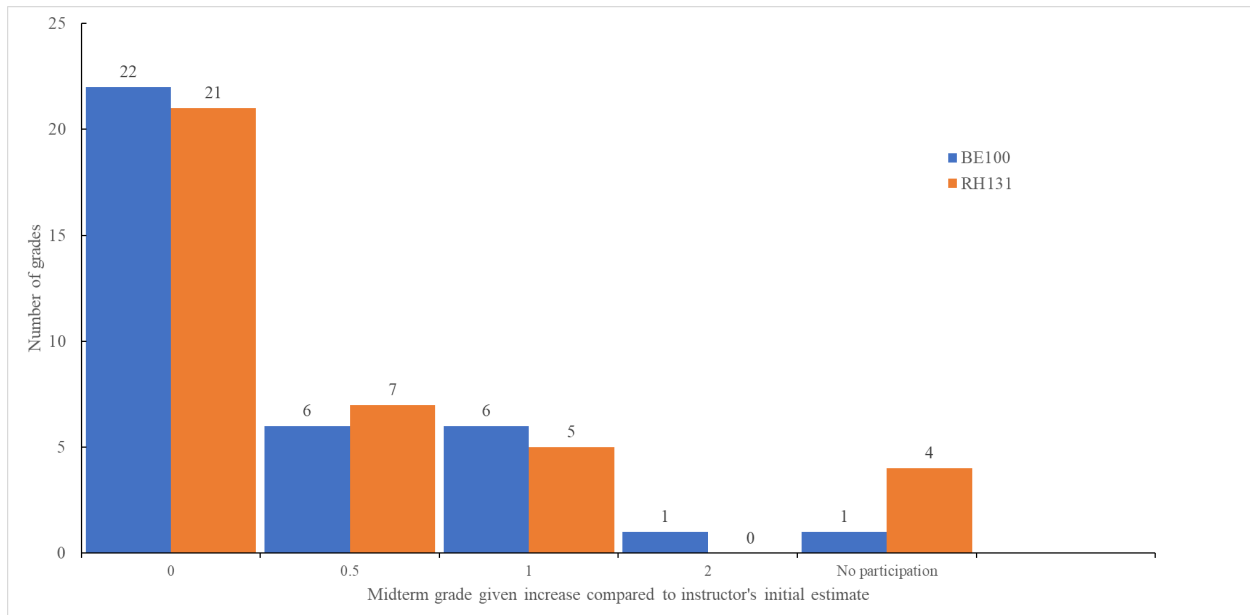
Figure 2: The increase in midterm grades assigned following the midterm conferences as compared to the original instructor estimate for BE100 (MATLAB) and RH131 (First-year composition).

Final Grade Conferences

At the end of the academic term, there was 72% (23/32) and 55% (17/31) agreement between instructor and student estimated grades for the Intro to MATLAB programming and First year composition courses, respectively. 0/32 students estimated their grades to be a half letter grade lower, 22% (7/32) estimated their grades to be a half letter grade higher, and 6% (2/32) estimated 1 letter grade higher, than the Intro to MATLAB instructor. 1 student did not participate in the ungrading process. (Figure 3)

For the First-year composition course, 3% (1/31) estimated their grades to be a half letter grade lower, 6% (2/31) estimated their grades to be a half letter grade higher, 26% (8/31) estimated 1 letter grade higher, and 10% (3/31) estimated 2 letter grades higher than the instructor. (Figure 3)
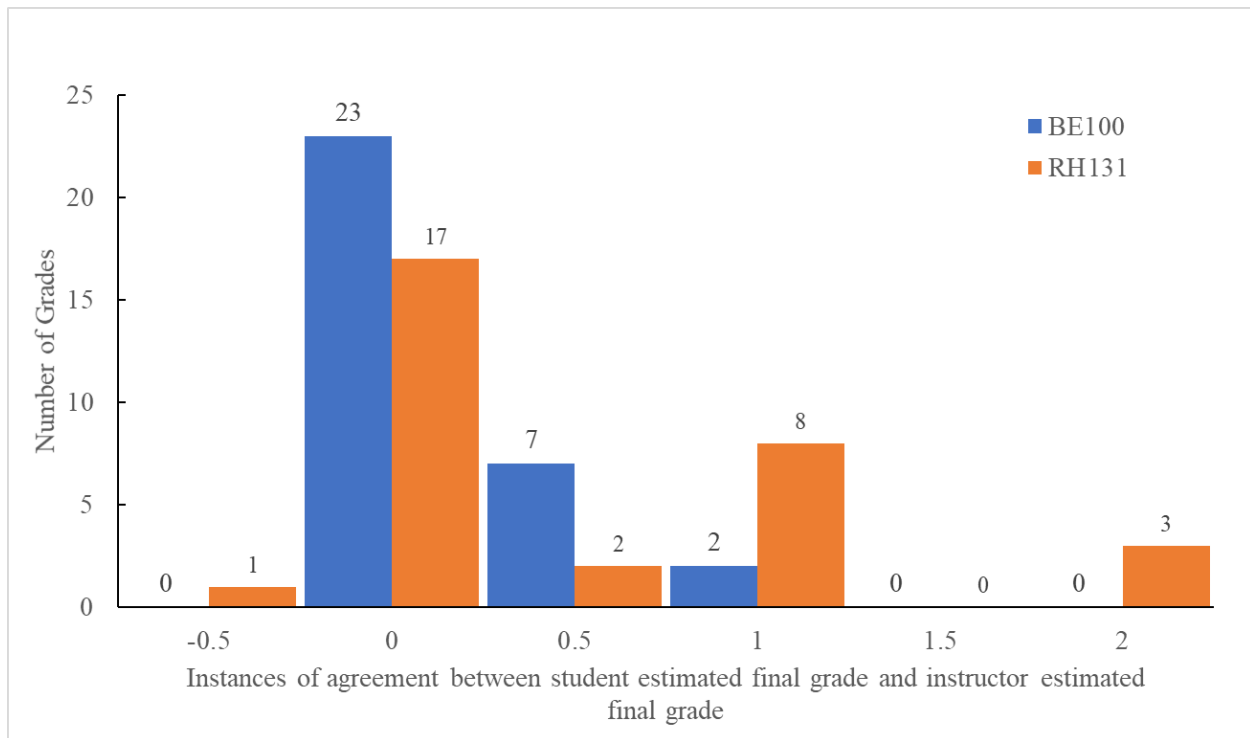
Figure 3: Student versus instructor final grade estimations prior to the final conference sessions for BE100 (MATLAB) and RH131 (First-year composition). The horizontal axis represents the difference in grade estimation by half letter grade increments and the vertical axis represents the number of grades.

Following the conferences, 82% (27/33) and 61% (19/31) of the final grades assigned matched the original instructor estimate for the Intro to MATLAB programming and First-year composition courses, respectively. For the Intro to MATLAB programming 12% (4/33) of grades increased by half a letter grade as compared to the original instructor estimate, and 6% (2/33) of grades increased by a full letter grade as compared to the original instructor estimate. (Figure 4)

For the First-year composition course, 18% (6/33) of grades increased by half a letter grade and 18% (6/33) of grades increased by a full letter grade as compared to the original instructor estimate. (Figure 4)
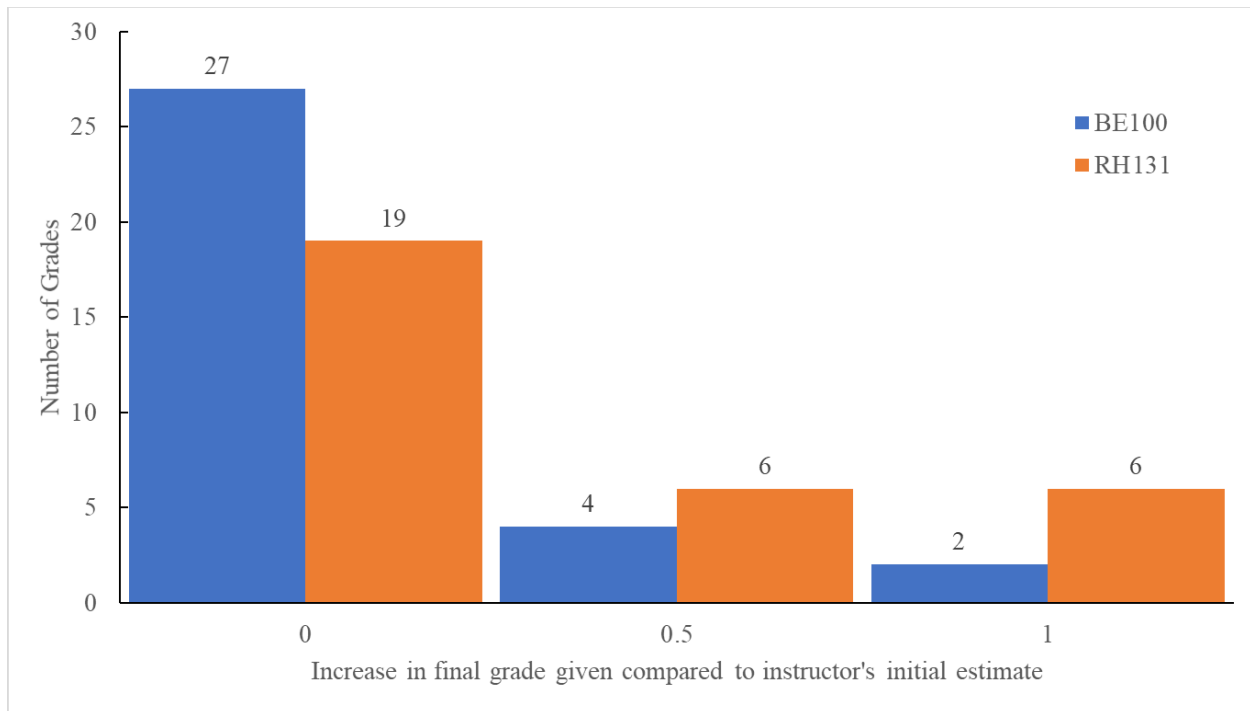
Figure 4: The increase in final grades assigned following the final conferences as compared to the original instructor estimate for BE100 (MATLAB) and RH131 (First-year composition).

It should be noted that the discrepancy between the total number of students accounted for in the MATLAB course (32 versus 33) was due to a conference participation issue and the discrepancy between the total number of students in both courses between the midterms and the finals was due to students dropping the course.

When comparing the change from the midterm (Figure 1) to the final point (Figure 3) in student versus instructor estimated grades prior to the conferences, there was a slight increase in the number of match grades for each class (3 additional students had a perfect match with the instructor estimate at finals than at midterms for both courses). In addition, there were fewer student estimated grades that diverged largely from the instructor estimated grades at the finals as compared to the midterms. These results suggest that by finals, students were able to better engage in metacognition self-assessment and had an improved sense of course performance expectations.

Figures 2 and 4 demonstrate the number of grades changed from the initial instructor estimate. In both courses, several grades were modified following the conferences, suggesting that the meetings resulted in meaningful conversations regarding course performance and gave the instructor additional insight into the student's performance and growth in the course beyond what the course assignments had provided.

Student Self-Efficacy

From the student written evaluations for both courses taught, the instructors identified a theme of improved confidence (Hutchison et al, 2006; Loo & Choi, 2013; Mara et al, 2009; Mamaril et al,

2016) as either writers, programmers, or both. Students made comments regarding their new-found self-assurance in their abilities as a writer and reviser in the first-year composition course. Likewise, students in the MATLAB course expressed how they overcame their initial feeling of intimidation of programming and now perceived themselves able to tackle any programming challenge. Below are some representative statements that capture the theme of student confidence from their written evaluations:

> Comment A (first year composition): All of the class writing modules have shown me how my writing has grown. Each week, I've learned new revision strategies which I keep in the back of my mind while writing the next module. I've also consistently had less and less feedback each week, which tells me my writing has grown.

> Comment B (introduction to MATLAB): I was very intimidated by coding at first, but now I feel like I could learn almost anything in MATLAB.

> Comment C (introduction to MATLAB): Prior to this class, I knew nothing about coding, but now I feel confident with many basic MATLAB functions.

Developing Student Agency

Another theme that the instructors identified following review of student written evaluations was that of agency (Pitterson et al, 2018; Vieira et al, 2021). Students self-identified an ability to and the importance of developing their own problem-solving strategies, identifying what needs to be done on an assignment, and applying previous lessons to new contexts. The instructors also observed that the students were developing a sense of engagement and urgency for completing the work even without strict deadlines and self-direction regarding their revisions and learning. Below are some representative statements that capture the theme of student agency from their written evaluations:

Comments from the first year composition course highlight the theme of leveraging the tools taught in class for self-directed revision (emphasis added):

> Comment D (First-year composition): I know this reflection is supposed to be talking about the growth of us as writers and all the skills that we gained and how our writing has improved, but I think that growing as a writer also includes how your feeling toward writing has changed. At the start of the semester I wasn't a big fan of writing. **All throughout my high school career I always had to write argumentative essays and analysis essays. It was a very formulaic way of writing, and it omitted the part of writing I think makes writing so important: using writing as a form of expression. Being able to have complete creative control over a piece is what makes writing interesting and fun. The ability to tell a story in any form that you desire is truly a beautiful thing. This semester I was reminded why I used to enjoyed writing.**

> Comment E (First-year composition): A piece of writing advice I'd like to offer other students is to actively work on improving your writing abilities. Keep a **growth mindset**

and **be proactive** in seeking out feedback and ways to better your writing. Also, accept that your essay isn't going to be perfect the first time around. Just get everything onto paper, and then you can revise, revise, revise! As long as you honestly try your best at writing essays and giving feedback, participate in class and seek out feedback, your writing will improve.

Comments from the Introduction to MATLAB course highlight the theme of commenting about course and schedule flexibility, for better or for worse. Some students loved the ability to work on their own time and those who wished for more structure had to develop the skill of time management and prioritizing the course even when something wasn't immediately due:

Comment F (introduction to MATLAB): "It would be great if it was more structured. Coding is interesting in the fact that a lot of it is self-taught exploration of different functions. I was very frustrated sometimes when some of the required projects needed different code or things we were explicitly shown."

Comment G (introduction to MATLAB): It really helped having the class online. It gave us more time to do the work, and we could do it from basically anywhere we wanted. Also, it was nice moving at our own pace. We could work ahead and it was relatively easy to get caught up if you fell behind.

Comment H (introduction to MATLAB): I really like how we could see our progression over this course because it seemed like most of the concepts built on one another. I also really appreciate that I know more about coding after having taken this class.

Building a Foundation for Lifelong Learning
While difficult to measure directly, we strive as faculty to prepare our students with the desire and ability to engage in life-long learning (Stefanou et al, 2012). Students need to understand not only the importance of self-directed learning but also possess the skills to acquire new knowledge without explicit instruction. While we do not expect this skill to be fully developed in our freshmen students, we did hope to lay the foundation for students to be able to independently pursue the information that they need to complete a task or solve a problem. Comments from the Introduction to MATLAB course suggested that this skill was beginning to emerge in some students. Below are some representative statements that capture the theme of life-long learning from student written evaluations:

Comment I (introduction to MATLAB): This course was very good at teaching me the basics of MATLAB and just the basics of programming. This course also gave me the skills to look up helpful resources when I am stuck, so I am less reliant on Dr. Dosmar.

Comment J (introduction to MATLAB): ...The course helped me become a better independent learner…

Discussion:

As a result of our interviews described above, we engaged students in frank and candid conversations about course expectations, student perceptions of performance, and goals for the rest of the term. In some cases, the interview process provided an opportunity for a grade calibration. For example, at the midterms, Dr. X's (Introduction to MATLAB) student who has failed several assignments, suggested that they deserved an "A" while Dr. X saw their performance closer to a "C." The discrepancy allowed them to discuss what performance improvements would be needed during the remainder of the term to raise them up to the "A" they wished to receive. Similarly, Dr. Y (First-year composition) saw students who rated themselves at an A and who had completed A work; however, they were significantly behind on course progress. This allowed for a conversation about the many factors that contribute to a grade and ultimately, an agreement about when certain milestones should be met. By finals, there was a 31% increase in the percentage of students whose own grade estimation matched that of the Instructors for the MATLAB class and a 45% increase for the composition class. This increase suggested that students had an improved sense of course expectations and an ability to self-assess. Overall, we view this process as an opportunity for improving students' metacognition and their ability to self-assess accurately, rather than relying on the professor's assessment and authority.

In addition to the numerical changes following the midterm and final grade conferences, both instructors observed common themes from the students' written reflections at the end of the course. Students self-identified improved confidence, developed agency, and appeared to show potential for life-long learning and engagement following the two courses. In terms of confidence, while from the instructor perspective, none of the students achieved a terminal mastery of the material from these introductory courses, it was promising to see how much student confidence had grown throughout the term. As these students move on into the remainder of their freshman year and progress in their curriculum, a perceived sense of self-reliance is critical to their success. Similarly, the agency that the students expressed is also key to their future successes. While some student comments reflected a negative tone regarding how much they had to self-regulate to get through the course, the instructors view this as a sign that they were developing this skill, even if they do not enjoy it. We believe that preparing students for a professional environment includes preparing them to juggle multiple projects and create their own deadlines; thus, agency is a necessary skill.

While meaningful feedback and dialogue can and does occur in a traditional, graded classroom, the ungraded version of our courses yielded comments that focused on the students' own involvement in their progress to learning. Students in the MATLAB course frequently made references to pursuing knowledge beyond what was taught in the lectures and about feeling empowered to teach themselves new concepts. Students in the writing course emphasized the importance of revisions and responding to feedback. These comments differed from previous years where most comments focused on the professor, the quality of instruction, and on the material covered.

Developing students into life-long learners is not only something the instructors value from a purely academic perspective but is also a necessary skill to propel these students into successful careers. We believe that laying the foundational framework for life-long learning includes an ability to identify information needed and to seek that information without the instructor's help. Several students in the MATLAB course identified a new ability to work independently and rely less on the instructor by the end of the course. Some students mentioned the need to "teach themselves" material and troubleshoot their code which was also a deliberate feature of the course. Overall, we believe that the students show emerging signs of becoming life-long learners that will hopefully develop further over the next four years.

Overall, both instructors viewed the ungrading process as a way to engage students in metacognitive exercises and to refocus them on learning and skill development rather than on earning points and receiving a certain grade. By relaxing deadlines and prioritizing feedback and revisions, we emphasized that as long as the learning objectives were eventually met, the timeline was of low importance. Of course, there were some associated challenges with this approach, mainly surrounding students who viewed the relaxed nature of our courses as an opportunity to skip assignments and focus on other classes. Such students did, in most cases, find themselves so far behind that they either dropped or failed one or both of the courses. We both observed an atypical number of drops and F grades than in previous years, and it was difficult to discern if this was due to ungrading or the result of the COVID-19 pandemic high schooling experience from which these students had just graduated. We plan to continue teaching using ungrading strategies and researching how these practices impact students in key meta-cognitive areas.

Conclusion

Ungrading remains a developing field with a lack of consistency and rigor when it comes to implementation and assessment of the pedagogical techniques. Instructors interested in ungrading may choose the degree to which they relinquish control of their classrooms and grading systems. In the case of these two classes, our emphasis on feedback and revision allowed students to focus on the learning process and on demonstrating improvement, rather than focusing on the final grade. As instructors, we found that by employing ungrading, our students demonstrated an improved sense of agency and independence as compared to students in previous versions of our respective courses. By conducting midterm and final grade conferences, our students gained the opportunity to calibrate course expectations and discuss strategies for demonstrating improvement. These conferences yielded grades that were in line with student expectations without compromising the instructors' standards. Overall, ungrading offers an opportunity to engage students in the learning and assessment process while instilling accountability and agency.

References:

Blum, S. D. 2020. Ungrading: Why Rating Students Undermines Learning (and What to Do Instead). Teaching and Learning in Higher Education. 1st Edition.

Butler, R. Enhancing and undermining intrinsic motivation: The effects of task-involving and ego-involving evaluation on interest and performance. British Journal of Educational Psychology 58(1):1 – 14. May 2011.

Dosmar, E. A Case Against Grades. The Teaching Professor. June 14, 2021. https://www.teachingprofessor.com/tag/ungrading/

Dosmar, E. & Williams, J.M.. Decentering Authority to Communicate Learning. Teachers Going Gradeless Blog (October 16, 2021). https://www.teachersgoinggradeless.com/blog/decentering-to-communicate

Dosmar, E. & Williams, J.M.. Assessment Practices in the Ungraded Classroom. National Teaching and Learning Forum. Forthcoming 2022.

Kohn, A. 2021. The case against grades. https://www.alfiekohn.org/article/case-grades/

Hutchison, M. A., Follman, D. K., Sumpter, M., & Bodner, G. M. (2006). Factors influencing the self-efficacy beliefs of first-year engineering students. *Journal of Engineering Education*, *95*(1), 39-47.

Loo, C. W., & Choy, J. L. F. (2013). Sources of self-efficacy influencing academic performance of engineering students. *American Journal of Educational Research*, *1*(3), 86-92.

Marra, R. M., Rodgers, K. A., Shen, D., & Bogue, B. (2009). Women engineering students and self-efficacy: A multi-year, multi-institution study of women engineering student self-efficacy. *Journal of engineering education*, *98*(1), 27-38.

Mamaril, N. A., Usher, E. L., Li, C. R., Economy, D. R., & Kennedy, M. S. (2016). Measuring undergraduate students' engineering self-efficacy: A validation study. *Journal of Engineering Education*, *105*(2), 366-395.

McCord, Rachel E., Patrick J. Cunningham, Holly M. Matusovich, and Cheryl A. Carrico. "Creating a Metacognition Community of Practice: Transforming the Engineering Learning Community." In 2018 IEEE Frontiers in Education Conference (FIE), pp. 1-5. IEEE, 2018.

Pitterson, N., Case, J., Agrawai, A. & Hasbun, I. "Investigating the ways in which Student Agency develops through Engagement with Knowledge," *2018 IEEE Frontiers in Education Conference (FIE)*, 2018, pp. 1-5, doi: 10.1109/FIE.2018.8658556.

Stefanou, C., Lord, S. M., Prince, M. J., & Stolk, J. (2012). The effect of different active learning environments on student outcomes related to lifelong learning. *International Journal of Engineering Education*, *28*(3), 606-620.

Vieira, C., Magana, A.J., Roy, A. *et al.* Providing students with agency to self-scaffold in a computational science and engineering course. *J Comput High Educ* 33, 328–366 (2021). https://doi.org/10.1007/s12528-020-09267-7