

Relaxed Deadlines: Do They Provide an Unfair Advantage?

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Educators seeking academic rigor have historically included strict deadlines for student work as part of preparing students for the reality of life after college. However, during the pandemic, there were calls to relax deadlines to alleviate stress on students' mental health. Flexible deadlines can also benefit neurodiverse students and non-traditional or marginalized students. One argument against relaxed deadlines is the risk of students who turn assignments in late having an unfair advantage due to having more time to work or having access to solutions or classmates' assignments. Accordingly, homework grades were examined for the past three terms of a course at Northeastern University with liberal late policies. The goal was to determine if there were any statistical differences between grades for students who turned homework in on time versus those whose work was turned in late. Additionally, the data was examined for correlations between late homework and the grades on related lab experiments. For every homework examined in four terms, the average homework score for the on-time homework was higher than the late homework score. This was true even if grades of zero were excluded from the sample. For nine assignments, the difference between on-time and late grades was statistically significant, further underlining that extra time did not provide any advantage, either in terms of cheating off other students or spending additional time on the problems. Grades on the more difficult lab experiments were positively correlated with grades on certain homework assignments, but these benefits diminished the later the homework was turned in. Results indicate that while relaxed deadlines may provide mental health benefits for the students, the learning value of the homework assignments decreases the later they are turned in. Based on this data, a combination of liberal deadlines and directly reaching out to students whose work is more than three days late may maintain the mental health benefits while preserving the learning benefits.

Introduction

For many engineering professors, their undergraduate experiences were marked by chalk-andtalk lectures and rigid deadlines, designed to prepare students for the 'real world'. Grades were curved such that if some students did better, others' grades would decrease. It was expected that not everyone would pass every class and a professor who gave all A's would be accused of grade inflation or some other dereliction of duty. Given this background, it is not surprising that many faculty members run their courses similarly. Evidence-based teaching has changed some of these views, but strict deadlines are still seen as necessary for rigor in many cases. However, there is increasing evidence in the literature that these two concepts – strict deadlines and rigor – are not strongly linked and that these deadlines may disadvantage certain groups of students.

Deadlines and rigor

Academic rigor was defined by the 1947 Truman Commission as promoting critical thinking, having high expectations, and providing scaffolding to allow all students to achieve high levels [1]. Professors seeking rigorous policies may equate high expectations with detailed, almost legalistic course policies. Course policies arise to prevent cheating [2], teach students to manage their time and meet deadlines [3], and in many cases control the flow of work needing to be

graded [4]. Cheating and plagiarism have been correlated with each other and with making fraudulent excuses [2]. Roig & Caso found that 38% of the students in their study had no professors who required proof for excuses and described this as "alarming" [2, p. 487]. They recommended strict policies requiring proof to validate student excuses. Syllabi typically have a strong tone telling students what they must and must not do with often draconian penalties for being even minutes late or slightly off in formatting [3]. Academic rigor became equated with controlling the students first, then critical thinking, with scaffolding becoming equated with 'spoon-feeding'.

In the last two decades, an increasing number of authors have begun questioning rigid deadlines. An article in 2005 discussed how FERPA regulations and policies designed to protect universities from litigation had led professors to treat syllabi like legal documents which had to spell out everything that was and was not allowed [3]. This might prevent litigation, but also fosters an atmosphere of distrust, which leads to less student learning. Other authors challenged the argument that rigid deadlines prepare students for future employment and the supposed rigor of the 'real world' [4,7]. One professor realized that not only were the deadlines in the real world much more flexible than their artificial course deadlines, but by holding these rigid deadlines they were preventing students from learning to manage their time and projects [4]. Another author realized that being compassionate about deadlines builds community with the students and that some of the best work was turned in after the deadline [7]. Fairness was a concern, as students who turned in things late had more time to work on them and consider the problem. However, they conceded that few if any students complained about flexible deadlines being unfair.

Deadlines and Diversity

In a 2016 article, Boucher framed rigid deadlines as contributing to student stress and imposing unfair consequences on the most vulnerable students [8]. For example, students who may be working multiple jobs or who are first-generation college students may not know how to ask for help or extensions. These students fall behind and "disappear" from classes or increasingly slip into depression or other mental health issues. Boucher stated, "The problem with a rigid policy on lateness is that it compounds students' stress at a time when they are already overwhelmed." [8, p.3]. This can lead to cheating, flimsy excuses, poor work, attendance problems, and students dropping out of university. Another author discussed the annoyance she felt when one student walked out of class during a group activity, and another was always wearing earbuds [9]. However, when she spent time talking with the students, she found that the first student had had a panic attack, and the second student needed the background noise from the headphones to help him focus. This and other interactions led her to a greater awareness of how policies in her classroom might put undue pressure on students who are working, struggling with mental health issues, or coping with disabilities. The article ended with a call for instructors to familiarize themselves with the mental health resources on their campuses.

Many existing course policies are based on the idea of a traditional student with no disabilities, no work or family commitments, and all the resources they need [9,10]. This standard student has no problem with firm deadlines, has no executive functioning problems, and already knows how higher education works. Students with ADHD, autism spectrum disorders, learning disabilities, and dyslexia have been increasing in number over the last ten years [11]. These

students do not fit the standard student mold and are more likely to fail courses and drop out of higher education. Students with these disabilities are most likely to encounter problems with classic course teaching and evaluation methods. Although accommodations are often available through a campus disability center, it may be difficult to get these accommodations. It can be expensive and time-consuming to get formally diagnosed. Moreover, the stigma attached to neurodiversity and mental health disorders prevents many students from identifying themselves.

Higher education institutions have seen a large increase in student stress and mental health issues in the last decade, particularly during and after the global pandemic [12,13]. Depression and anxiety have become increasingly prevalent and severe in college students and rates of suicide and suicidal thoughts have increased as well [12]. As with learning disabilities, many students do not seek help due to the stigma surrounding mental health issues. Depression and anxiety are often comorbid disorders with ADHD and autism [11,13]. Accommodations for mental health disorders are often needed acutely and may need to be applied retroactively. If a student's stress levels boil over into anxiety that was not previously diagnosed, they may not have the opportunity to request accommodations before seeking help [13]. Given these trends, it seems morally questionable to add additional stress that doesn't promote learning.

Previous work with flexible deadlines

Some initial attempts at deadline flexibility were found in computer programming courses, particularly for first- and second-year students [5,6]. Instructors realized that students required feedback to improve their programs. Some instructors provided incentives to revise homework during a short time window to allow them to fix bugs but without allowing students to get too far behind [5]. Additional student benefits came from allowing a certain number of late days that the students could use when needed. A different approach either removed deadlines or allowed for minimal late penalties, which was credited with increasing the work of grading [6]. Students reacted positively to these policies, but improvement in student learning was difficult to demonstrate due to low numbers of participants.

In another example, a CAD course was delivered in a flipped format with rigid deadlines and no late work was accepted [14]. Some students were noted to fall behind on the lecture materials and assignments, so a self-paced format was tried. The authors determined that rigid deadlines were preferable as the self-paced, flexible deadline group left things until right before the exam and then 'crammed' to finish. However, another set of authors found that rigid deadlines didn't prevent cramming [15]. They determined that students with lower levels of ability and accomplishment required support to learn effective strategies for learning and organizing their studying to succeed, rather than hard deadlines. Another group found that rigid deadlines prevented students from fully participating in online adaptive learning assignments [16]. Rigid deadlines with no late assignments accepted meant that students who knew they would not be able to finish by the deadline just didn't do the assignments at all, spending the time on other work. This decreased their performance on other measures in the class.

Mastery grading or mastery learning is another approach to student assessment that was originally introduced in the 1960s [17]. Mastery grading requires students to master each assignment by retaking it until they achieve a perfect score. A recent review [18] found many benefits of this approach. Students must learn to check their work for errors and understand the

process involved in producing high-level work. Professors reported that the effort raises standards, saves time on grading, produces data that is useful for accreditation, and allows students to learn at their own pace. This approach does not allow for partial credit, as that could lead to students passing the class by partially understanding many concepts. However, students can take advantage of this by intentionally doing poorly on the first submission and using the instructor's feedback to achieve apparent mastery sooner. Students are often resistant to this method as it can be more time-consuming than traditional courses and there is no alternative but to keep resubmitting an assignment until it is correct. This approach is also time-consuming for the instructor and can be difficult to implement. This paper intends to examine flexible deadlines in the context of a lab class without mastery grading.

In summary, although rigid deadlines have been part of an educational package designed to promote responsibility and academic rigor, their use in course policies is not necessarily justified. Although the policies are meant to make students ready for the 'real world' and prevent cheating, the 'real world' is very often flexible with deadlines. More information is needed to explore the positive and negative effects of different approaches to deadlines. The work presented below seeks to answer these questions: 1) Are students who turn in assignments late getting an unfair advantage? 2) Are there any correlations between late assignments and performance on other coursework? and 3) Were there any discernible trends over time as flexible deadline policies were clarified?

Course Background

The course in question is ME4505, Measurements and Analysis with Thermal Science Application. This is a required 4 credit lecture course with a 1 credit lab course students must coregister for. The course teaches design of experiments, sensor use and selection, statistical data analysis, and uncertainty analysis with a focus on thermofluids topics. Students attend three lectures and one lab session per week. This course has been taught solely by the author for the past 13 years and has been revised several times to update and improve the experiments and course materials.

The course is designed using the principles of universal design for learning and follows a set pattern for presenting the material. Each week, new material is presented in an active lecture format with frequent in-class activities. These might include small experiments, calculations worked in groups, and open-ended discussion questions. A homework assignment is due by midnight on Friday and includes calculations, writing experimental procedures and data tables, and questions requiring outside research. This assignment is graded by the instructor over the weekend and returned on Monday. The lab experiment related to the material and homework starts on the Monday following the due date and continues through that week. All lecture notes, homework, projects, and labs are posted prior to the start of class in multiple formats. The textbook is presented online in the TopHat engagement tool and includes videos, sample problems, and example data to provide multiple routes to learning the material. This course does not have exams as the grades are determined by the homework, in-class work, lab reports, and a term project done with their lab group.

In Fall 2020, in response to the pandemic, the course was taught in a hybrid mode which continued through Spring 2021. During that time the university launched a campaign to raise

awareness about student mental health and stress levels. The course had always had a somewhat liberal late policy. Although the deadlines for homework and lab reports were presented as fixed, students who requested a short extension ahead of the deadline with a reasonable excuse were usually granted an extra day or two to finish the work. Homework that was handed in after solutions were posted was given half credit. Lab reports had 5 points deducted per week late.

In Fall 2021, the course returned to fully on-campus, although all lectures were hosted on Zoom and recorded. Students who were sick were encouraged to tune into the course on Zoom and answer the participation questions on TopHat. Additionally, the TopHat in-class questions were set to 'homework' mode after the last lecture of the day. This allowed students to connect to the material asynchronously if needed and to review lectures to assist with comprehension. During Fall 2021 the 'somewhat liberal' policy with the deductions listed above was continued.

During Spring 2022, the deadlines were still presented as fixed, but the deduction for late work was quietly dropped for students who communicated their need for an extension prior to the deadline. Students who turned things in without communicating before the deadline had the usual deductions. The need to communicate with the instructor prior to the deadline was emphasized at several points during the term. In addition, a personal email was sent to each individual student midway through the term. If the student was doing well, the email encouraged them to keep up the good work. If the student was missing work, the email let them know that the late work would still be accepted, albeit with deductions. Many students expressed gratitude for the reminder and submitted late work within a week of the email. Others did not respond to the email, but some did submit work at the end of the term. Work was accepted up until the last day of class.

In subsequent terms, the instructor was more intentional about the due date policy. Students were told that extensions would be given if requested. It was made clear that no doctors' notes were required for illness. The mid-term emails were repeated as before. Additionally, lectures were revised to include examples of diverse and lesser-known scientists as part of an effort to improve the representation of women and BIPOC scientists in engineering courses. The syllabus was also revised to include extended information on expectations of civility, the importance of self-care, and the willingness of the instructor to provide accommodations for students, whether or not they were officially registered with the Disability Resource Center. No deductions were taken for lateness, regardless of the number of days late. This has remained the policy to date.

The college administration had encouraged all faculty to record their lectures and allow students to join remotely if they were ill or had been exposed to COVID. Also, students could request a certain number of Wellness Days where they could be absent from class. Students taking a Wellness Day could make up work from that day with no penalties. During an end-of-the-year department retreat in Spring 2023, concern was expressed by other faculty that students would use the extra time provided by relaxed homework deadlines and Wellness Days to copy from the solutions or other students. There was also concern that recorded lectures would lead to low attendance. These concerns prompted the present work.

Research Questions and Methods

This study sought to answer the following questions:

- 1. Was there a measurable difference in grades between work turned in on time and work turned in late?
- 2. If so, did the difference indicate an advantage for the students who turned in work late?
- 3. Did the number of students turning in late work increase as the deadlines became more intentionally relaxed?
- 4. Did the average number of days late increase after the deadlines were relaxed?

Four terms of ME4505 were examined between Fall 2021 and Spring 2023. A total of 442 students were represented in total (N=442). The homework, in-class, and lab report grades were examined. There were 8 homework assignments during the term. The in-class grades were determined based on the percentage earned of all in-class points throughout the term. The lab reports included two reports written individually and four group lab reports. Pearson's Product-Moment correlation analysis was used to determine any relationships between homework and lab scores. A decision was made to focus more heavily on the homework grades, as the group reports may confound the results. The number of days late for each homework assignment was determined based on the time stamp from the course management system. The homework grades were further divided into on-time and late assignments. Assignments that were not turned in were assigned a grade of zero. No assignments turned in on time or late earned a grade of zero. One-way ANOVA and two-tailed t-tests were also used to determine the statistical significance of any differences.

Results

The results are summarized in Table 1 below. For each term studied, the average scores for each homework assignment are separated based on whether they were on time or late. The P-value is the probability resulting from a two-tailed t-test comparing the on-time and late scores for each homework assignment. The percentage of students who turned in assignments late is also presented, as well as the number of students who did not submit the assignment. In all cases, the average score of homework submitted on time was greater than that of the late work. Before determining the average for the late work, any deductions for lateness were added back in. Shaded cells in the table indicate statistically significant differences ($\alpha = 0.05$).

Fall 2021 (N=99)	On-Time Avg	Late Avg	P-Value	Late %	# Unsubmitted
HW1	17.81	13.50	0.17	6.06	1
HW2	18.39	13.38	0.35	13.88	1
HW3	18.21	15.67	0.17	6.12	1
HW4	18.18	15.94	0.02	55.56	6
HW5	16.20	13.35	0.12	13.40	2
HW6	18.78	13.31	0.02	18.18	5
HW7	14.87	6.36	< 0.001	16.16	4
HW8	16.16	14.90	0.09	64.65	6
Spring 2022 (N=123)	On-Time Avg	Late Avg	P-Value	Late %	# Unsubmitted
HW1	18.81	17.88	0.20	9.76	0
HW2	18.15	17.33	0.19	2.44	0
HW3	16.09	14.95	0.21	8.13	0
HW4	18.33	16.99	0.023	65.85	5
HW5	15.40	13.97	0.19	14.63	1
HW6	17.53	12.26	< 0.001	18.70	5
HW7	16.85	14.17	0.011	30.89	5
HW8	16.19	13.93	0.003	56.10	7
	10.17	15.75	0.005	30.10	,
Fall 2022 (N=86)	On-Time Avg	Late Avg	P-Value	Late %	<i>#</i> Unsubmitted
Fall 2022 (N=86)	On-Time Avg	Late Avg	P-Value	Late %	# Unsubmitted
Fall 2022 (N=86) HW1	On-Time Avg 19.05	Late Avg 17.00	P-Value 0.23	Late % 13.95	# Unsubmitted
Fall 2022 (N=86) HW1 HW2	On-Time Avg 19.05 18.33	Late Avg 17.00 14.50	P-Value 0.23 0.35	Late % 13.95 5.81	# Unsubmitted 1 1 1
Fall 2022 (N=86) HW1 HW2 HW3	On-Time Avg 19.05 18.33 18.44	Late Avg 17.00 14.50 13.79	P-Value 0.23 0.35 0.12	Late % 13.95 5.81 8.14	# Unsubmitted 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Fall 2022 (N=86) HW1 HW2 HW3 HW4	On-Time Avg 19.05 18.33 18.44 18.56	Late Avg 17.00 14.50 13.79 17.70	P-Value 0.23 0.35 0.12 0.11	Late % 13.95 5.81 8.14 29.07	# Unsubmitted 1 1 1 0 2 2 2
Fall 2022 (N=86) HW1 HW2 HW3 HW4 HW5	On-Time Avg 19.05 18.33 18.44 18.56 17.08	Late Avg 17.00 14.50 13.79 17.70 16.62	P-Value 0.23 0.35 0.12 0.11 0.29	Late % 13.95 5.81 8.14 29.07 9.30	# Unsubmitted 1 1 1 0 2 2 2 3
Fall 2022 (N=86) HW1 HW2 HW3 HW4 HW5 HW6	On-Time Avg 19.05 18.33 18.44 18.56 17.08 18.09	Late Avg 17.00 14.50 13.79 17.70 16.62 12.93	P-Value 0.23 0.35 0.12 0.11 0.29 0.18	Late % 13.95 5.81 8.14 29.07 9.30 8.14	# Unsubmitted 1 1 1 0 2 2 2
Fall 2022 (N=86) HW1 HW2 HW3 HW4 HW5 HW6 HW7	On-Time Avg 19.05 18.33 18.44 18.56 17.08 18.09 18.31	Late Avg 17.00 14.50 13.79 17.70 16.62 12.93 14.09	P-Value 0.23 0.35 0.12 0.11 0.29 0.18 <0.001	Late % 13.95 5.81 8.14 29.07 9.30 8.14 18.60	# Unsubmitted 1 1 1 0 2 2 2 3
Fall 2022 (N=86) HW1 HW2 HW3 HW4 HW5 HW6 HW7 HW8	On-Time Avg 19.05 18.33 18.44 18.56 17.08 18.09 18.31 17.31	Late Avg 17.00 14.50 13.79 17.70 16.62 12.93 14.09 16.11	P-Value 0.23 0.35 0.12 0.11 0.29 0.18 <0.001 0.24	Late % 13.95 5.81 8.14 29.07 9.30 8.14 18.60 31.40	# Unsubmitted 1 1 1 0 2 2 3 2 3 2
Fall 2022 (N=86) HW1 HW2 HW3 HW4 HW5 HW6 HW7 HW8 Spring 2023 (N=134)	On-Time Avg 19.05 18.33 18.44 18.56 17.08 18.09 18.31 17.31 On-Time Avg	Late Avg 17.00 14.50 13.79 17.70 16.62 12.93 14.09 16.11 Late Avg	P-Value 0.23 0.35 0.12 0.11 0.29 0.18 <0.001 0.24 P-Value	Late % 13.95 5.81 8.14 29.07 9.30 8.14 18.60 31.40 Late %	# Unsubmitted 1 1 1 1 0 2 2 2 3 2 # Unsubmitted 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Fall 2022 (N=86) HW1 HW2 HW3 HW4 HW5 HW6 HW7 HW8 Spring 2023 (N=134) HW1	On-Time Avg 19.05 18.33 18.44 18.56 17.08 18.09 18.31 17.31 On-Time Avg 18.69	Late Avg 17.00 14.50 13.79 17.70 16.62 12.93 14.09 16.11 Late Avg 15.11	P-Value 0.23 0.35 0.12 0.11 0.29 0.18 <0.001 0.24 P-Value 0.11	Late % 13.95 5.81 8.14 29.07 9.30 8.14 18.60 31.40 Late % 6.72	# Unsubmitted 1 1 1 1 0 2 2 3 2 # Unsubmitted 1
Fall 2022 (N=86) HW1 HW2 HW3 HW4 HW5 HW6 HW7 HW8 Spring 2023 (N=134) HW1 HW2	On-Time Avg 19.05 18.33 18.44 18.56 17.08 18.09 18.31 17.31 On-Time Avg 18.69 18.26	Late Avg 17.00 14.50 13.79 17.70 16.62 12.93 14.09 16.11 Late Avg 15.11 17.69	P-Value 0.23 0.35 0.12 0.11 0.29 0.18 <0.001 0.24 P-Value 0.11 0.12	Late % 13.95 5.81 8.14 29.07 9.30 8.14 18.60 31.40 Late % 6.72 11.94	# Unsubmitted 1 1 1 1 0 2 2 2 3 2 # Unsubmitted 1 0 0
Fall 2022 (N=86) HW1 HW2 HW3 HW4 HW5 HW6 HW7 HW8 Spring 2023 (N=134) HW1 HW2 HW3	On-Time Avg 19.05 18.33 18.44 18.56 17.08 18.09 18.31 17.31 On-Time Avg 18.69 18.26 17.01	Late Avg 17.00 14.50 13.79 17.70 16.62 12.93 14.09 16.11 Late Avg 15.11 17.69 13.88	P-Value 0.23 0.35 0.12 0.11 0.29 0.18 <0.001 0.24 P-Value 0.11 0.35	Late % 13.95 5.81 8.14 29.07 9.30 8.14 18.60 31.40 Late % 6.72 11.94 15.67	# Unsubmitted 1 1 1 1 0 2 2 2 3 2 # Unsubmitted 1 0 3
Fall 2022 (N=86) HW1 HW2 HW3 HW4 HW5 HW6 HW7 HW8 Spring 2023 (N=134) HW1 HW2 HW3 HW4	On-Time Avg 19.05 18.33 18.44 18.56 17.08 18.09 18.31 17.31 On-Time Avg 18.69 18.26 17.01 18.01	Late Avg 17.00 14.50 13.79 17.70 16.62 12.93 14.09 16.11 Late Avg 15.11 17.69 13.88 16.55	P-Value 0.23 0.35 0.12 0.11 0.29 0.18 <0.001 0.24 P-Value 0.11 0.35	Late % 13.95 5.81 8.14 29.07 9.30 8.14 18.60 31.40 Late % 6.72 11.94 15.67 14.18	# Unsubmitted 1 1 1 1 0 2 2 2 3 2 # Unsubmitted 1 0 3 2
Fall 2022 (N=86) HW1 HW2 HW3 HW4 HW5 HW6 HW7 HW8 Spring 2023 (N=134) HW1 HW2 HW3 HW4 HW5	On-Time Avg 19.05 18.33 18.44 18.56 17.08 18.09 18.31 17.31 On-Time Avg 18.69 18.26 17.01 18.01 16.20	Late Avg 17.00 14.50 13.79 17.70 16.62 12.93 14.09 16.11 Late Avg 15.11 17.69 13.88 16.55 13.95	P-Value 0.23 0.35 0.12 0.11 0.29 0.18 <0.001 0.24 P-Value 0.11 0.32 0.09	Late % 13.95 5.81 8.14 29.07 9.30 8.14 18.60 31.40 Late % 6.72 11.94 15.67 14.18 14.93	# Unsubmitted 1 1 1 1 0 2 2 2 3 2 # Unsubmitted 1 0 3 2 4 1 0 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2

 Table 1: Summary data from four terms of ME4505 Shaded cells represent a statistically significant difference between the average of the on-time and late work.

Figure 1 plots the on-time homework averages for all the homework assignments over time. Although the averages vary randomly across the terms the average grade never goes below 75%. This course is ostensibly meant for junior-level students, but in practice some students are seniors, and some are sophomores who came in with many AP credits. Spring terms contain a higher percentage of seniors who may or may not be in Capstone design and sophomores. Because of this, the spring term grades tend to be slightly lower. Despite these factors, the ontime grades still show a reasonable mastery of the material.

Figure 2 shows the averages for homework assignments that were turned in after the deadline. The lowest average was 31% for homework 7 in Fall 2021. In subsequent terms, the average scores were at or above 61%. The lowest scores, except for Fall 2021, are on homework assignments 5 and 6. These two homework assignments cover instrument uncertainty, which is often a difficult concept for students to grasp, and thermodynamic concepts for Lab 5. Lab 5 deals with measuring open and closed thermodynamic systems and is historically the most difficult experiment. Additionally, these two homework assignments usually coincide with the midterm exams in the required course in heat transfer, which many students are taking at the same time as ME4505. Struggling students tend to choose the heat transfer course to focus on as it is considered more difficult. The data also shows a general improvement in the scores on the first four homework assignments. Although error bars were not shown on the plots for clarity, the standard deviations for the on-time assignments, with one exception during Fall 2021, were lower than those for the late assignments.

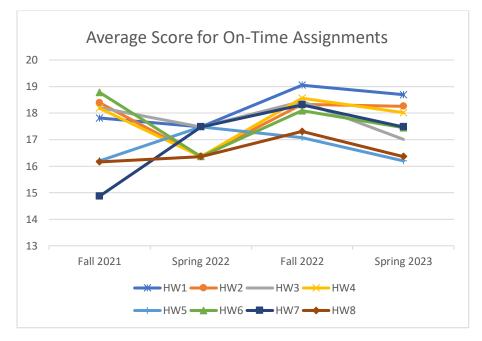


Figure 1: Average score for on-time homework assignments over time. For all homework assignments, the maximum score was 20 points.

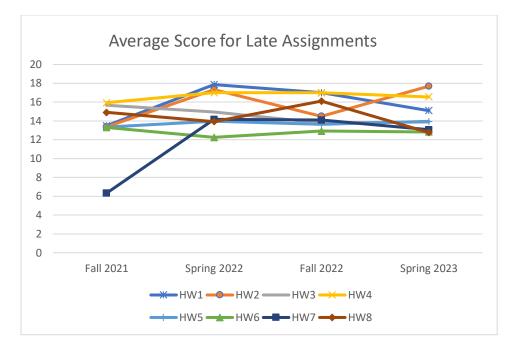


Figure 2: Average score for late homework assignments over time. The maximum score was 20 points.

Figure 3 shows the average number of days late for each term. Fall 2021 had the lowest number of days late, which might indicate the effectiveness of a strict due date in terms of getting students to turn things in by the deadline. However, Fall 2021 had some of the lowest averages, which may mean that students turned in incomplete or poorly done work. The number of days late grew as the deadlines became more relaxed, and homework assignments 5 and 6 had the highest average days late. This may indicate that students took advantage of the ability to turn in work late as a way to manage the work and stress surrounding midterms in other classes.

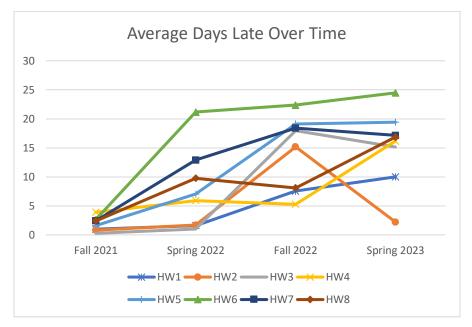


Figure 3: Average number of days late over time.

Pearson's Product-Moment correlation coefficients were calculated between the homework assignments, the lab reports, and the number of days late for each homework assignment. R coefficients greater than or equal to ± 0.70 are considered strong correlations. Strong positive correlations are presented in Table 2. Fall 2022 and Fall 2021 showed perfect positive correlations between the number of days late for homework 1 and homework 2. Another way of interpreting this is that students who turn in homework 1 late tend to also turn in homework 2 late. This pattern is seen several times during the terms studied – once students start turning in homework assignments late, they tend to continue to hand in homework late, and this tendency was more pronounced in Spring 2023. In contrast, there seem to be positive correlations between the grade on homework 5, which focuses on uncertainty, and Lab 4, which focuses on data analysis and uncertainty. Scores for Lab 2 and Lab 6 are also positively linked. Lab 2 walks students through designing an experiment, a skill that was required for Lab 6.

Term	Factor 1	Factor 2	R
Fall 2022	Days Late HW1	Days Late HW2	1.00
Fall 2021	Days Late HW1	Days Late HW2	0.99
Fall 2022	HW2	Lab 1	0.90
Fall 2022	HW1	HW2	0.89
Fall 2022	HW1	Lab 1	0.85
Sp 2023	Days Late HW4	Days Late HW5	0.83
Fall 2021	HW3	Lab 1	0.76
Sp 2023	Days Late HW4	Days Late HW8	0.74
Sp 2023	Days Late HW2	Days Late HW4	0.72
Sp 2023	Days Late HW3	Days Late HW4	0.72
Fall 2021	HW1	HW2	0.72
Fall 2022	HW5	Lab 4	0.71
Sp 2022	Lab 2	Lab 6	0.70
Fall 2021	HW5	HW6	0.70

Table 2: Strong positive correlations found in data.

Table 3 shows strong negative correlations between various factors. As expected, higher grades on homework assignments tended to correlate with fewer days late for nearly every homework assignment. This supports other observations that students tend to do better on homework that is turned in nearer to the due date. Two terms indicated negative correlations between turning homework 1 in on time (a low number of days late) with high scores on homework 2.

Term	Factor 1	Factor 2	R
Fall 2022	HW2	Days Late HW2	-0.91
Fall 2022	Days Late HW1	HW2	-0.90
Sp 2022	HW4	Days Late HW4	-0.90
Fall 2021	Days Late HW1	HW2	-0.89
Fall 2021	HW2	Days Late HW2	-0.89
Fall 2021	HW4	Days Late HW4	-0.87
Sp 2022	HW6	Days Late HW6	-0.85
Fall 2022	HW1	Days Late HW1	-0.84
Fall 2022	HW1	Days Late HW2	-0.84
Fall 2021	HW6	Days Late HW6	-0.83
Fall 2022	HW5	Days Late HW5	-0.76
Fall 2022	HW3	Days Late HW3	-0.75
Sp 2023	Days Late HW1	HW1	-0.74
Fall 2021	HW1	Days Late HW1	-0.74
Fall 2022	HW6	Days Late HW6	-0.73
Sp 2022	HW7	Days Late HW7	-0.73
Fall 2021	HW1	Days Late HW2	-0.73
Fall 2022	HW7	Days Late HW7	-0.72

Table 3: Strong negative correlations between data items.

Discussion and Recommendations

The data clearly shows that students have higher grades, often statistically significantly higher grades, when they turn assignments in by the original deadline. There is no evidence that students gain an advantage by turning in homework very late. In most cases, the later the homework is turned in, the lower the score. This makes sense for several reasons. Students who turned homework in weeks after the deadline did not practice the relevant skills at the time they learned them. Anecdotally, many of those students were absent more often or attended class remotely rather than in person. At the end of the term many students who have been disengaged from the course suddenly realize that their grades are going to be much lower than they would like them to be. This causes a flurry of late homework and lab reports on the last day of class. Only two lab reports are done by students as individuals – the other four are group assignments. This tends to limit the number of late lab reports, which explains why there are fewer correlations with lab scores.

An argument could be made that the grading scheme just shifts stress from early in the term until later in the term. This is definitely possible. Classes outside of ME4505 are beyond the instructor's control, and observation shows that struggling students tend to let ME4505 slide when there is an exam in Heat Transfer or Signals and Controls. However, these courses have traditional final exams and smaller-scale projects. The last few weeks of ME4505 are kept intentionally with a light load to allow students time to finish their term projects. The number of students turning things in on the last day of class is usually very small, and these students tend to express gratitude for the second chance. Additional data, perhaps from open-ended survey

questions, would be needed to conclusively show that students experience additional stress due to turning in late work.

This class uses many principles of universal design for learning (UDL). UDL principles build accessibility into the course, which is a departure from the usual model of having students request accommodations [19]. As stated earlier, some students may have disabilities, visible or invisible, that they choose not to disclose. Even without disabilities, students have accidents, get sick, or have family difficulties unexpectedly. UDL doesn't specifically recommend relaxed deadlines, but it does recommend building in additional time for exams. Allowing students to request extra time on assignments, without requiring any proof or reason, seems to be an extension of this concept. Students also seem to use extensions to deal with weeks where work in other courses is piled up.

The author believes strongly in learning student names and connecting with students. At the beginning of the term, every effort is made to let the students know that learning is the most important goal, rather than procedural details. When students request extensions at the beginning of the term, they are often hesitant and offer up all manner of excuses and proof of their need. They are often taken aback at the lack of difficulty they encounter, and the word seems to spread. The author is neurodiverse and open about it, which sparks many conversations during office hours. The practice of emailing students mid-term often surprises them – they often have had no experience of a professor reaching out to them directly. During the current term, in response to this study's results, students who fail to submit homework 1 will receive an email inviting them to submit the homework late. Hopefully, this will prompt more students to engage with the early homework assignments and set the stage for further success.

Based on this information the following recommendations are presented:

- Instructors are encouraged to set deadlines to help students pace themselves through the course and to let them know that late assignments may lead to lower grades.
- Deadlines should be extended when students request them. Although proof should not be required, instructors are encouraged to use the request as an opportunity to open a discussion with the student about how the instructor could support their learning.
- Universal design for learning principles are a way to support student learning, provide for maximum accessibility, and support academic rigor by scaffolding new ideas and providing support.
- Instructors are encouraged to reach out to their students as individuals as much as possible. Although this is difficult to do in very large classes, it is not impossible.

Extremely late assignments do not seem to help students to learn the material, but neither does it provide an unfair advantage. Students with extensions of up to a week have grades comparable to on-time work. Student stress can prevent students from learning. Giving students the flexibility and the support to manage their stress smooths the path for students to persist in a class. This is not a case of a class with no deadlines, but rather a case for using deadlines to connect with and serve the students.

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