# Standards-based Grading in Difficult Times:
# Precalculus Student Perceptions During the COVID-19 Pandemic

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Standards-based grading is an alternative grading system that gives students multiple opportunities to demonstrate proficiency in course standards or objectives. It has the potential to provide flexibility and reduce student anxiety, which are particularly important during difficult times such as the COVID-19 pandemic. In this study, students in a Precalculus course using standards-based grading between Spring 2021 and Spring 2022 were surveyed about how the pandemic had affected their learning and the benefits and challenges of standards-based grading. The students who took the course in Spring 2021, whose previous learning was least affected by the pandemic, were most likely to find standards-based grading beneficial. However, in all three semesters, students on average reported that compared with exams in previous math courses, assessments in the standards-based graded course were lower stakes and would better help them understand the material and to know what to study.

The COVID-19 pandemic has had a major impact on education. Many educators looked for ways to modify our teaching to better handle the challenges of the pandemic. Since illness, quarantine, and pandemic-related stressors could cause students to have periods of time where they were not able to put in as much effort, I decided to use standards-based grading to provide some flexibility when it was most needed. In this study, I surveyed 184 of my Precalculus students during the Spring 2021, Fall 2021, and Spring 2022 semesters to determine what they perceived were the challenges of learning during the pandemic and how standards-based grading interacted with those challenges. I found that the students in the Spring 2021 semester had much more favorable opinions of standards-based grading than the students in the Fall 2021 and Spring 2022 semesters. The differences in the semesters could be explained by the later students having had more than a year of their education affected by the pandemic. In this paper, I discuss the impacts of the pandemic, student perceptions of standards-based grading, and how the pandemic has exacerbated the challenges of using standards-based grading.

## RESEARCH QUESTIONS
The goal of this study is to understand undergraduate Precalculus student perceptions of the effect the pandemic had on their learning and the impact of using standards-based grading during the pandemic, including how it affected their anxiety and study habits. The research questions the study attempts to address are:

**Q1: How do students perceive their learning was affected during the pandemic?**

**Q2: How has using standards-based grading during the pandemic impacted the students?**

**Q3: How do students perceive standards-based grading?**

## LITERATURE REVIEW
### Standards-based Grading
There are probably as many variations of standards-based grading (SBG) as there are people who use it. There is also no one standard terminology. It is sometimes used synonymously with mastery grading and sometimes considered to be a specific type of mastery grading. What the variations tend to have in common is that students are given a list of standards or objectives on which they will be assessed and the course grade is primarily determined by how well they have met the standards by the end of the course (Cilli-Turner et al., 2020; Clark, 2021; Collins et al., 2019; Talbert, 2021). Meeting a standard typically requires demonstrating a deep understanding, or mastery, of the topic. This involves multiple opportunities to assess each standard, with feedback given in between each attempt. In their article, "Mastery Grading: Build-A-Syllabus Workshop," Cilli-Turner, *et al*, (2020) give numerous examples of ways to design a course using standards-based grading, including how to choose standards to assess, ways to assess them, and how to determine final course grades. Standards-based grading has been most used and studied in the American K-12 system, but recently its use in higher ed, including mathematics, has grown significantly (Campbell et al., 2020; Cilli-Turner et al., 2020; Dempsey & Huber, 2020; Guskey, 2009; Harsy et al., 2021; Lewis, 2020b; Pollio & Hochbein, 2015; Slavin, 1987). Due to the varying implementations of SBG, any individual study will have limited implications for SBG as a whole, so it is important to look at multiple studies in various contexts.

There are many goals of standards-based grading, including helping students to achieve a deep understanding of the material, reducing anxiety, encouraging a growth mindset, and ensuring the course grade accurately reflects learning (Collins et al., 2019; Knight & Cooper, 2019; Lenarz & Pelatt, 2023; Pollio & Hochbein, 2015). In a traditionally graded course, determining the amount of partial credit to give is subjective and has the potential to lead to inconsistent scores (Elsinger & Lewis, 2020; Nilson & Stanny, 2015). Students often study only enough to earn adequate partial credit without achieving a thorough understanding of the material (Collins et al., 2019; Nilson & Stanny, 2015). Standards-based grading attempts to remedy this by setting high expectations and giving students multiple opportunities to demonstrate their learning. The concept of a growth mindset, developed by psychologist Carol Dweck (2006), is the belief that you can develop your intelligence and abilities through hard work as opposed to the fixed mindset belief that intelligence is a fixed trait. Standards-based grading is designed to help students develop a growth mindset by allowing multiple attempts to demonstrate learning and empha-

sizing the importance of making mistakes and learning from feedback (Collins et al., 2019; Knight & Cooper, 2019). Studies have shown that students report various benefits from SBG, such as reduced test anxiety (Elsinger & Lewis, 2020; Harsy et al., 2021; Harsy & Hoofnagle, 2020), increased confidence (Elsinger & Lewis, 2020), and that exams better reflect what students have learned (Elsinger & Lewis, 2020; Harsy et al., 2021; Harsy & Hoofnagle, 2020). Instructors have observed that SBG gives the opportunity to earn an A to hard-working students who would have likely earned B's or C's in the same course prior to the implementation of SBG (Harsy & Hoofnagle, 2020; Lewis, 2020a). It helps both instructors and students to be aware of which areas in particular students are struggling with (Dempsey & Huber, 2020; Knight & Cooper, 2019). Pollio and Hochbein (2015) found that high school Algebra 2 students using SBG had grades that better correlated with standardized test scores than those that used traditional grading, suggesting that SBG may more accurately measure content mastery.

Of particular concern to educators during the COVID-19 pandemic and otherwise is student anxiety: since living through difficult times increases stress, how can we reduce the anxiety caused by our courses? Studies have shown that higher math and test anxiety are correlated with lower performance on exams (Chin et al., 2017; Chishti & Rana, 2021; Hembree, 1990; von der Embse et al., 2018; Westfall et al., 2021). Students report the highest levels of anxiety during exams (Dempsey & Huber, 2020; Taylor & Fraser, 2013). Standards-based grading reduces the stakes of exams by allowing reassessment opportunities. There is some evidence that lower-stakes exams lead to students reporting reduced anxiety (Dempsey & Huber, 2020; Elsinger & Lewis, 2020; Harsy & Hoofnagle, 2020; Lewis, 2020b; von der Embse et al., 2018). Harsy, Carlson, and Kamerus (2021) found that students in a course using mastery-based testing reported less anxiety before exams at the end of the semester than they did at the start of the semester and less anxiety overall at the end of the semester than their counterparts in a traditionally graded course. Lewis (2022) found that standards-based grading led to lower test anxiety, particularly for women, which significantly reduced the gender differences in test anxiety when compared with a course using traditional grading.

Standards-based grading also comes with its own challenges. It requires significant work on the part of the instructor. For example, in a traditional points-based graded course, the instructor might give 2-3 exams, but in a course using standards-based grading, it is important for students to have an adequate number of opportunities to assess the standards, so the instructor will need to give more assessments or provide time for out-of-class reassessments, both of which involve writing and grading more problems (Cilli-Turner et al., 2020; Collins et al., 2019). While grading tends to be quicker using SBG because the instructor doesn't need to choose a specific number of points to give each response, the amount of grading can be significantly higher (Harsy, 2020). In addition, instructors must help the students to understand how to succeed within the unfamiliar system. Students may have difficulty understanding the new system and what is expected of them, especially since they may be used to earning significant partial credit in their previous courses (Bagley, 2023; Collins et al., 2019; Elsinger & Lewis, 2020; Scarlett, 2018). Instructors have also reported concerns with assessing students primarily on their attainment of the standards when some students are

hard workers, but have difficulty mastering the material (Dempsey & Huber, 2020; Knight & Cooper, 2019; Pollio & Hochbein, 2015). Indeed, SBG may lead to fewer students passing the course even as it typically increases the number of A's (Harsy et al., 2021; Harsy & Hoofnagle, 2020; Lenarz & Pelatt, 2023; Weir, 2020). Students who do not master concepts early may feel overwhelmed by the amount of work needed to catch up (Harsy & Hoofnagle, 2020; Knight & Cooper, 2019). Giving the students the responsibility of acting upon their feedback to improve their learning can be frustrating to students who are not used to taking control of their own learning (Beatty, 2013; Harsy, 2020; Weir, 2020). There are various ways to handle the challenges of using SBG, such as talking to students frequently about how the system works and what their responsibilities are as well as helping them to understand the benefits. In this paper, I look at how both the benefits and challenges of SBG interacted with its use during the COVID-19 pandemic.

## THE COVID-19 PANDEMIC AND LEARNING

The COVID-19 pandemic has had a significant effect on learning, both directly through difficulties with online learning and indirectly through increased stress. Students unable to have their basic physiological and safety needs met will have more difficulty learning (Eyler, 2018). Loneliness such as that caused by isolation during the pandemic can lead to depression and anxiety in adolescents (Loades et al., 2020). Studies have shown that students did report increased anxiety and depression during the pandemic (Davis et al., 2022; Herold & Chen, 2021). Students around the world dealt with changing work responsibilities, financial difficulties, limited access to technology, illness in themselves or loved ones, and overall increased anxiety and less ability to focus on schoolwork (Aguilera-Hermida et al., 2021; Herold & Chen, 2021). Herold and Chen (2021) found that 65% of the undergraduate psychology students surveyed at a large American university reported that their stress levels ``increased a lot'' and 57% reported that their ability to focus "decreased a lot" during the Spring 2020 semester.

In March 2020, schools transitioned to remote learning and many stayed remote or hybrid during the 2020-2021 school year (Darling-Aduana et al., 2022). Moore and Hayes (2021) found that most of the American secondary school students they surveyed were concerned that school closures during COVID-19 would hurt their mathematics preparation for the next year of school and for college. Many students reported loss of motivation, increased distractions, difficulty staying engaged, and difficulty understanding the material while learning from home during the pandemic (Davis et al., 2022; Herold & Chen, 2021; Means & Neisler, 2020; Parker et al., 2021). Parker, Hansen, and Bernadowski (2021) surveyed and interviewed students during the pandemic and found that they felt unsatisfied, less engaged, less accountable, and were more likely to cheat during online learning. Darling-Aduana, et al, (2022) found that more virtual learning in the 2020-21 school year correlated with less student achievement growth.

Estimates of the amount of learning lost due to the pandemic vary, but US reports agree that the effects were exacerbated in schools with high poverty levels and high percentages of BIPOC students (Curriculum Associates, 2021; Dawson, 2022; Goldhaber et al., 2022; Kane, 2022). Goldhaber, et al (2022) report that a best-case scenario is that schools that remained remote longest lost about 40% of a school year's learning. In the US, BIPOC

students were twice as likely to be learning online in January 2021 than white students even though they had less access to technology. In addition, the pandemic disproportionally impacted the health and livelihoods of people of color, adding to increased stress and academic hardship for those students (Kuhfeld et al., 2021).

The pandemic is what led me to implement standards-based grading in my course because I wanted to give students more flexibility during such a difficult time. When I began this study, I did not know how much the pandemic would affect their learning. Numerous publications, including the New York Times, have written about difficulties new college students are facing, particularly in math (Binkley, 2022; Boucher, 2022; Fawcett, 2022; Sanchez, 2022). The challenges students have faced during the pandemic have made it particularly important to make changes to gateway courses such as Precalculus to help students succeed so that they can continue in their chosen major and graduate college.

## DESCRIPTION OF THE COURSE

The course that was the subject of this study is a Precalculus course in an American public liberal arts university. The data come from the Spring 2021 through Spring 2022 semesters. The student body comes primarily from the state of Georgia. The percentages of freshmen in the course each semester were 63% for Spring 2021, 82% for Fall 2021, and 68% for Spring 2022. Most of the remaining students were sophomores, but each semester had a handful of juniors and seniors. The most common majors were biology, exercise science, business, marketing, and psychology. Precalculus is a math course that is frequently taught in high schools, colleges, and universities. Precalculus courses can vary significantly in topics covered. This course focused on understanding the fundamental concepts and properties of functions, including exponential, logarithmic, and trigonometric functions.

Like most faculty, I revised the course significantly for the pandemic. Pre-pandemic, it was taught using a style of inquiry-based learning that involved students working in small groups throughout the course. A colleague and I had received a grant in 2019 to create worksheets for use in class based on the Open-Stax Precalculus textbook (Abramson, 2014; Epstein & Chiorescu, 2020). Starting in Fall 2020 and continuing through Spring 2022, the course was taught using more of a flipped-classroom model. I revised the worksheets we had previously created for the course to fit the new structure. Students watched videos that I had recorded over the summer of 2020 before class and answered some basic questions about the material in the videos. In class, I reviewed the material from the videos and then we worked on problems, sometimes together as a class and sometimes individually. Class was recorded and posted online along with the notes from class, so that students who were unable to come to class or did not feel comfortable coming to class during a pandemic could follow along.

As there are many different variations of standards-based grading, I will summarize how it worked in my courses. There were 24-25 standards, depending on the semester. The standards were written by modifying the section objectives in the Open-Stax Precalculus textbook. Each standard consisted of a list of things students were expected to achieve to meet that standard. Students would demonstrate that they had met the standards through Learning Checkpoints, which were given during class time roughly every three weeks. These looked similar to regular exams,

except that problems were divided by standard. For example, a problem assessing the Function Composition standard may have two parts, one where students demonstrate algebraic knowledge of composition and another where they demonstrate conceptual knowledge, such as by composing functions using a table of function values. Short Learning Checkpoints contained a selection of standards and Extensive Learning Checkpoints included all standards that we had seen so far. Each problem was scored with either an M, meaning they Met the standard by correctly answering all parts of the problem assessing that standard, a P, meaning they were Progressing and had not yet met the standard, or an N, meaning that the problem was Not Assessable, which was only given rarely and usually because there was too little work to assess. As in Elsinger and Lewis (2020), students could also earn a score of "*" when they had a minor error that they could fix by a certain date by the method that I specified, which was either a Zoom meeting to explain their work or an email to fix a mistake such as an algebra error.

The course letter grade was determined primarily by the total number of M's earned in the course. Students could earn up to two M's on each standard, meaning that after they had met a standard twice, they would no longer do the problems associated with that standard on future Learning Checkpoints. Each standard appeared on at least three learning checkpoints and most appeared on more. The most important early standards, such as "Functions" and "Invertible Functions," were designated as Core Standards and must be met at least once to receive a C in the class and twice for an A. The Core Standards appeared on almost all of the 10-11 Learning Checkpoints to give plenty of opportunities to meet them. Students could also get up to eight additional M's by doing the Pre-Class Questions, Problems, and Reflection assignments, all of which were graded on completion as opposed to correctness. To earn an A in the course, students must have a total of 48 M's, including two in each Core Standard and at least one in 19 of the 20 other Standards. The full requirements for each grade can be seen included in the Early Grade Reflection in the Appendix.

I made several changes to the course between the semesters, particularly before Fall 2021. Some changes involved terminology: in Spring 2021, I used the terms "quiz" and "exam" instead of "Short Learning Checkpoint" and "Extensive Learning Checkpoint," and I used the term "mastery grading" instead of "standards-based grading." In Spring 2021, there were 76 students in the three sections of the Precalculus course that I taught. In Fall 2021, there were 138 students across four sections, which meant that I expected to spend significantly more time grading than I had in Spring 2021, and I was already spending many hours grading. Thus, some changes to the course were necessary to keep the grading load manageable, and these changes were kept for Spring 2022, where I had 96 students across four sections. One of the biggest changes was a switch from online quizzes and exams to in-class Learning Checkpoints, with a Zoom option upon request. Giving Learning Checkpoints in class allowed for problems that were easier to grade quickly with less risk of academic dishonesty. To keep grading more manageable, I added a limit to how many standards could be attempted on each Learning Checkpoint, except for the final Learning Checkpoint, where any number could be attempted. I do not believe that this had a significant negative impact on the students, as students could choose the problems that they were most able to answer and anyone who would have

been able to get more M's than the limit would have no problem getting an A in the course. Due to scheduling issues, there was one more quiz in Spring 2021 than in the later semesters. To make up for the difference, more standards were included on the later Short Learning Checkpoints in Fall 2021 and Spring 2022.

In Spring 2021, there were more reflections after exams and quizzes than there were in the later semesters. The primary reason for the reduction of the number of reflections was to ease the students' workload. However, I believe reflection assignments are valuable and removing them may not have been beneficial. In Spring 2021, there was only one reflection assignment that helped students to understand their grade and it was in the last half of the semester, after the withdrawal deadline had passed. In the later semesters, I added an earlier reflection that helped students plan for the grade that they wanted in the course. In each semester, I had two undergraduate Supplemental Instructors (SI's), who sat in on the course and led evening help sessions. Students in all semesters were strongly encouraged to come to office hours and SI sessions to discuss standards they had difficulty earning M's in and I reached out by email to students who I was concerned about.

## METHODOLOGY

The primary data collection method for this study was through surveys of 184 students in 11 sections of Precalculus taught by the author in the Spring 2021, Fall 2021, and Spring 2022 semesters. At the beginning of each semester, students were given the opportunity to participate in the study by having their survey and other course data used confidentially. The numbers of students who chose to participate each semester were 53 out of 76 in Spring 2021, 72 out of 138 in Fall 2021, and 59 out of 96 in Spring 2022. The beginning-of-semester survey was given the first week of class. The end-of-semester survey was the final reflection assignment in the course and was assigned the last week of class. Both surveys consisted of text response questions followed by Likert response questions with options from Strongly Disagree to Strongly Agree. The surveys, which I designed specifically for this study, asked about the effects of the pandemic on their learning and various questions about their feelings and perceptions of math courses, such as whether math courses give them anxiety. The end-of-semester survey also asked them about their opinions of standards-based grading. For Likert response questions that appeared on both surveys, results were analyzed only for students who answered the question on both surveys. The number of students who completed both surveys was 24 in Spring 2021, 39 in Fall 2021, and 34 in Spring 2022, which was approximately 31% of the total number of enrolled students.

## RESULTS
### Difficulties during the pandemic

To address Q1, regarding how students perceive their learning was affected by the pandemic, a question on the beginning-of-semester survey asked, "How has the COVID-19 pandemic affected your learning, in math or in other topics?" The coded responses are summarized in Table 1.

The most commonly mentioned effect of the pandemic on their learning was a lack of engagement or focus (n=15), followed by lack of motivation (n=11). Other challenges with learning during the pandemic that students mentioned included difficulty remembering what they had learned (n=6), lack of relationships

with instructors and students (n=6), higher stress (n=4), absences due to quarantine (n=4), and getting sick (n=3).

*Table 1. Coded responses to the question from the beginning-of-semester survey: "How has the COVID-19 pandemic affected your learning, in math or in other topics?"*

| Semester | Negative | No effect | Pros & Cons | Positive |
|---|---|---|---|---|
| Spring 2021 (n=47) | 72% | 11% | 4% | 2% |
| Fall 2021 (n=62) | 69% | 13% | 7% | 7% |
| Spring 2022 (n=51) | 71% | 12% | 0% | 2% |

These quotes illustrate some of the concerns students had:

When my high school was virtual last year, it made learning a lot harder overall. It was harder to pay attention in my classes, harder to understand the material and get help on it, and harder to stay awake. (Fall 2021, assigned theme of "lack of engagement or focus")

Since all my classes were virtual, it was extremely difficult for me to learn because I had a hard time paying attention to class and holding myself accountable for my assignments and attendance. With school being online it made it all feel optional, which it wasn't. (Fall 2021, assigned themes of "lack of engagement or focus" and "lack of motivation")

COVID-19 made me become "lazy." I would say that being online did not make me put as much effort compared to being in person. (Spring 2022, assigned theme of "lack of motivation")

COVID adds additional stress because we are always worried that we/family/friends are going to get sick. (Spring 2021, assigned theme of "higher stress")

Any information that I learned from math while taking it online has left my memory. (Spring 2022, assigned theme of "difficulty remembering what they had learned")

In addition, two students suggested that their grades may not reflect their learning in the same way as in previous semesters, either through easier coursework or an explicit policy to raise grades:

For the last two years I was online and my teachers made assignments and learning much easier. (Spring 2022)

Luckily, my school wouldn't allow our grades to drop too much. (Spring 2022)

### Perceived Impacts of Standards-Based Grading

Research question Q2 asks, "How has using standards-based grading during the pandemic impacted the students?" One question on the end-of-semester survey asked if standards-based grading had lessened the challenges of the pandemic or made things more challenging, and to explain their answer. I grouped their responses into three categories. Since not all students answered the question and some gave examples that did not involve standards-based grading, the total numbers for each semester that were categorizable were small. The results are summarized in Table 2 and the coded reasons for their answers are summarized in Table 3. This is one of multiple situations where the responses from Spring 2021 differed greatly from the responses of the two later semesters,

as students in the Spring 2021 course were much more likely to feel that SBG lessened the challenges of the pandemic.

**Table 2. End of semester responses to whether SBG lessened the challenges of the pandemic or made things more challenging**

| Semester | Lessened the challenges | Somewhere in the middle (or some of both) | More challenging |
|---|---|---|---|
| Spring '21 (n=19) | 84% | 11% | 5% |
| Fall '21 (n=23) | 48% | 22% | 30% |
| Spring '22 (n=23) | 52% | 26% | 22% |

**Table 3. Responses from end-of -semester survey on how SBG lessened or increased the challenges of the pandemic**

| Way it lessened challenges | n | % (N=75) |
|---|---|---|
| Doing poorly on a test won't hurt your grade as much | 19 | 25.33% |
| Less stressful | 12 | 16.00% |
| Pushed to understand more thoroughly | 10 | 13.33% |
| Missing class less bad | 5 | 6.67% |
| **Way it increased challenges** | **n** | **% (N=75)** |
| More stressful | 7 | 9.33% |
| New and confusing | 7 | 9.33% |
| Harder to know grade | 7 | 9.33% |

On the end-of-semester survey, students were asked to rate their agreement with the statements "My anxiety in this course is less than in previous math courses" and "My anxiety in this course is less than it would have been without standards-based grading." (In Spring 2021, I used the term "mastery grading.") Tables 4 and 5 summarize the results, which were very favorable for Spring 2021, but were on average neutral in the other two semesters, including much more disagreement with the statements than in Spring 2021

**Table 4. Likert responses to "My anxiety in this course is less than in previous math courses"**

| Semester | Likert median | Likert average | SD |
|---|---|---|---|
| Spring 2021 (n=25) | 5 (strongly agree) | 4.2 | 1.08 |
| Fall 2021 (n=40) | 3 (neutral) | 2.9 | 1.46 |
| Spring 2022 (n=39) | 3 (neutral) | 2.74 | 1.37 |

Note. The Likert scale used was
1: strongly disagree, 2: disagree, 3: neutral, 4: agree, 5: strongly agree.

**Table 5. Likert responses to "My anxiety in this course is less than it would have been without standards-based grading"**

| Semester | Likert median | Likert average | SD |
|---|---|---|---|
| Spring 2021 (n=25) | 4 (agree) | 3.96 | 1.27 |
| Fall 2021 (n=40) | 3 (neutral) | 3.25 | 1.37 |
| Spring 2022 (n=39) | 3 (neutral) | 2.85 | 1.15 |

The following quotes illustrate how students reported SBG reduced their anxiety:

> It helped relieve stress if I couldn't study for all the concepts because I would be able to attempt them again. (Spring 2022)

> Instead of being almost unbearably overwhelmed for each assessment, I was very laid back with the attitude only of "do your best," rather than "you have to be the best." (Spring 2021)

The grading system also alleviated some stress off of me when I had covid which helped drastically. Having covid is already straining not only physically, but mentally and this course helped lessen the challenges because it did not add too much added stress when I needed to focus on feeling better. (Fall 2021)

Related to anxiety is the issue of getting behind on your work and having difficulty catching up. A Likert scale question asked for their agreement at the beginning of the semester with the statement "If I got behind on my work in a previous math course, I could catch up." At the end of the semester, the same question was asked for this course. As shown in Table 6, there was a much larger increase in agreement Spring 2021 than in the two following semesters.

**Table 6. Likert responses to "If I got behind on my work in a previous math course/this course, I could catch up"**

| Semester | Beginning of semester avg. (previous course) | End of semester avg. (this course) | Avg. difference | SD |
|---|---|---|---|---|
| Spring 2021 (n=24) | 3.58 | 4.29 | 0.71 | 1.37 |
| Fall 2021 (n=39) | 3.51 | 3.64 | 0.13 | 1.36 |
| Spring 2022 (n=34) | 3.59 | 3.88 | 0.29 | 1.40 |

Tables 7 to 9 show the changes in agreement of statements about their perceptions of exams. In Fall 2021 and Spring 2022, the end-of-semester survey had "Learning Checkpoint" in place of "exam." Table 7 shows that students in all semesters, but especially Spring 2021, believed that the stakes of the exams/ Learning Checkpoints were lower than in a usual course. The beginning-of-semester survey asked about their previous math courses and the end-of-semester survey asked about the course being studied. Table 8 shows that students in all semesters on average believed the exams/Learning Checkpoints helped them to better understand the material than those in previous courses. Table 9 shows that students on average believed exams/Learning Checkpoints in this course helped them know what to study more than in previous courses.

**Table 7. Likert responses to "Doing poorly on an exam would hurt my grade significantly in previous math courses/this course"**

| Semester | Beginning of semester avg. (previous course) | End of semester avg. (this course) | Avg. difference | SD |
|---|---|---|---|---|
| Spring 2021 (n=24) | 4.38 | 1.92 | -2.46 | 1.35 |
| Fall 2021 (n=39) | 3.87 | 2.62 | -1.25 | 1.50 |
| Spring 2022 (n=34) | 3.56 | 2.71 | -0.83 | 1.54 |

**Table 8. Likert responses to "Exams help me to better understand the material in a math course/the course"**

| Semester | Beginning of semester avg. (previous course) | End of semester avg. (this course) | Avg. difference | SD |
|---|---|---|---|---|
| Spring 2021 (n=24) | 3.38 | 4.33 | 0.96 | 1.43 |
| Fall 2021 (n=39) | 2.97 | 3.72 | 0.74 | 1.41 |
| Spring 2022 (n=34) | 3.21 | 3.94 | 0.74 | 1.02 |

**Table 9. Likert responses to "Doing poorly on an exam helps me to know what to study to improve my abilities"**

| Semester | Beginning of semester avg. (previous course) | End of semester avg. (this course) | Avg. difference | SD |
|---|---|---|---|---|
| Spring 2021 (n=24) | 3.92 | 4.42 | 0.50 | 0.83 |
| Fall 2021 (n=39) | 4.00 | 4.15 | 0.15 | 0.87 |
| Spring 2022 (n=34) | 3.65 | 4.18 | 0.53 | 1.16 |

## Opinions on Standards-Based Grading

To address Q3 about student perceptions of standards-based grading, the final open response question asked what their opinion of standards-based grading was and what they liked or disliked about it. Table 10 summarizes the most common responses.

**Table 10. What students liked and disliked most about SBG**

| Things liked about SBG | n | % (N=85) |
|---|---|---|
| Multiple opportunities to demonstrate learning | 27 | 31.76% |
| Better understanding | 10 | 11.76% |
| Low stress | 9 | 10.59% |
| Ability to choose what to study | 4 | 4.71% |
| **Things disliked about SBG** | **n** | **% (N=85)** |
| Difficult to figure out grade | 14 | 16.47% |
| Confusing | 11 | 12.94% |
| Encourages procrastination/false belief they didn't need to try as hard | 5 | 5.88% |

A related Likert scale question asked the students to agree or disagree with the following statement: "I prefer standards-based grading over regular points-based grading." The results are summarized in Figure 1. Clearly, the students in the Spring 2021 semester had a much more favorable opinion of standards-based grading than the later students.

One common issue that was particularly pronounced in the Fall 2021 and Spring 2022 semesters was that students had the tendency to procrastinate due to a perception of having plenty of time to meet the standards later in the course. The following quote from a student in the Fall 2021 semester captures the concerns of many of the students:

> It relieved a little pressure to have to do well on every [Learning Checkpoint], but it gave me less incentive to do well because I knew I'd have multiple chances to get an 'M' on a standard. Although this was a good thing and I did not stress about the "M's," it all built up at the end of the semester and now I am struggling to pass as many standards as I can. I should have worked harder in the beginning of the semester, but having this idea of being able to pass a standard whenever I could made me not try as hard in the beginning.

Other students had difficulty knowing what to do to get the grade they wanted. As one Fall 2021 student explains, "The standard-based grading has been hard mentally for me because instead of maintaining a grade all semester I have had to work up to a grade and it has been difficult to see where I would end up at some points."

While many students appreciated the opportunities for more attempts to meet standards, some students may become frustrated by the need to try again. As one student in Fall 2021 wrote, "When I don't do good on a [Learning Checkpoint] I feel like I'm never gonna get it because I have to redo a standard over and over again."

There were many positive comments about standards-based grading as well. For example, some students reported changed attitudes and behavior regarding mistakes, as the following quotes from Spring 2021 students illustrate:

> I actually take the time to read my feedback and figure out what went wrong. I would not do this if I had no chance of correcting my mistakes.

> This course taught me that overall, it is important to learn from your mistakes rather than take them personally or as a failure.

It also helped some students develop better study habits, such as this student from Spring 2022:

> I think this course helped me to focus on learning topics along the way instead of waiting till a test to study and I hope to carry that habit into other classes.



**I prefer standards-based grading over regular points-based grading**
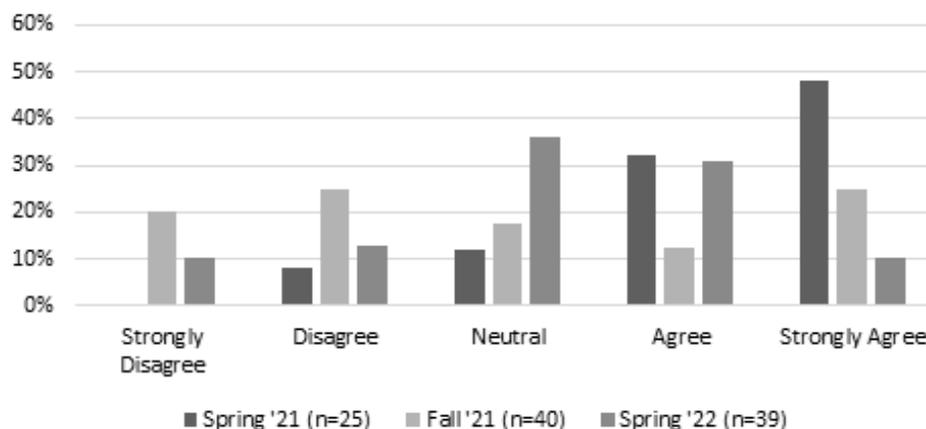
*Figure 1. Likert results by semester showing preference of SBG versus points-based grading*

Multiple students expressed having a strong understanding of the topics at the end of the course. As one Spring 2022 student commented:

> Standards based grading has helped because it has allowed me to master the information, rather than just memorizing for one test. I now know the standards for life!

## DISCUSSION

Research question Q1 asks, "How do students perceive their learning was affected during the pandemic?" The survey responses about the challenges they encountered in their learning during the pandemic suggest that they had trouble staying focused and motivated, their courses became less challenging, and they had more difficulty remembering what they had learned. I observed a marked difference between the Spring 2021 semester and the later two semesters noticeable in student behavior, level of readiness for the course, and ultimately in their grades, as the average grade in Spring 2021 was half a letter grade higher than in the later semesters. There are many differences in the survey responses between the Spring 2021 semester and the later two semesters. While I cannot disregard the changes made to my course between Spring 2021 and Fall 2021, I believe that the primary reason for these differences was that the students taking the course in the 2021-2022 academic year had already had over a year of school during the pandemic, including, for most of them, over a year of high school math, while most of the Spring 2021 students had no more than half a semester of previous mathematics during the pandemic. Since the students during the Fall 2021 and Spring 2022 semesters had had a longer period of learning affected by the pandemic, these challenges affected them most.

To answer research question Q2, we look at how students perceived this course on its own and in comparison with previous courses. Many students mentioned that the course gave them a better attitude toward mistakes, which may have been due to the basic principle of standards-based grading, which allows you to reassess standards and does not directly penalize students for wrong answers. Students in all three semesters believed the stakes on exams/Learning Checkpoints were lower than those on exams in previous courses (Table 7), that exams/Learning Checkpoints helped them to better understand the material than in previous courses (Table 8), and that doing poorly on an exam/Learning Checkpoint helped them know what to study better than in previous courses (Table 9). Since problems on exams or Learning Checkpoints in a course using SBG are labeled with which standards they are assessing, students likely have an easier time identifying which topics they are struggling with when they miss a problem. With regard to the pandemic, students in Spring 2021 overwhelmingly felt that SBG lessened the challenges of the pandemic, while only about half in the other two semesters felt the same. The most common way they said it lessened the challenges was by making the exams lower stakes. Students in the Spring 2021 semester also thought SBG gave them less anxiety than other grading systems, but the later two semesters had more neutral reactions. It is worth noting that as this was most students' first college math course, it is possible that students attributed challenges within the course to standards-based grading that were actually due to the material being more challenging than they were used to, particularly after a year of pandemic learning.

Research question Q3 asked about students' perceptions of standards-based grading. While some students prefer traditional points-based grading, many students, especially in the Spring 2021 semester, preferred SBG. Students liked that it provided multiple opportunities to demonstrate their learning by giving them the ability to reassess standards that they had difficulty with. Many students felt that SBG helped them learn more deeply. On the other hand, students disliked that it was hard to know their grade, confusing, and led to procrastination.

There was evidence that the best way for students to improve their grades is to seek help. In Fall 2021 and Spring 2022, I gave an Early Grade Reflection assignment after the first two Short Learning Checkpoints to help the students determine a path to their desired grade. See the Appendix. Of the 19 students who had 0 M's at the time of the Early Grade Reflection, only one of the students started coming frequently to student hours, and that is the only one of the students who earned a C in the course. Ten of the other students withdrew, 6 received F's, and 2 received D's. I hope that by making students more aware of the potential benefit of seeking help, they will be more equipped to make decisions about the course.

Looking at students who earned an A in the course in Fall 2021 or Spring 2022, at the time of the Early Grade Reflection, their number of M's out of 9 possible ranged between 2 and 9. The fact that some students had just 2 M's after the first two Learning Checkpoints and still received A's demonstrates that it is possible for students to have a strong understanding of the material by the end of the semester even when they are struggling in the beginning. In a course using points-based grading, these students may not have been able to make up for the points lost on early quizzes or exams and so may have ended up with grades that did not reflect their overall learning.

I believe that standards-based grading can be beneficial for all students, but the pandemic has added new challenges that can't be ignored. Students coming from high school may not be used to studying for a math course. In addition, the pandemic has led to reduced material covered in prerequisite courses, making it harder for students to master the content in a course that requires knowledge of things they have never encountered. In order to address these challenges, we could add extra support to gateway courses such as Precalculus. In addition, when using SBG, it is important to build in structure to help the students learn from their mistakes. One possible way to add structure would be to require that students show evidence of rethinking problems before they are allowed to reattempt them. Another way is to build in frequent, more specific reflection assignments, which I have implemented in my Spring 2023 Precalculus course. I have also provided additional resources to help the students understand the grading system and plan their studying. In a traditionally graded course, students can often see their current letter grade posted on a learning management system. However, those grades do not necessarily reflect the grade they will get at the end of the semester because, for example, the final exam may be worth a large percentage of the grade. In standards-based grading, it is always possible to know exactly what needs to be achieved to earn the desired grade, so I hope that by giving them the tools to better understand the grading system, they can be convinced that it is actually easier to plan for the grade they want using SBG than traditional points-based grading.

## LIMITATIONS AND TOPICS FOR FURTHER STUDY

As with all scholarship of teaching and learning, this study has its limitations. Any research into standards-based grading can only speak to the specific variation used. In addition, this study had no comparison group as only standards-based grading was used. Comparing to previous or later semesters was not possible as the pandemic was a significant factor during the period studied. Furthermore, participation in the study was voluntary. The grades of students who chose to participate were on average higher than the grades of the non-participating students. In addition, only students who chose not to withdraw from the course midsemester were surveyed at the end of the semester.

Many instructors who use standards-based grading notice that their students seem to be understanding at a deeper level than in courses using traditional grading. However, most of the research on the learning gains of SBG has been done in a K-12 setting. It would be useful to study the effectiveness of SBG by comparing the outcomes in later courses in a sequence of students who took a course using SBG with those who did not. For example, the effectiveness of SBG in Precalculus may be measured by looking at the outcomes in Calculus.

As a follow-up to this study, I am currently conducting a SoTL study in my Precalculus course examining the impacts of various tools that I designed to help students maximize their success in a standards-based graded course. These tools include resources to help students understand the grading system and frequent, detailed reflection assignments to help them to effectively learn from their feedback and make a plan for their success.

The challenges caused by the pandemic will likely affect all areas of higher education for years to come. It will take institutional change as well as changes in our classrooms in order to overcome them. We may need to consider restructuring course sequences, offering corequisites, or increasing the number of contact hours in a course such as Precalculus. Kuhfield, et al, (2021) propose a number of policies for "supporting COVID-19 recovery for BIPOC students." While these are focused on K-12 institutions, many could apply to higher education as well.

With the difficulties pandemic-prepared students had with standards-based grading, it can be tempting to go back to regular points-based grading. However, student comments from all three semesters indicate that for many students, it did help them to have a stronger understanding of the material while causing less anxiety and was more flexible during situations such as pandemic-related absences. There is no perfect grading system, but most of us are at institutions where letter grades are required. I believe that standards-based grading combined with regular guidance to help students stay on track can be effective even in difficult times.

## CONTACT

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## REFERENCES

Abramson, J. (2014). *Precalculus* (1st ed.). OpenStax. https://openstax.org/books/precalculus/pages/1-introduction-to-functions

Aguilera-Hermida, A. P., Quiroga-Garza, A., Gómez-Mendoza, S., Del Río Villanueva, C. A., Avolio Alecchi, B., & Avci, D. (2021). Comparison of Students' Use and Acceptance of Emergency Online Learning Due to COVID-19 in the USA, Mexico, Peru, and Turkey. *Education and Information Technologies*, *26*(6), 6823–6845. ERIC. https://doi.org/10.1007/s10639-021-10473-8

Bagley, S. (2023, May 22). Student perceptions of alternative grading systems. *Grading for Growth*. https://gradingforgrowth.com/p/student-perceptions-of-alternative

Beatty, I. D. (2013). Standards-based grading in introductory university physics. *Journal of the Scholarship of Teaching & Learning, 13*(2), 1–22. https://scholarworks.iu.edu/journals/index.php/josotl/article/view/3264

Binkley, C. (2022, August 9). "I Didn't Really Learn Anything": COVID Grads Face College. *U.S. News & World Report*. https://www.usnews.com/news/us/articles/2022-08-09/i-didnt-really-learn-anything-covid-grads-face-college

Boucher, K. (2022, July 5). OPINION: Students are coming to college less prepared during the pandemic. They need our help. *The Hechinger Report*. https://hechingerreport.org/opinion-students-are-coming-to-college-less-prepared-during-the-pandemic-they-need-our-help/

Campbell, R., Clark, D., & OShaughnessy, J. (2020). Introduction to the Special Issue on Implementing Mastery Grading in the Undergraduate Mathematics Classroom. *PRIMUS*, *30*(8–10), 837–848. https://doi.org/10.1080/10511970.2020.1778824

Chin, E. C. H., Williams, M. W., Taylor, J. E., & Harvey, S. T. (2017). The influence of negative affect on test anxiety and academic performance: An examination of the tripartite model of emotions. *Learning and Individual Differences*, *54*, 1–8. https://doi.org/10.1016/j.lindif.2017.01.002

Chishti, M. H., & Rana, A. M. K. (2021). Test Anxiety Effects on Student's Performance: A Psychological Analysis at Secondary School Level in Punjab, Pakistan. *Journal of Behavioural Sciences*, *31*(1), 182–201. http://pu.edu.pk/images/journal/doap/PDF-FILES/9_V31-1-2020.pdf

Cilli-Turner, E., Dunmyre, J., Mahoney, T., & Wiley, C. (2020). Mastery Grading: Build-A-Syllabus Workshop. *PRIMUS*, *30*(8–10), 952–978. https://doi.org/10.1080/10511970.2020.1733152

Clark, D. (2021, August 23). Standards and Contracts and Competencies, oh my! *Grading for Growth*. https://gradingforgrowth.com/p/standards-and-contracts-and-competency

Collins, J. B., Harsy, A., Hart, J., Anne Haymaker, K., (Armstrong) Hoofnagle, A. M., Kuyper Janssen, M., Stewart Kelly, J., Tyler Mohr, Austin, & OShaughnessy, J. (2019). Mastery-Based Testing in Undergraduate Mathematics Courses. *PRIMUS*, *29*(5), 441–460. https://doi.org/10.1080/10511970.2018.1488317

Curriculum Associates. (2021). *Academic Achievement at the End of the 2020– 2021 School Year* (Curriculum Associates Research Brief). https://www.curriculumassociates.com/-/media/mainsite/files/i-ready/iready-understanding-student-needs-paper-spring-results-2021.pdf

Darling-Aduana, J., Woodyard, H. T., Sass, T. R., & Barry, S. S. (2022). Learning-Mode Choice, Student Engagement, and Achievement Growth During the COVID-19 Pandemic. *AERA Open, 8*. https://doi.org/10.1177/23328584221128035

Davis, L., Qun Sun, Lone, T., Levi, A., & Pei Xu. (2022). In the Storm of COVID-19: College Students' Perceived Challenges With Virtual Learning. *Journal of Higher Education Theory & Practice, 22*(1), 66–82. https://doi.org/10.33423/jhetp.v22i1.4964

Dawson, M. (2022). *Student Growth during COVID-19: Grade-Level Readiness Matters* (Curriculum Associates Research Brief). https://www.curriculumassociates.com/-/media/mainsite/files/i-ready/student-growth-during-covid-19.pdf

Dempsey, P., & Huber, T. (2020). *Using Standards-Based Grading to Reduce Mathematics Anxiety: A Review of Literature.* Online Submission; ERIC. https://files.eric.ed.gov/fulltext/ED605522.pdf

Dweck, C. S. (2006). *Mindset: The New Psychology of Success.* Random House.

Elsinger, J., & Lewis, D. (2020). Applying a Standards-Based Grading Framework Across Lower Level Mathematics Courses. *PRIMUS, 30*(8–10), 885–907. https://doi.org/10.1080/10511970.2019.1674430

Epstein, R., & Chiorescu, M. (2020). Ancillary Materials for OpenStax Precalculus (GCSU). *Mathematics Ancillary Materials, 20*. https://oer.galileo.usg.edu/mathematics-ancillary/20

Eyler, J. (2018). *How humans learn: The science and stories behind effective college teaching.* (First edition.). West Virginia University Press.

Fawcett, E. (2022, November 1). The Pandemic Generation Goes to College. It Has Not Been Easy. *The New York Times.* https://www.nytimes.com/2022/11/01/us/covid-college-students.html

Goldhaber, D., Kane, T. J., McEachin, A., Morton, E., Patterson, T., & Staiger, D. O. (2022). *The Consequences of Remote and Hybrid Instruction during the Pandemic. Working Paper No. 267-0522.* National Center for Analysis of Longitudinal Data in Education Research (CALDER); ERIC. https://eric.ed.gov/?id=ED620476

Guskey, T. R. (Ed.). (2009). *Practical solutions for serious problems in standards-based grading* (2008-12124-000). Corwin Press.

Harsy, A. (2020). Variations in Mastery-Based Testing. *PRIMUS, 30*(8–10), 849–868. https://doi.org/10.1080/10511970.2019.1709588

Harsy, A., Carlson, C., & Klamerus, L. (2021). An Analysis of the Impact of Mastery-Based Testing in Mathematics Courses. *PRIMUS, 31*(10), 1071–1088. https://doi.org/10.1080/10511970.2020.1809041

Harsy, A., & Hoofnagle, A. (2020). Comparing Mastery-based Testing with Traditional Testing in Calculus II. *International Journal for the Scholarship of Teaching & Learning, 14*(2), 1–13. https://doi.org/10.20429/ijsotl.2020.140210

Hembree, R. (1990). The Nature, Effects, and Relief of Mathematics Anxiety. *Journal for Research in Mathematics Education, 21*(1), 33–46. JSTOR. https://doi.org/10.2307/749455

Herold, D. S., & Chen, T. (2021). Switching from Face-to-Face to Online Instruction Midsemester: Implications for Student Learning. *Journal of Teaching and Learning with Technology, 10*, 321–336. https://doi.org/10.14434/jotlt.v10i1.30521

Kane, T. (2022, May 22). Kids Are Far, Far Behind in School. *The Atlantic.* https://www.theatlantic.com/ideas/archive/2022/05/schools-learning-loss-remote-covid-education/629938/

Knight, M., & Cooper, R. (2019). Taking on a New Grading System: The Interconnected Effects of Standards-Based Grading on Teaching, Learning, Assessment, and Student Behavior. *NASSP Bulletin, 103*(1), 65–92. https://doi.org/10.1177/0192636519826709

Kuhfeld, M., Ruzek, E., Lewis, K., Soland, J., Johnson, A., Tarasawa, B., & Dworkin, L. (2021). *Understanding the Initial Educational Impacts of COVID-19 on Communities of Color.* NWEA. https://www.nwea.org/research/publication/understanding-the-initial-educational-impacts-of-covid-19-on-communities-of-color/

Lenarz, J., & Pelatt, K. E. (2023). A Transition to Mastery-Based Testing with the Hope of Increasing Student Persistence. *PRIMUS, 33*(2), 97–106. https://doi.org/10.1080/10511970.2020.1843209

Lewis, D. (2020a). Gender Effects on Re-assessment Attempts in a Standards-Based Grading Implementation. *PRIMUS, 30*(5), 539–551. https://doi.org/10.1080/10511970.2019.1616636

Lewis, D. (2020b). Student Anxiety in Standards-based Grading in Mathematics Courses. *Innovative Higher Education, 45*(2), 153–164. https://doi.org/10.1007/s10755-019-09489-3

Lewis, D. (2022). Impacts of Standards-Based Grading on Students' Mindset and Test Anxiety. *Journal of the Scholarship of Teaching and Learning, 22*(2). https://doi.org/10.14434/josotl.v22i2.31308

Loades, M. E., Chatburn, E., Higson-Sweeney, N., Reynolds, S., Shafran, R., Brigden, A., Linney, C., McManus, M. N., Borwick, C., & Crawley, E. (2020). Rapid Systematic Review: The Impact of Social Isolation and Loneliness on the Mental Health of Children and Adolescents in the Context of COVID-19. *Journal of the American Academy of Child & Adolescent Psychiatry, 59*(11), 1218-1239.e3. https://doi.org/10.1016/j.jaac.2020.05.009

Means, B., & Neisler, J. (2020). *Suddenly Online: A National Survey of Undergraduates during the COVID-19 Pandemic.* Digital Promise. http://hdl.handle.net/20.500.12265/98

Moore, R., & Hayes, S. (2021). *Mental Health Supports and Academic Preparedness for High School Students during the Pandemic. Insights in Education and Work.* ACT, Inc. https://eric.ed.gov/?id=ED613543

Nilson, L. B., & Stanny, C. J. (2015). *Specifications grading: Restoring rigor, motivating students, and saving faculty time.* (First edition.). Stylus.

Parker, S. W., Hansen, M. A., & Bernadowski, C. (2021). COVID-19 Campus Closures in the United States: American Student Perceptions of Forced Transition to Remote Learning. *Social Sciences, 10*(62), 62–62. Directory of Open Access Journals. https://doi.org/10.3390/socsci10020062

Pollio, M., & Hochbein, C. (2015). The association between standards-based grading and standardized test scores as an element of a high school reform model. *Teachers College Record, 117*(11), 1–28. https://doi.org/10.1177/016146811511701106

Sanchez, O. (2022, April 6). After the pandemic disrupted their high school educations, students are arriving at college unprepared. *The Hechinger Report*. https://hechingerreport.org/after-the-pandemic-disrupted-their-high-school-educations-students-are-arriving-at-college-unprepared/

Scarlett, M. H. (2018). "Why did I get a C?": Communicating Student Performance Using Standards-Based Grading. *InSight: A Journal of Scholarly Teaching*, *13*, 59–75. https://doi.org/10.46504/14201804sc

Slavin, R. E. (1987). Mastery Learning Reconsidered. *Review of Educational Research*, *57*(2), 175–213. https://doi.org/10.2307/1170235

Talbert, R. (2021, August 30). Finding common ground with grading systems. *Grading for Growth*. https://gradingforgrowth.com/p/finding-common-ground-with-grading

Taylor, B. A., & Fraser, B. J. (2013). Relationships between learning environment and mathematics anxiety. *Learning Environments Research*, *16*(2), 297–313. https://doi.org/10.1007/s10984-013-9134-x

von der Embse, N., Jester, D., Roy, D., & Post, J. (2018). Test anxiety effects, predictors, and correlates: A 30-year meta-analytic review. *Journal of Affective Disorders*, *227*, 483–493. https://doi.org/10.1016/j.jad.2017.11.048

Weir, R. J. (2020). Rethinking Precalculus and Calculus: A Learner-Centered Approach. *PRIMUS*, *30*(8–10), 995–1016. https://doi.org/10.1080/10511970.2019.1686669

Westfall, R. S., McAuley, A. J., & Millar, M. (2021). The Influence of Implicit Math Anxiety on Math Achievement. *Psychological Reports*, *124*(6), 2651–2668. https://doi.org/10.1177/0033294120964055

# APPENDIX - EARLY GRADE REFLECTION

If you haven't done so already, read the feedback you received on the SLC 2. You can see it if you go to the Assignments list under the Course Work tab. This is a different type of reflection from the previous reflection. The purpose of this one is to plan for the grade you want and to get practice working with our grading system. You should upload your responses to the following questions in a single document (pdfs or Word documents recommended).

1. How many M's do you have so far from SLC 1 and SLC 2? (Note that even if your answer is 0, it is still possible to get an A.)

2. The syllabus shows the requirements to get an A, B, etc. Here is what the relevant part says:

   Here is how your grade will be determined:

   <u>For a D</u>: Get a total of at least **26 M's** (out of 58 possible) **OR** get an M in at least 16 different standards.

   > Note: A D grade is the only grade that there are two different ways to achieve. For the others, you must meet all the requirements.

   <u>For a C</u>: **All** of the following:
   - Get a total of at least **36 M's** (out of 58 possible)
   - Meet all five core standards at least once
   - Meet at least three standards from each unit at least once (there are three units)

   <u>For a B</u>: **All** of the following:
   - Get a total of at least **42 M's** (out of 58 possible)
   - Meet all five core standards at least once
   - Meet at least 15 of the 20 non-core standards at least once

   <u>For an A</u>: **All** of the following:
   - Get a total of at least **48 M's** (out of 58 possible)
   - Meet all five core standards <u>twice</u>
   - Meet at least 19 of the 20 non-core standards at least once (this means only one standard can be left unmet)

   Choose a letter grade that you want to work with for this assignment - I recommend choosing A, but if you are more interested in knowing what it takes to get a B or C, you can choose one of those. Write down the requirements to get that letter grade - I recommend using your own words to rewrite it instead of just copying and pasting, so that you can better process the information.

3. Note that you can get up to 8 M's from doing the regular assignments. Here is the part of the syllabus that talks about that:

   Pre-Class Questions: 1 M if at least 70%, 2 M's if at least 90%
   Reflections and miscellaneous assignments: 1 M if at least 70%, 2 M's if at least 90%
   Problems: 1 M for 60%, 2 M's for 70%, 3 M's for 80%, 4 M's for 90%

   How many M's do you expect to get from the assignments? It's early enough that even if you have missed some, you can probably still get 8 M's.

4. Now, add the number of M's from question 3 to the number you currently have from SLCs (question 1). What do you get? This is the number of M's you should consider yourself as having now.
   How many more M's do you need to get the grade that you want? For example, if Neva has 2 M's from the SLCs and expects 8 from assignments, she has 10, so she would need 38 more for an A.

5. Now, make a plan for how many M's you want to get for each of the ELC's. Don't worry about the SLC's - any M's you get on those can be thought of as fewer to get on the ELC's. I recommend limiting the number of M's on the first four ELC's to 8 at most, as the final exam (the fifth ELC) will be longer than the others and also you will have learned more by then. Also, some ELC's will have limits to how many problems you can attempt, but the final exam won't have a limit. Here is an example: Neva needs 38 M's, so she divides them up among the ELC's as follows: 5, 6, 7, 8, 12.

6. Finally, reflect on all of this. You can use any of the following questions as guidance. What feelings do you have about what you have just done? What can you do to get on track and stay on track to your goal? How will you study? Where will you seek help? Which standards are you going to focus on next?

If you have any questions, please feel free to ask in student hours or by email!