SECTION V. SABBATICAL LEAVE APPLICATION

Lindsey Lang	Feb 10, 2023
Name (Open Print Preview to have your name populate throughout the form)	*Date*
Diablo Valley College	Fall 2023
College	*Sabbatical leave period requested*
Mathematics	17
Teaching field(s)	*Years of service in CCCCD*

Have you had previous Sabbaticals? If "yes" give time period(s) and activity (activities).

No

Indicate type of Sabbatical program (see United Faculty Agreement, Section 12.5.6) If program can be categorized by more than one type, check where applicable.

- ☐ Institutional study (complete Form A)
- ☐ Travel (complete Form B
- ☒ Professional Study and/or Creative Study (complete Form C)

GENERAL SUMMARY OF SABBATICAL PROGRAM
(GIVE A 100-WORD MAXIMUM STATEMENT)

For my one semester sabbatical, I will convert my Calculus I course (Math 192) to an entirely mastery-based course, including all assignments and assessments grading based solely on demonstration of mastery by students on the standard(s) in the assignment or assessment. I will research details of mastery-based implementations in STEM classrooms, create a FLEX workshop presentation on mastery-based grading systems, and create a complete mastery-based course with all structures and documentation that any Math 192 instructor could use.

Lindsey Lang

Name

VALUE TO EDUCATIONAL PROGRAM

(The Sabbatical Leave Committee will utilize this information as the basis for scoring Rubrics 1, 2, 3 and 4)

Describe how the proposed sabbatical will benefit the educational program. In particular:

1. *How will it benefit students, programs, or staff/colleagues?*

The vast majority of STEM courses, particularly in math, are structured on a points-based system. Students are given points on assignments, quizzes, exams, and possibly other categories including projects or discussions. Instructors determine how many points each problem is worth, and partial credit (points less than the full point value of a problem) is generally awarded for solutions to problems that are not completely correct. Final course grades are usually calculated using weighted averages for various categories of work, for example homework, quizzes, exams, project, final exam, etc.

There are many drawbacks to this traditional points-based system. There are often factors that do not measure students' learning and achievement of course outcomes that are included in scores, including whether an assignment was submitted on time or formatted in a requested manner. As a result, final course grades often do not accurately reflect whether students have attained individual learning outcomes; at best they reflect the overall degree to which students achieved the outcomes in general. Research documents how the partial-credit point system turns grades into a game, the object of which is to maximize points with the minimum amount of effort rather than a focus on learning and understanding the material (Benson, 2006; Nathan, 2005, Singleton-Jackson, Jackson, & Reinhardt, 2010). A grade of zero on one single assignment or assessment can have a catastrophic effect on a student's overall grade and morale. Moreover, the point-based system does not typically account for growth in student learning and understanding over the span of the term; rather, this system prioritizes formative assessments in the form of high stakes exams that cause stress and anxiety for students and offers no opportunity to earn points for increased mastery of exam topics after these assessments take place. In addition, research shows that students tend to ignore instructor feedback on points-driven assignments and assessments (Butler & Nisan, 1986). The student is losing valuable insight on how to improve their understanding by focusing on the points and ignoring the feedback, and the instructor is essentially wasting their time providing detailed feedback during the grading process if they also assign a numerical score. Points-based systems translate to an overall course percentage score out of 100, which is a very granular system allowing close to 70 different levels of failure and only 30 levels of success – are there really these many levels of demonstrated learning in the course and how is failure more finely distinguished than success?

Conversely, a mastery-based system awards credit, not points, when a student demonstrates achievement of course outcomes. Assessments and assignments are graded on a two- or three-tier rubric: successful or not yet successful, with a possible third-tier allowing for revision. A student who does not earn credit for demonstrating mastery on an outcome during an assessment is given the opportunity to reassess those outcomes throughout the term using new assessment questions that assess the same outcomes. This system allows for a more flexible timeline of student learning and motivates students to master concepts rather than maximize points. Students are not punished for having a poor showing on exam day; rather, they are rewarded for following up on feedback and being persistent in working towards demonstrating their achievement of course outcomes. There are various ways to calculate the final course grade in a mastery-based course, but that calculation is always based on the number of outcomes with demonstrated mastery. Thus, a mastery-based system upholds high academic standards while motivating students to learn and excel. It also reduces student stress around high-stakes exams and improves student and instructor relations by eliminating the argument over points. A critical aspect of a mastery-based system is feedback. With mastery-based grading, instructors provide detailed feedback on unsuccessful mastery attempts. Students then use that feedback to investigate their errors and improve their learning before they attempt to reassess an outcome. The focus of these assessments becomes learning and mastering, rather than winning the points game. In addition, this cycle of feedback and improvement encourages and normalizes help-seeking behavior, which has positive ripple effects in students' entire academic career.

Converting my entry-level Calculus course to an entirely mastery-based course will benefit teachers and students by reducing conflict and stress associated with traditional grading and by focusing the students on learning rather than playing the points game. Moreover, with the new law AB 1705 coming into effect, all new incoming STEM students may be required to start in Calculus (as opposed to the AB 705 model of students starting in Trigonometry or Pre-Calculus). Now more than ever it will be critically important that we focus our students on mastery of course content as the method of passing the course, not winning the points game.

2. *How will it enhance and/or improve your background and professional competence?*

While the mathematics of Calculus may not have changed in several hundred years, best practices in education continue to evolve. I strive to stay updated on educational research related to all aspects of my career, and I have long felt that the traditional points-based system used to grade students is inadequate. In the past several years, I have embarked on learning about other grading methods and systems on my own time, including reading books, papers, and blogs written on the topic and taking an online class from College Bridge last spring to learn more about how to convert my classes to a mastery-system. This initial exploration has inspired me to discover more about how others have been able to implement this system, specifically in the area of mathematics and Calculus. There are many different versions of mastery-based systems in practice, and this sabbatical will allow me the time to research those examples in my field to get a sense of how to best structure my mastery-based Math 192 course. It will also provide me with an opportunity to learn enough to become a source of information and guidance for my colleagues about mastery-based systems, which can begin with creating a thorough presentation of my research during the sabbatical.

AB705 and AB1705 are two pieces of legislation that have radically shifted the way that mathematics can be offered in community colleges in California. We have eliminated pre-transfer level math courses, and we may be on the way to having to lift prerequisite courses for Calculus, depending on what data the Chancellor's Office requests to evaluate their effectiveness. It has never been a more critical time for math instructors to evaluate how their class is structured and what the focus of the course truly is. By taking the time to build an entirely mastery-based Calculus course, I will be able to find that focus, to distill the course content to its essentials and build everything else in the course around the mastery of those essentials, eliminating the many distractions of a traditional system that de-motivate both students and teachers like high-stakes exams and power struggles over points. Instead, I will be able to finally build a culture in my classroom where learning is the reward and making mistakes and seeking help are critical parts of the learning process. I have attempted to do achieve these goals for a very long time through classroom activities and workshops, but when the underlying system by which the students will be ultimately graded perpetuates "the game", I will always fall short.

3. *How will it relate to your ongoing professional assignment?*

I teach Math 192 on a regular basis, so this project would relate to my teaching assignment in almost every semester. I also plan to share my resources, materials, process, and ideas with the math department through a FLEX workshop, so it will function as a pedagogical reference point for math instructors at DVC. I'll also be continuing to examine my disaggregated course data (retention and success), so over time I can compare my data in a points-based system to a mastery-based system and note any significant changes that may occur, particularly around equity gaps that tend to exist in all math courses.

4. *How are the breadth and depth of the project appropriate for the sabbatical leave rather than the regular teaching year?*

Converting a course entirely to a mastery-based system involves a great deal of work. I was motivated to embark on one step of the process in Fall 2022 in my Math 192 course, changing only how I graded quizzes and exams to a mastery-rubric: Successful (3 points), Needs Revision (2 points), New Attempt Required (1 point). This simple change required me to also dive into the process of creating reassessment questions and tracking reassessment attempts for students. The experience did focus the course on learning over points more than I have ever been able to do before and was extremely rewarding for both myself and my students. The experiment was also eye-opening for me; I realized that I could not implement all of the pieces at one time, due to the time-commitment necessary to do so. I was still using points and weighted averages to compute final course grades. I did not have an efficient system to track reassessments; instead, I fumbled through with a rather tedious system that taught me what not to do. I struggled to find the time to create mutliple versions of reassessment questions that were of similar difficulty and breadth as the original assessment questions - sometimes needing six to seven versions of one conceptually rich question. I felt overwhelmed by the daunting task of putting together all of the pieces that I would need to do in order to truly implement a mastery-system for the entire course. This sabbatical will allow me the ability to put all of the pieces together at once, so that I can complete the conversion with the thought and consideration it deserves, rather than in a piecemeal, time constrained manner.

Below, I will outline the tasks that are required for me to fully convert my Math 192 course to a mastery-based system. In part C, I have a clear breakdown of my time for each step of this process during my sabbatical.

1) Research mastery-grading implementations in mathematics and STEM classrooms.

As mentioned in question 2, I have done some introductory research about mastery-grading, how to convert a course, and various implementations used in different disciplines already. I feel that I have enough knowledge at this point to embark upon the journey of converting a course, and that I understand the steps needed to do so. However, I still want to learn more about specific implementations. I will seek out examples of college-level Calculus I courses and examine the structural details of the course, from the list of outcomes to the final grading structure and the methods of record-keeping (all of which are listed in the tasks below).

2) Create a set of clearly-defined, demonstratable learning outcomes for the course.

The student learning outcomes on the course outline of record guide the course curriculum and content. However, these official outcomes are general and contain multiple concepts or applications within each one; they are too broad in their current form to serve as the outcomes that provide the assessable structure of a mastery-based system. I will need to deconstruct the course SLOs into a set of between 20 – 35 individually assessable outcomes that are action-based, comprehensive, measurable, result in evidence of learning, and are bound to specific and important concepts. As I move through the other tasks, this initial list will continue to be revised and refined.

3) Create assessments and reassessments for each outcome.

Students will be given credit for demonstrating evidence of achieving each outcome in a classroom assessment setting, and when achievement is not demonstrated, students are given opportunities for reassessment. Depending on the final course grading structure (see step 5), an outcome may need to be demonstrated more than once during the semester. The majority of the assessment questions will be typical Calculus problems, including those that require conceptual explanation rather than quantitative analysis. If there are roughly 30 outcomes and I assume half of them need to be achieved twice, then I have roughly 45 assessment questions that serve as initial assessments - the first opportunity for students to demonstrate mastery. I then must factor in reassessments, which will require me to create multiple new problems of similar caliber on the same outcomes; these will not be the same problems with new numbers. Earlier course outcomes will require quite a few reassessment versions, since students will have more opportunities to take these reassessments. If I average 4 additional versions per original assessment question, that comes to roughly 180 reassessment questions that need to be created.

4) Research and design a course grading structure based on mastery to determine final grades in the course.

There are many examples of a final course grading structure based on mastery grading. I have already read and researched some examples of these structures in a College Bridge course on Standards Based Grading that I took last spring, as well as in the book Specifications Grading by Linda B. Nilson and the online blog Grading for Growth (gradingforgrowth.com). Some structures simply calculate the percentage of course outcomes mastered to determine the final grade, while others create "bundles" of outcomes achieved with other course tasks like homework reports or projects to create a list of requirements (sometimes called specifications) for each final course grade. Some structures may also bundle a group of outcomes that must be demonstrated together at the same time in a gateway assessment. For example, a Foundations Assessment towards the middle of the unit may assess six fundamental outcomes that students need to master before learning the next course outcomes. Students could be required to reassess the entire Foundations Assessment until at least 5 of 6 outcomes are successfully mastered on the same attempt, rather than reassess each outcome individually. Weekly homework is an essential part of learning Calculus, and how to incorporate credit for thoughtfully working through homework problems successfully is an aspect of mastery-grading systems that I need to explore more. I plan to continue to research specific examples used in college level math courses, specifically Calculus when available, in order to determine how I would like to determine final course grades, and then outline that structure in clear detail. This task will also require determining how to setup a final course gradebook, whether in Canvas or another system, that can track and communicate progress toward a final course grade to the students. It will also require producing clear documents that will be provided to students to describe the grading system.

5) Research and design a structure of assessments and reassessments that are manageable for the instructor and beneficial for the students.

As discussed in question 1, reassessments are a critical enabler of the mastery grading feedback loop: they give students the chance to learn from their mistakes and to show that they've improved their understanding. They also serve to reduce test anxiety and increase flexibility for the students' learning process. However, it is important that reassessment opportunities are not unlimited so the instructor is not overwhelmed with grading them and so students have time to complete the necessary work between attempts. To that end, I will plan an in-class assessment schedule that allows for timely initial attempts to demonstrate outcomes, without overwhelming the instructor workload. Students may also wish to reassess previously unachieved outcomes during student hours or other times outside of class, so I will also need to plan appropriate policies to accommodate students to do so. This task will also require creating an efficient and effective method of tracking standards' achievement and assessment attempts for the students. Traditional gradebooks are set-up to record scores on assignments and tests, not mastery of outcomes. Reassessments increase the complexity of tracking, as I will need to not only record when an outcome is mastered, but also when it was previously attempted and which version of the assessment was attempted. My own experiment in Fall 2022 taught me that this task is critically important.

Lindsey Lang

Name

PROPOSED OBJECTIVES AND EVIDENCE OF COMPLETION

(The Sabbatical Leave Committee will utilize this information as the basis for scoring Rubrics 5 and 6). Note that Rubric 6 regarding the "Proposed Evidence of Completion" is weighted twice that of all other rubrics.

Identify specific objectives and describe in detail the evidence that will accompany your report, which indicates that you have met each objective. The product of your approved sabbatical leave program will be subject to review by the Sabbatical Leave Committee at the time of making your final report. Examples follow:

Institutional study
Objective: *9 units of graduate level history courses as indicated on Form A will be taken at ... University.*
Evidence: *(Here you would describe the transcripts, class notes, exams, class projects, etc., you would submit as evidence of completing these units.)*

Travel
Objective: *Travel to archeological zones in Central America.*
Evidence: *(Here you would describe exactly what you plan to submit to document your sabbatical leave travel. You should specify the kinds of things you will present, like journals, artifacts, and slides, and you should give the committee an idea of the extent of the evidence by specifying the minimum number of slides, pages in a journal, number of museums, etc. If you so state, you must provide tangible evidence in your final sabbatical leave report that you have, in fact, written the minimum number of pages you proposed, visited the minimum number of archaeological zones you proposed, etc.*

Professional study and/or creative study
Objective: *Compose a musical score or write a textbook.*
Evidence: *(Here you would clearly indicate the scope of the project, including the minimum number of pages you plan to write, approximate length, an outline of the contents, description of the complexity, etc.)*

The Committee will rely on the information you provide in the evidence section to determine if you have met the contractual obligation of the leave.

Lindsey Lang

Name

INSTITUTIONAL STUDY
Form A

Name of Institution	*Place of Institution*

Period of Attendance	**UNDERGRADUATE LEVEL**	**GRADUATE LEVEL**
	☐ Semester units to be attempted* ☐ Quarter Units to be attempted **(Minimum 12 semester units)* **(Minimum 18 quarter units)* **Neither continuing education units (CEUs) nor courses taken from unaccredited institutions will be considered as Institutional Study. Please see Professional Study Form C.*	☐ Semester units to be attempted* ☐ Quarter units to be attempted **(Minimum 9 semester units)* **(Minimum 13.5 quarter units)* **Neither continuing education units (CEUs) nor courses taken from unaccredited institutions will be considered as Institutional Study. Please see Professional Study Form C.*

Accepted for Admission:

☐ Yes ☐ No ☐ Other

If "Yes," attach evidence of admission.
If "Other," explain:

List courses and unit value from the institution's catalogue. In case your choice of courses is not available, please indicate substitutions. (The Sabbatical Leave Committee will utilize this information as the basis for scoring Rubric 7. Be sure that the scope of your studies is clearly defined.)

** A full load is considered to be 12 semester units of undergraduate work or 18 undergraduate quarter units, or 9 semester units of graduate work or 13.5 quarter units at an accredited college/university.*

Lindsey Lang

Name

TRAVEL
Form B

Plan: Itinerary *(The Sabbatical Leave Committee will utilize this information as the basis for scoring Rubric 7. Be sure that the purpose, duration, and schedule of your travel are clearly delineated.)*

Place	Duration of Visit	Purpose

Lindsey Lang

Name

PROFESSIONAL STUDY AND/OR CREATIVE STUDY

Form C

(The Sabbatical Leave Committee will utilize this information as the basis for scoring Rubric 7. Units completed at any unaccredited and/or international institutions will not be considered. Be sure the kind and scope of your study methods, resources, and activities are clearly delineated. Include an estimate of the time that will be spent engaged in various activities.)

Objective: Create a complete mastery-based system, including objectives, assessments and reassessments, course grading structure, and record-keeping system for Math 192: Analytic Geometry and Calculus I.

Evidence: I have outlined the steps to create this mastery-based course in question 4 above. Here is my proposed weekly schedule:

Each week will constitute approximately 40 hours of research, writing (outcomes, assessments), designing and creating systems, structures, and documents to communicate those systems.

Week 1 - 4: Research mastery-grading implementations in mathematics classrooms and create a FLEX presentation. See step 1 of question 4. This research will build on the work that I have done already and will focus on finding examples of Calculus I and other STEM courses in higher education currently using mastery-grading. I will investigate the detailed objectives, course grading structure, and record-keeping mechanisms of these implementations. These examples will inform the many decisions listed in the tasks for the remaining weeks. As I work through and complete this research, I will design a FLEX presentation on mastery-grading with specific emphasis on STEM courses to offer for faculty beginning in Spring 2024. This FLEX presentation will discuss the drawbacks of tradition points-based systems, the benefits of mastery-based systems, different implementations of mastery-based systems in STEM classrooms, steps to convert a course to mastery-based grading, and resources for further information.

Week 5: Create a set of 20 - 35 clearly-defined, individually assessable learning outcomes for the course based on the student learning outcomes of record. See step 2 of question 4.

Week 6 - 7: Create assessments and reassessments for each outcome. See step 3 of question 4. This work will result in no less than 150 individual assessment questions.

Week 8 - 11: Design a course grading structure based on mastery to determine final grades in the course. See step 4 of question 4. Based on the research done in the first month of the project and the outcomes and assessments subsequently created, I will design the course structure for how grades will be determined that answers the following questions:
How often is each outcome required to be demonstrated?
Is this number consistent for all outcomes or are some outcomes required to be demonstrated more than others?
Are any outcomes bundled together in a quiz that requires a minimum number of outcomes mastered to be passed? See the example of a Foundations Quiz in Step 4 in question 4.
How will weekly homework assignments be awarded credit and how will that credit factor into the final course grade?
How does my department's requirement of a comprehensive final exam during finals week (an exam that cannot be revised or reattempted) factor into the grading structure for the course?
How does a student earn each of the letter grades for the course?

Week 12 - 13: Design a structure of assessments and reassessments that are manageable for the instructor and beneficial for the students. See step 5 of question 4. I will design an assessment structure that includes the following:

How often are in-class assessments conducted and at what points in the curriculum?
How often are students allowed to reassess specific problems/outcomes?
Does a student have to fulfill any specific requirements in order to reassess, for example some type of work or form documenting time spent working towards mastery?
How will students who wish to reassess outside of class be given equal opportunity to do so, regardless of whether they can attend Student Hours?

Weeks 14 – 16: Design and set-up record-keeping structures for assessments, reassessments, and final course grades. Once all of the pieces of the course are determined, I must create efficient structures for managing and tracking course requirements. As mentioned in question 4, gradebooks in Canvas and on other software are not set-up to do this, so I will need to use the research from the first month of this project and my own experience from FA22 to design and create these structures for myself. Specifically, I will design the following:
A system that tracks student achievement of course outcomes.
A mechanism for tracking reassessments of outcomes.
A structure that records student progress toward a final course grade that can be shared with and communicated to students following FERPA laws.
Student-facing documentation describing the structure and policies of the course grading system to be provided to the students at the beginning of the course with they syllabus.

References

Benson, T.H. (2006, April 14). The 7 deadly sins of students. The Chronicle of Higher Education. Available at http://chronicle.com/article/The-7-Deadly-Sins-of-Students/46719/

Butler, R., & Nisan, M. (1986). Effects of no feedback, task-related comments, and grades on intrinsic motivation and performance. Journal of Educational Psychology, 78(3), 210.

Nathan, R. (2005). My freshman year: What a professor learned by becoming a student. Ithaca, NY: Cornell University Press.

Nilsen, L.B. (2015). Specifications Grading: Restoring Rigor, Motivating Students, and Saving Faculty Time. Sterling, VA: Stylus Publishing, LLC.

Singleton-Jackson, J.A., Jackson, D.L., & Reinhardt, J. (2010). Students as consumers of knowledge: Are they buying what we're selling? Innovative Higher Education, 35(4), 343-358.

DVC
DIABLO VALLEY COLLEGE

February 3, 2023

To the Sabbatical Committee:

The Mathematics Department at the Pleasant Hill Campus strongly supports Lindsey Lang in her request for a sabbatical project. The past few years have seen numerous changes to the mathematics program including the loss of basic skills courses due to AB705, the launch of Guided Pathways, and learning loss due to the pandemic. The department has struggled to keep up with the increasing demands from students and their various needs.

Recognizing these challenges, Lindsey recently undertook a course in mastery grading. Lindsey wanted to find ways to support her students and motivate them to succeed. Encouraged by the concept of students taking responsibility for their learning, she ran a pilot of her work in the fall semester of 2022. Lindsey designed multiple forms of assessment for her students in one of her courses, Math 192, with great success. However, mastery grading requires a significant amount of work from the instructor to successfully implement across the entire course. While Lindsey's pilot on her 192 class was successful, her work was not complete. Lindsey is hoping to continue her work in re-designing her Math 192 course to include student-focused mastery grading through her sabbatical project. She intends to share her efforts with other members of the department who may be interested in utilizing a similar technique.

The Math Department is happy to support Lindsey in her pursuit of incorporating mastery grading into her calculus course. The department unanimously approved Lindsey's sabbatical project on February 1, 2023. We look forward to seeing the work that she develops and sharing it with the department.

Sincerely,

Julie Walters
Department Chair
DVC Mathematics