GradeSync: A Tool for Automating Incomplete Processing to Support Mastery Learning

Manan Bhargava
University of California, Berkeley
Berkeley, CA, USA
manan.bhargava@berkeley.edu

Mehul Gandhi
University of California, Berkeley
Berkeley, CA, USA
gandhi@berkeley.edu

Eemon Qayumi
University of California, Berkeley
Berkeley, CA, USA
eemonq@berkeley.edu

Victoria Phelps
University of California, Berkeley
Berkeley, CA, USA
jedi_force@berkeley.edu

Zixuan Zhang
University of California, Berkeley
Berkeley, CA, USA
lynn_kkcz@berkeley.edu

Naveen Nathan
University of California, Berkeley
Berkeley, CA, USA
naveen.nathan@berkeley.edu

Connor Bernard
University of California, Berkeley
Berkeley, CA, USA
connorbernard@berkeley.edu

Dan Garcia
University of California, Berkeley
Berkeley, CA, USA
ddgarcia@berkeley.edu

Abstract

Incomplete grades are given to students who are unable to finish work in a given term, typically for medical reasons. Teaching assistants (TAs) typically oversee the management of processing incompletes for these students the following term. This involves communicating both deadlines and remaining work, entering project and exam updates into the previous semester's grade book, calculating course grades, and passing that information to the previous instructor, who shares it with the registrar. This remarkably manual process is quite daunting for instructors who would like to allow students to work beyond the term to achieve mastery in the course by temporarily assigning them an incomplete grade. This deters CS classes from offering incompletes to support mastery learning.

We are developing **GradeSync**, a microservice architecture in development for processing incompletes, capable of entirely removing humans from the loop. This microservice is built for the **Gradeview** platform [1]. Its primary purpose is to reduce staff workload through automation, enabling courses with lower staffing budgets to implement flexible policies regarding incompletes. By supporting post-term project completion, the system promotes equity, allowing students the time they may need beyond the semester to achieve mastery. In this poster, we will explore the system's implementation and its potential impact on faculty workload and student success.

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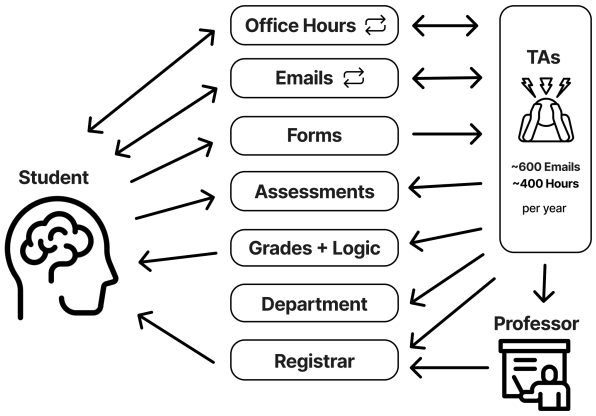

Figure 1: Current manual model for processing incompletes

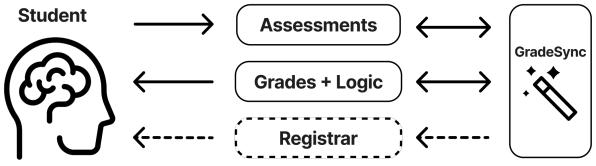

Figure 2: Automated system for processing incompletes. (dashed lines indicate future work)

1 Background

When a student cannot complete a course for reasons out of their control (often related to a medical issue), they are allowed to receive an Incomplete (I) grade. The student does not re-register for that course; they instead work closely with the following term's course staff to understand both the scope of their remaining work as well as the procedures and deadlines for adequate course completion. The

course staff (typically TAs assigned specifically to support Incomplete students) then updates the grades in the previous semester's grade book, calculates the incomplete students' final grades, and notifies the instructor, who must then send the final grade to the registrar as shown in Figure 1.

Research has shown that adopting a mastery learning approach can improve student performance and overall learning experience [3, 4]. However, traditional grading structures are limited to a *single term*, restricting the students' ability to achieve mastery. In a seminal paper about mastery learning, one author argues that that students need to have *"time allowed for learning, the key to mastery."* More recently, courses are beginning to offer post-term mastery learning opportunities, using the Incomplete grade as a mechanism to signal "the students' mastery of the material is *incomplete*" while allowing them to continue working [2].

However, as the number of students who receive incompletes grows, the associated workload for course staff increases dramatically. We estimate that processing medical and mastery-based incompletes for CS0, a single course of ~200 students/term, currently consumes 10 hours/week on average over the course of a year totaling $15,000 annually.

To manage the scaling and cost issues — and ensure Incompletes can be processed efficiently — we are developing *GradeSync* to streamline this process. With our system, we hope to tackle the following questions:

(1) How can we create scalable and dynamic software to minimize the workload for teaching assistants and faculty who currently process post-term assignment completion and grade updates?
(2) How can we make post-term extensions more generalizable and accessible to other courses?

2 Manually Processing Incompletes

Currently, to manage student grades for each semester, CS0 uses instructor-facing Google Sheets as a database. The current system for resolving incompletes requires: (1) continuous manual grade revisions throughout the term and (2) communicating incomplete extension deadlines and grade statuses clearly with students.

To support post-term assignment submissions, TAs pull data from multiple Learning Management Systems (LMSs) across all terms with incompletes. When an incomplete student submits work on Gradescope, the student must also submit an "assignment completed" form to notify course staff of the update. Course staff must then personally update the master grade sheet which leaves room for manual error. Students are also allowed to retake exams; when the exam is over, the TA processes the results, exports the grades, and push the new data to Google Sheets.

Historically, this takes significant time and effort by CS0 course staff. Additionally, since there is no present way for students to view their grades, owing to the decentralized, disjoint system, CS0 course staff are peppered with emails about grade statuses.

3 Automatically Processing Incompletes

As illustrated by Figure 2, we are developing **GradeSync** to entirely remove TA and instructor interaction from the process. When a student completes an assignment from previous term, they log into GradeSync, select their class, term, and project, and click "update." GradeSync then queries the LMS that hosts the assignment to get the updated assignment grade. It then forwards the updated grade to the course's master grade database, returning the student's updated course letter grade. When the student has completed all incomplete assignments, GradeSync will push the final letter grade to the registrar through a third, secure API call. The student would receive notification that their course grade has been updated and passed on to campus for processing.

The new system for resolving incompletes has the following benefits: first, it eliminates the need for "assignment completed" forms due to the integrations with existing LMSs. Second, it eliminates all manual grade updates and related emails between the students and TAs. Finally, it eliminates the need for the TA to manually fill out an incomplete extension and a completion form that is typically sent to the department for approval of post-term grade updates.

We presently have developed a prototype web app that provides a student-facing user interface capable of pulling data from GradeScope and PrairieLearn, and pushing that data into a Google Sheet.

4 Future Work

We plan to test GradeSync in our pilot CS0 class and collect student feedback. Comparing data on student's performance with and without GradeSync will give us more insight into the effects it has on student motivation and learning outcomes. In addition to analyzing grades, we plan to administer pre- and post-term surveys to capture feedback. We will conduct focus group interviews with students to understand how GradeSync can affect students with disability accommodations or underrepresented minority groups.

5 Conclusion

We hope GradeSync will serve as an "office automation" tool to increase efficiency when processing incompletes. Reducing this friction may lead to more classes allowing students to take incomplete grades as an option for students to master their course work post-term. This could promote educational equity on a larger scale, ultimately benefiting a broader range of students and reducing the administrative burden on educators.

6 Acknowledgements

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