

Reading Between the Lines: Student Experiences of Resubmission in an Introductory CS Course

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Leah Perlmutter is a PhD candidate preparing for a career teaching undergraduate CS, and was a TA for one of the courses in this study. Holder of a bachelor's degree in CS, she recognizes the CS education system as a gatekeeper to the individual, collective, social, political, and economic power that comes with programming skills. She is white and culturally Jewish.



Jayne Everson is a white woman who brings a critical lens to STEM education, a PhD student with 2 years of computing education research, and 11 years of math, engineering, and computer science secondary classroom experience.



Ken Yasuhara is an educational developer who has worked with both instructors featured in this paper and sees his role as promoting partnership between educators and students. He has a Ph.D. in CSE and 15 years of experience with mixed-methods research in engineering education. His past work has examined gender in CS but is new to the broader literatures relevant to equity in CS education. He identifies as Japanese American.



Brett Wortzman was the instructor for two of the courses in this study. He is a white male teaching professor and holds degrees in computer science and education. He values pedagogical choices that remove systemic barriers to success for students.



Kevin Lin is an Asian male teaching professor in computer science, and the instructor for one of the courses in this study. His teaching philosophy grew out of a desire to ensure that all students could not only participate in the computing community, but also reauthor CS to realize their own values and purposes. This equity framing inspires his current research directions in critical, reflexive, justice-centered, and culturally-responsive teaching practices.

Motivation

Student engagement, motivation, and experiences in our courses can be shaped by the design of our **assessment ecology** [4]: *the social power, relationships, environments, actions, and effects of human activity in the assessment environment*.

Traditional, single-attempt, points-based grading that averages student performance over time can increase anxiety and avoidance of challenging courses [2] and reinforce negative self-assessments of ability [3].

Traditional grading often involves normative value judgments that are incompatible with frameworks for moving "beyond equity as inclusion" [1] toward **rightful presence**: *justice-oriented education predicated on making present the political struggles that students embody and experience*.

If we want to design STEM classrooms that make space for more justice-oriented teaching and learning, a necessary first step is to transform our grading practices

Research Questions

What reasons do students choose for resubmitting?

What is the resubmission experience like for students?

In what ways do resubmissions make space for students to belong?

References

- [1] Angela Calabrese Barton and Edna Tan. 2020. Beyond Equity as Inclusion: A Framework of "Rightful Presence" for Guiding Justice-Oriented Studies in Teaching and Learning. *Educational Researcher* 49, 6 (Aug. 2020), 433–440. <https://doi.org/10.3102/0013189X20927363>
- [2] Kelsey Chamberlin, Mai Yasué, and I-Chant Andrea Chiang. 2018. The Impact of Grades on Student Motivation. *Active Learning in Higher Education* (Dec. 2018), 1469787418819728. <https://doi.org/10.1177/1469787418819728>
- [3] Jamie Gorson and Eleanor O'Rourke. 2019. How Do Students Talk About Intelligence?: An Investigation of Motivation, Self-Efficacy, and Mindsets in Computer Science. In *Proceedings of the 2019 ACM Conference on International Computing Education Research*. ACM, Toronto ON Canada, 21–29. <https://doi.org/10.1145/3291279.3339413>
- [4] Asao B. Inoue. 2015. *Antiracist Writing Assessment Ecologies: Teaching and Assessing Writing for a Socially Just Future*. The WAC Clearinghouse; Parlor Press. <https://doi.org/10.37514/PER-B.2015.0698>
- [5] Robert Talbert. 2017. *Specifications Grading: We May Have a Winner*. <http://rtalbert.org/specs-grading-iteration-winner/>

Resubmission and Grading Policy

We hope to produce grades that reflect what a student knows at the end of the term, rather than mistakes made in the learning process.

- Written feedback is provided for all assignments
- Rubrics are published to students with expectations for each possible grade
- Grading scale for smaller assignments:

S	N
Satisfactory	Not Yet

- Grading scale for larger assignments:

E	S	N	U
Exemplary	Satisfactory	Not Yet	Unassessable

Sometimes, one ESNU grade for each of several dimensions on a given assignment

- **After initial feedback students can resubmit each assignment as many times as they chose**
- The new grade replaces the old grade
- One resubmission opportunity per student per week, to manage staff workload
- Final grades are based on bundles published at the start of the term, for example:

To earn at least a 2.5, you must earn

- At least 30 total S's or better and no U's on take-home assessments
- S on at least 5 checkpoints
- S on both culminating assessments
- S on at least 4 reflections

- Based on Robert Talbert's model for Specifications Grading [5]

Selected Interview Findings

Impacts of Resubmission

Lowering The Pressure

It's okay if I screw it up this time, at least I can go fix it ... I felt a little bit, you know, safe because I could always resubmit it again. -- S6

Focus on Learning

The general energy from the course was definitely a lot lighter and I think part of that does have to do with the focus on student learning ... by talking about pedagogy it shows like a sense of care ... enabled more learning and more you know, actual engagement with the content rather than freaking out about everything. That was really nice. -- S4

Students looked at their feedback

When there is no opportunity to resubmit, students often ignore feedback, according to instructors

Limitations of Resubmission

Resubmissions alone can't create space for CS identity and belonging, but collaboration and relationships can

I was pretty stressed and I think a lot of my friends were really stressed that like about the whole collaboration and academic honesty stuff ... So if I had questions I'd go to office hours. But for [another class] it was all collaborative and I got to work with two informatics friends and we became really good friends... I sent it to my friends, was like, "hey look at this website that I made!" -- S2

Survey Findings

Feedback provided on graded assessments helped me understand how I could improve my work.

94% Agree or strongly agree
573 responses



What were your primary reasons for resubmitting?
418 open ended responses, coded inductively

Resubmission Reasons

To raise grade
To correct, improve, complete work
To improve style, correct comments
Ran out of time for first submission
To increase coding confidence
To learn
Guided by TA feedback

- Just under a third of students mentioned a higher grade as their sole reason
- Over half of the students mentioned improving or completing their assignment among their reasons

For assignments you chose NOT to resubmit, what were your primary reasons for not resubmitting?
219 open ended responses, coded inductively

Reasons for NOT Resubmitting

Grade maxed out
Satisfied with grade
Not applicable resubmitted all
Nothing to fix or improve
Satisfied with learning
Did not improve work
Insufficient time/motivation to resubmit work
Forgot to resubmit
Prioritizing another resubmission
Ran out of resubmissions
Consideration of TAs time
Guided by TA feedback