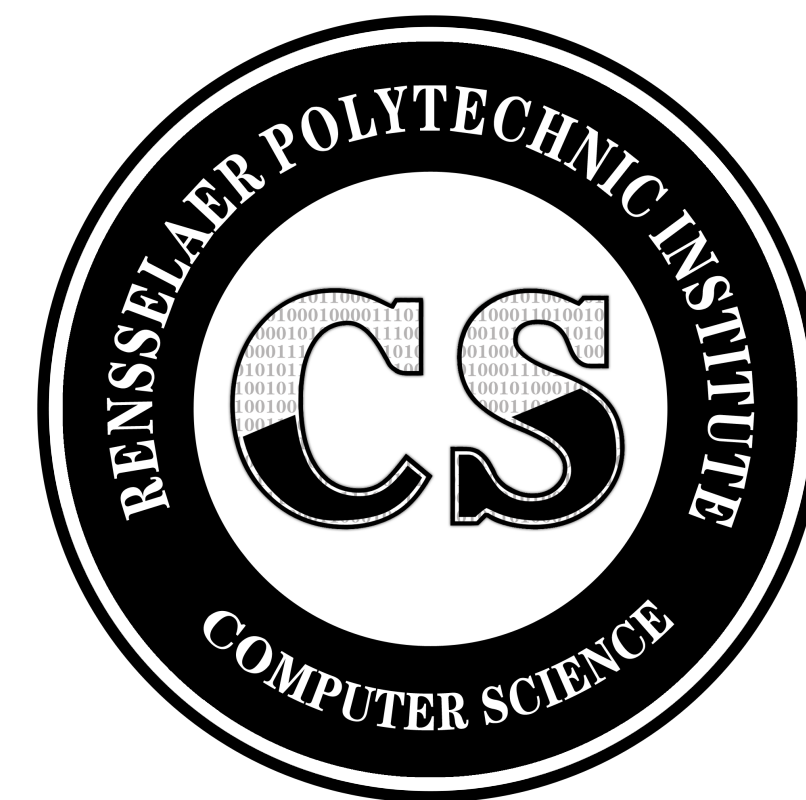




A Flexible Late Day Policy Reduces Stress and Improves Learning

Jeramey Tyler, Matthew Peveler, Barbara Cutler



Abstract

We present a non-grade-penalty late day policy used in many of the large lecture, required courses in our computer science department. We study the effectiveness of this late day policy in reducing student stress, distributing demand for teaching assistant resources in peak hours before the homework deadline, and in maintaining or improving student understanding and homework grades. A complex late day policy can be efficiently implemented and managed within our open-source homework submission system, Submittity, that utilizes automated testing and grading, allowing students to submit and resubmit homework as they make progress on the assignment.

A Typical Late Work Policy: Accept (but discourage) late submissions. Apply a small percentage score penalty per day after the original deadline.

Our Non-Penalty “Late Day” Policy: Each student is given a fixed number of “late days” at the start of the term. Students may use these late days as they need them to submit a homework assignment after the deadline for no score penalty.

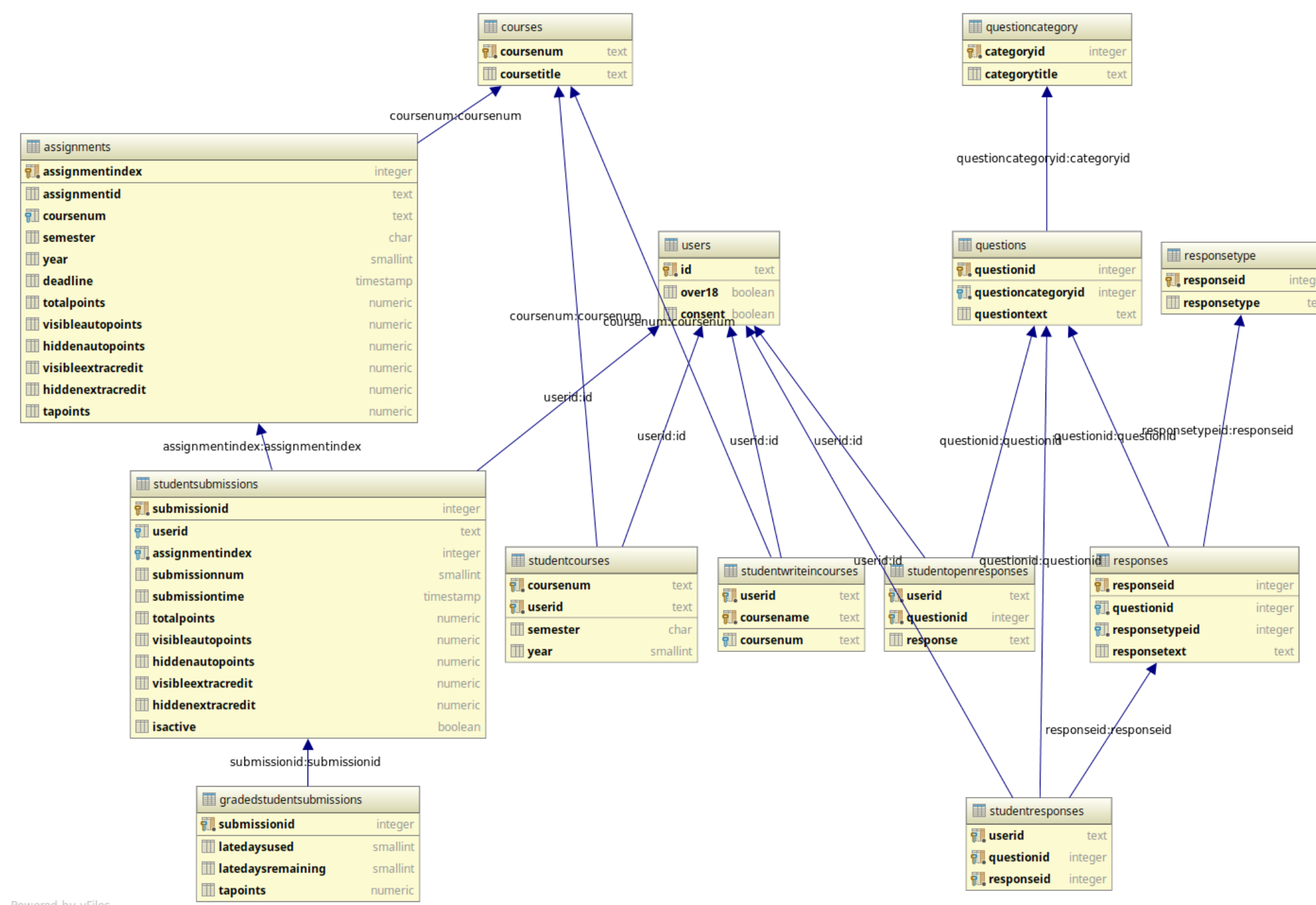
With our penalty-free late day policy we believe students are more likely to complete the assigned work for the targeted material. *We believe this policy is both compassionate and empowering to our students.*

Methodology: Student Survey & Anonymization

- Detailed, 30 minute survey with general and course-specific questions on electronic homework submission, homework resubmission, automated grading, and late day policies..
- Emailed survey invitations to 2,300+ recent students who had used Submittity.
- Received 707 valid responses to the survey.
- We anonymized the survey results and the archive of old submissions and auto-grading results using the same mapping from username to anonymized string.
- We scrubbed the contents of the files to remove all first names, last names, usernames, and student ID numbers that students may have used in their code.

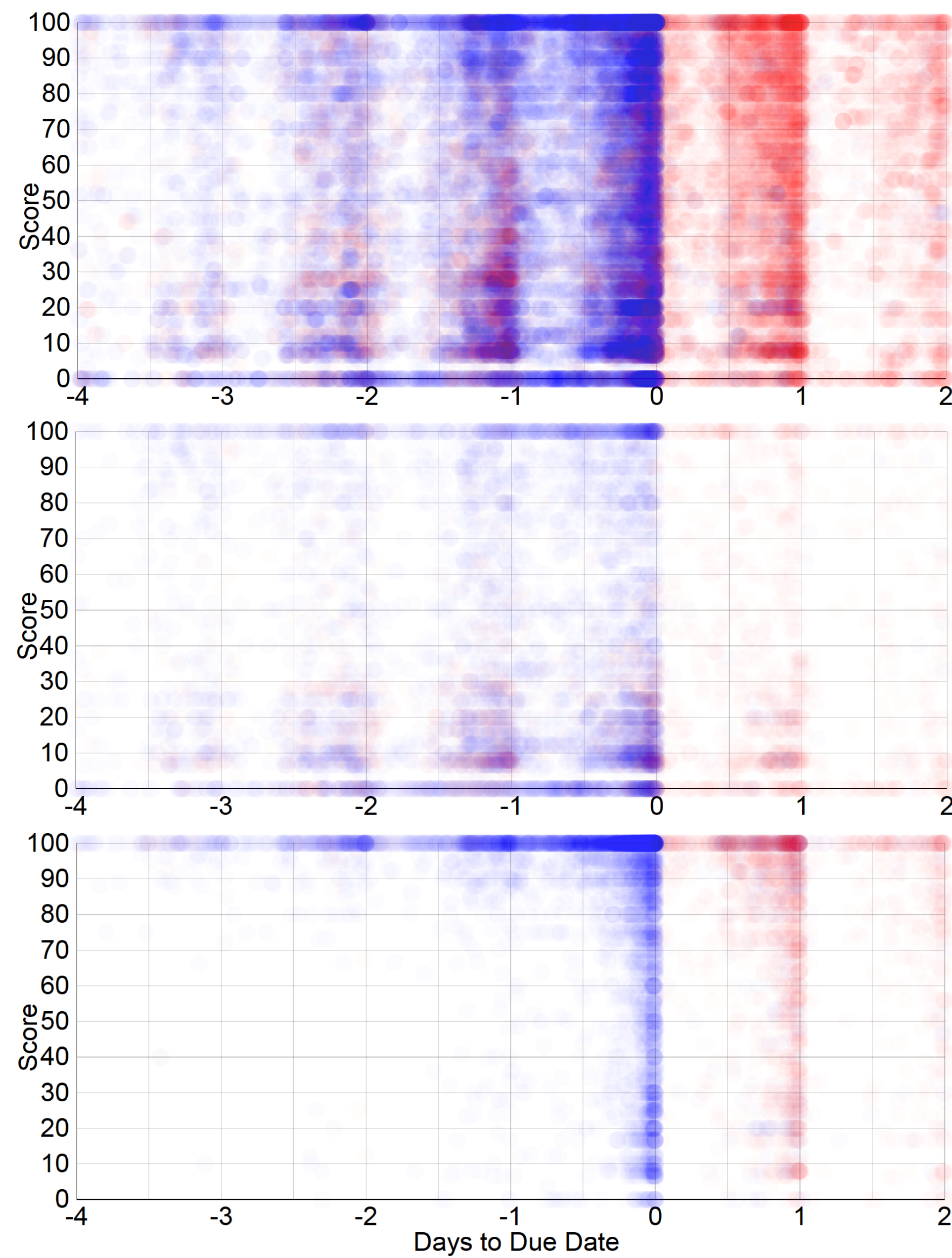
Methodology: Database

We created a database of the anonymized survey responses and submission history. From this information, we can examine how our students utilize different features of our system such as resubmissions and late days.

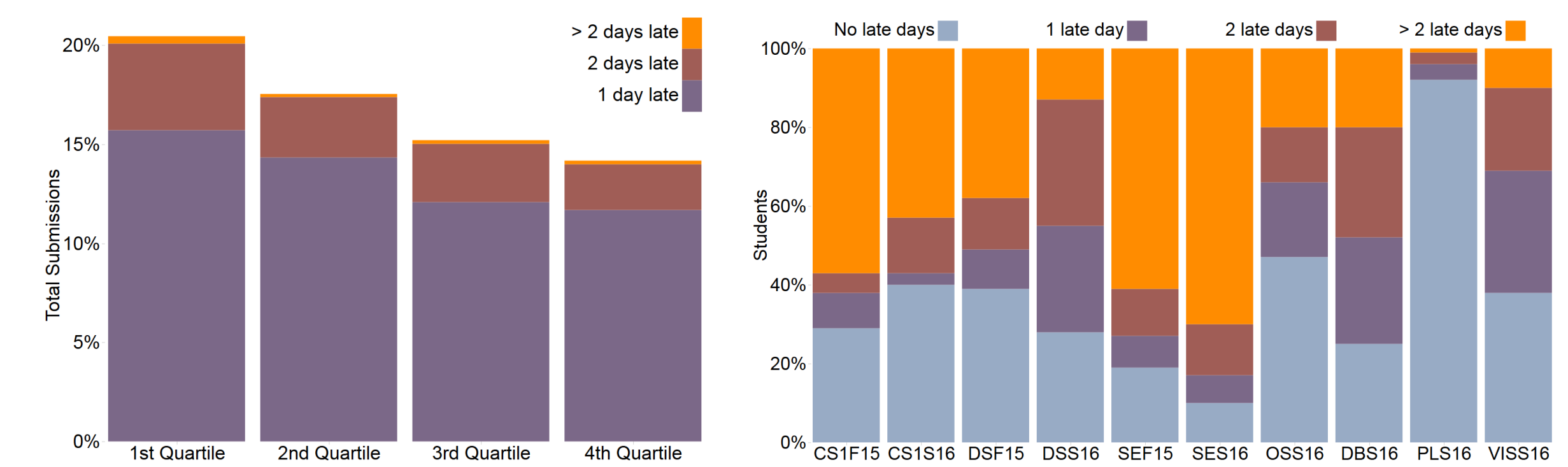


Submission Data

We present a scatterplot of autograding score vs. submission timestamp of nearly 45,000 submissions over 2 semesters. All submissions for assignments with a final submission one or more days late are colored red, all others are blue.



For each homework assignment for each course, we sorted the homeworks by score (autograding and TA) and then separated the homeworks into 4 quartiles. For each quartile we counted the number of homeworks that were submitted using no late days, one late day, two late days or more than two late days.



Next, we plot the cumulative number of late days used by students in each course. We note that as the curriculum progresses from freshman year courses on the left to junior/senior electives on the right, students tend to need/use fewer total late days.

Survey Responses

How, when, and why they used their late days:

- 52% said they had used late days only when they needed to
- 48% said they saved them for the busy weeks or difficult assignments
- 29% said they used them to try to get more points
- 18% said they had used them for minor illnesses
- 17% used one due to confusion over instructions
- 6% used one due to a hardware problem.

Common reasons for using late days:

- “I used [late days] when I was going through a stressful week.”
- “Occasionally I just got started on the homework too late and couldn’t finish in time.”
- “Saving [late days] for difficult parts of the semester is what it’s all about even grades in other classes are affected by my use of late days in a positive way!”
- “I used my late days towards the end of the semester to space out my assignments and allow for some social time.”

Advantages to having late days:

- 79% said they allow them to balance their workload
- 69% said they allow them to figure out unexpected errors on Submittity
- 26% said they allow them to work on extra credit
- 26% admitted they are not very good at time management.

Late days reduce stress:

- “Just knowing I have late days left helps reduce a lot of stress.”
- “Knowing I have them makes homeworks less stressful.”
- “They give a sense of security, knowing that if I do have minor errors on an assignment, I can go to office hours the next day and get more help.”

Ongoing Submittity Work

- Development of automated grading modules
- Visualization of our plagiarism detection module
- Improve error and warning messages given to students
- Display submission & grade statistics
- Penetration testing and security improvements
- Add pdf annotation for TA grading
- Seating charts for exams
- Expand system to additional courses in our department, to other departments at RPI, and to other universities

Acknowledgments

- Red Hat Software
- Rensselaer Center for Open Source (RCOS)

Extension: Electronic Clickers Incentive

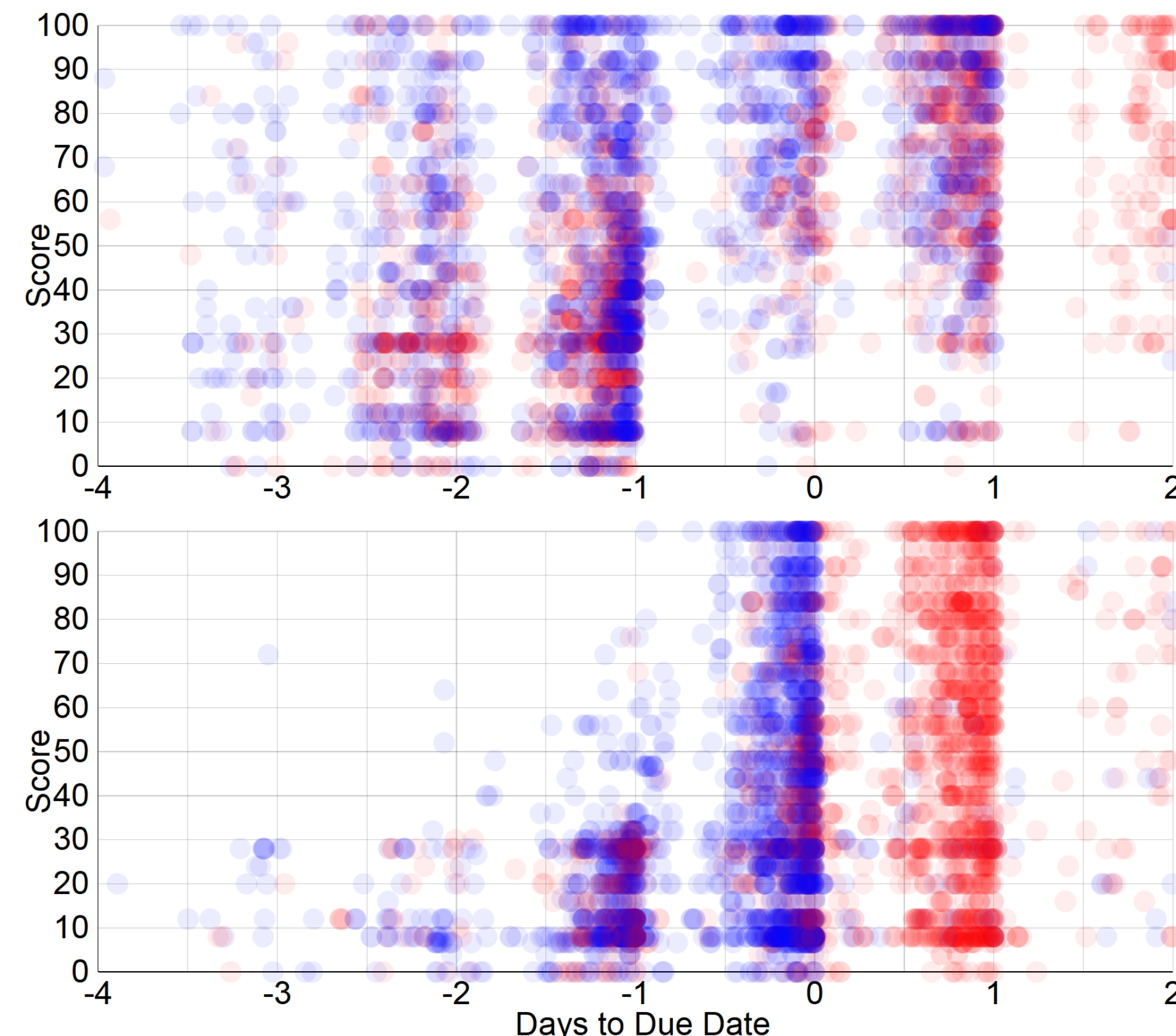
In our Data Structures course, we now use short multiple choice electronic clicker exercises during lecture. Rather than tie a direct percentage of the course grade to participation or accuracy of response, we reward regular participation in clicker exercises with additional late days.

In Fall 2016, of the 193 students on the final registration list:

- 166 earned an additional late day
- 120 earned two additional late days
- 69 earned three additional late days
- 106 students used one or more of the extra clicker-earned late days

Extension: Early Submission Incentive

A second late day policy offers an incentive that if students submit a draft of their solution early and Submittity validates that they have made *substantial progress* on the homework at least 24 hours before the main homework deadline, they are granted a one day extension on this deadline.



The above figure shows the submission autograde score vs. timestamp for five Data Structures homeworks with the early submission incentive over two semesters. Students who earned the requisite autograde score on Submittity at least 24 hours before the deadline, were given a 1 day deadline extension.

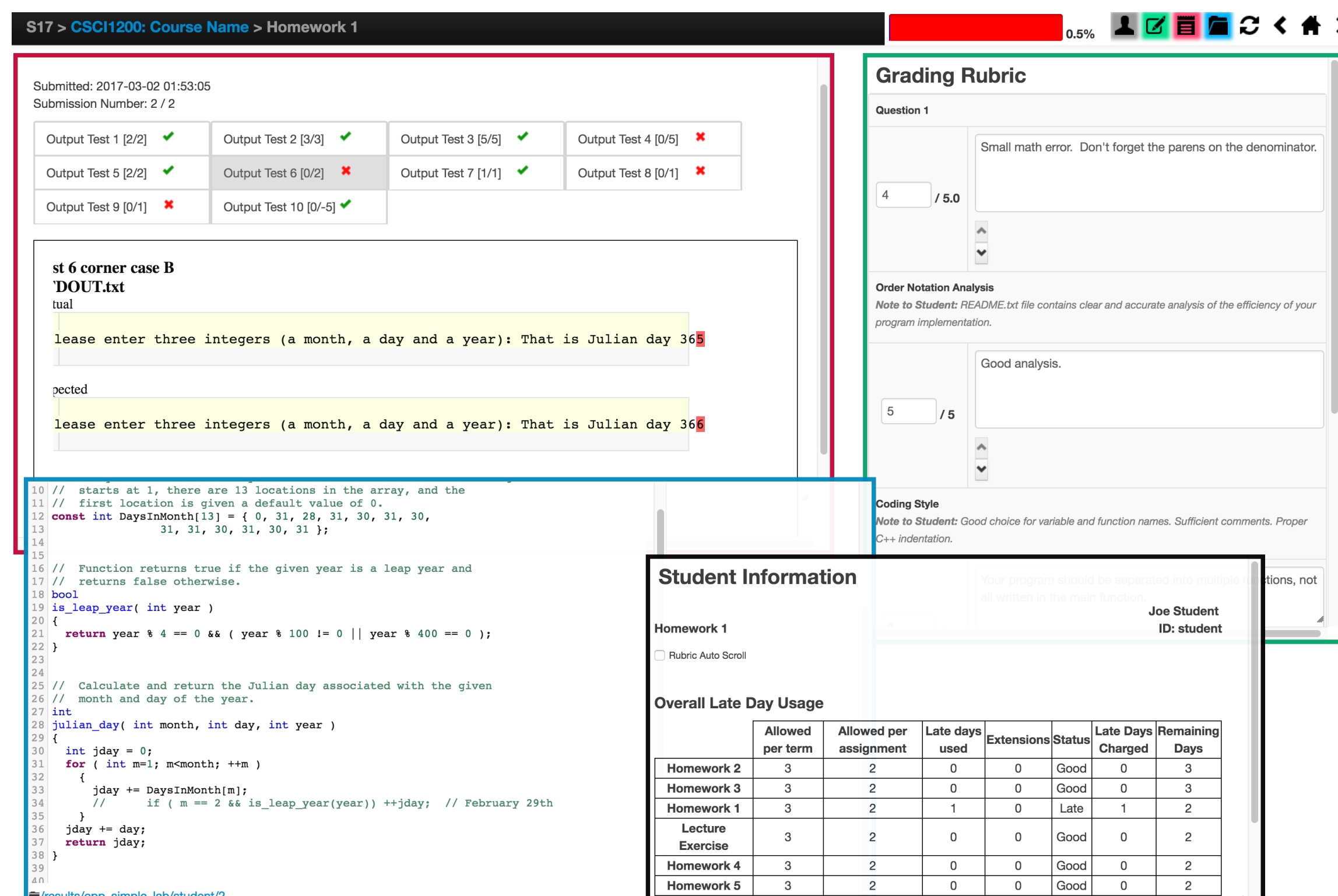
Many students who earned the target score did take advantage of the extra day. A small number used an additional late day to perfect their work. Few of the students who did not earn the extension started much more than 24 hours before the deadline.

Advantages of the Early Submission Incentive:

- 58% said that the incentive to earn a 1 day extension had encouraged them to start the homework early
- 14% said the incentive did not make a difference, since they usually finish their homework early anyway
- 47% thought it was a great idea and should be available on more or all homeworks
- 24% thought the target autograde score was too high, and that the goal should be adjusted to be more achievable.

Submittity <http://submittity.org>

Submittity is an open source programming assignment submission system from the Rensselaer Center for Open Source Software (RCOS), launched by the Department of Computer Science at Rensselaer Polytechnic Institute.



Other Submittity Research

- User Experience and Feedback on the RPI Homework Submission Server*, Wong, Sihsobhon, Lindquist, Peveler, Cutler, Breese, Tran, Jung, Shaw - Poster, SIGCSE 2016
- Using Static Analysis for Automated Assignment Grading in Introductory Programming Classes*, Breese, Milanova, Cutler - Poster, SIGCSE 2017
- Submittity: An Open Source, HighlyConfigurable Platform for Grading of Programming Assignments*, Peveler, Tyler, Breese, Cutler, Milanova - Poster SIGCSE, 2017