Covid-19 and high school grades: An early case study

Harrison Schramm, Isaac Rubin and Norah Schramm investigate the impact distance learning may have had on the grades of students at a California high school

Education, like many areas of society, has been disrupted by the Covid-19 pandemic. Teachers and students have had to adjust rapidly to new distance learning models of schooling, and in-person exams have been cancelled in many parts of the world. But, while Covid-19’s impact on society has been a focus of research in both statistical (bit.ly/3dLBGzt) and broader operational research outlets (bit.ly/37MhXM8), to the best of our knowledge none of these publications so far has addressed the impact that changes to education have had on student grades.

It may be a while yet before this question can be answered comprehensively. However, we decided to conduct our own study focused on one school: Pacific Grove High School (PGHS), located on the Monterey Peninsula of California. PGHS has approximately 600 students in grades 9–12, generally representing students aged 14–18. The school is part of the Pacific Grove Unified School District (PGUSD), which opted to go to “all virtual” teaching on 13 March 2020 in response to the pandemic.

As the transition between in-person and distance education happened during a semester, PGUSD initially adopted a “hold harmless” policy, meaning that the grades of individual students could be improved, but they could not decline from where they were at the point of transition. As the 2021 school year began in August 2020, students returned to class with an updated policy: grades earned in a virtual environment would be grades of record, and the hold harmless policy was no longer in effect.

For our study of PGHS students, we set out to understand how the change in instructional delivery impacted the distribution of grades. We recognise, of course, that grades are only part of the story. In the future, we hope that the statistical community at large will be able to address the question: how has the quality of education been impacted by moving to an all-online format?

The authors share the sense that the educational experience online is fundamentally different than in-person schooling, but the true effect of this on learning will not be visible for years to come. Grades are the effect that is measurable today. Furthermore, the comparison of grade distributions of different schooling formats will allow educators to be more informed as they continue to adapt to distance learning.

The educator’s perspective

Distance learning provides a variety of challenges in assigning grades, but the most significant one concerns accurate and reliable assessments of student learning. Many educators acknowledged the inability to perform in-person assessments at the beginning of the school year and adjusted the weighting factors composing a grade accordingly by increasing the relative value of participation and assignment completion. One consequence is that students who are naturally active in class or timely with their work may gain a net advantage, while students who shy away from participation or do not embrace submission of timely assignments — but still perform well on examinations — see a net decline. As standardised tests are being phased out in California (nyti.ms/3qSAle0), there may be a lasting advantage for outgoing, proactive students and a disadvantage for the “good testers”.

Students may also be advantaged or disadvantaged based on their access to technology. PGUSD has a policy to loan computers and wi-fi hotspots to students who do not have them at home, while students engaging in online learning have their browsers managed by PGUSD in order to prevent them from, say, looking up answers. However, there is no reliable control for students with multiple devices — meaning that those who have access to more than one device may be at an unfair advantage. This advantage is likely to favour students from higher socioeconomic backgrounds.

The PGHS data set

Our data is comprised of approximately 40,000 records,

Figure 1: Average grades across the core course areas for PGHS. S1, S2 represent the semesters. Hold harmless is 2020S2, and Distance is 2021S1. Note: grades assigned include fractional (+/-) marks, but PGUSD does not use these in the computing GPA. Secondly, PGUSD assigns an extra point to so-called “honours” courses. We do not draw this distinction here. Therefore, the GPAs we compute with this data may not agree in detail with those computed by the school.
each representing a grade received by a single student in a given course per semester, with gender and grade-level data from the 2016 school year to the autumn of the academic year 2021 (September–December 2020). Thus, a student taking six courses in a semester is represented by six records of data. The data is anonymised in the sense that student identifiers have been removed, limiting the ability to make inferences at the student level, and we are not able to make correlations between a student’s performance in one course against others. We analyse this data set using the R statistical programming language (r-project.org) and a technical compendium containing the executable code used in this analysis is available at bit.ly/3aT31hb.

Generally, we find that grades have slightly improved during both the hold harmless and distance learning periods in PGHS’s core courses (Figure 1). The highest average grades were seen during the hold harmless period, but grades also remained above their historical averages in each category during the distance learning period.

Examining average grades does not tell the whole story, though. For example, a lift in average grades could equally be achieved by every student doing slightly better, or a few students doing substantially better. Figure 2 explores the fraction of grades given out in the “tails” of the grade distribution, by educational regime, gender and grade level (i.e., school year group). Generally speaking, distance education appears to have stabilised the gender difference in D and F grades, while both hold harmless and distance education seem to have resulted on average in higher grades for female students than males.

One question we cannot answer at this time is the impact that distance learning may have had on students of different socioeconomic backgrounds. As noted earlier, access to technology and multiple devices may have granted advantages to some students over others, but due to privacy concerns we do not have demographical data beyond gender in this data set.

The student’s perspective

Students can feel that distance education increased the emphasis on grades, and that multiple online platforms updated in near real-time gave them the ability to gauge their performance. Students perceive an increased emphasis on timeliness and completion of assignments. It is our informed opinion that the students (and their families) who aggressively tracked these systems performed better as a whole.

As with educators, students also saw a change of emphasis from assessments (exams) to note-taking and homework completion. Many saw this as a positive change, alleviating test anxiety and making students feel more secure in their own abilities. Pressure to perform remains from parents, peers, or even the students themselves.

For the authors, the online experience has been a net positive, but we are aware that this is not universal. One major loss with the online format is the ability to form and maintain peer-to-peer relationships. Teachers have encouraged this by placing students in breakout rooms during virtual meetings, but oftentimes students do not talk among themselves.

Conclusion

This is a first exploration into what will be a long-lasting societal issue. We are surprised to observe that grades have increased overall, as this was not our a priori hypothesis. A key line of inquiry that remains is to explore performance at the individual student level. Given more detailed data, it is our expectation that success and failure in distance education is highly correlated between courses, and that we may be able to identify those sets of students for whom online education is especially problematic in the hopes of creating intervention strategies. Additionally, it will be interesting to observe how the grade distribution changes once – eventually – schools return to the traditional in-person format.

Ultimately, though, the long-term impact of distance education will not be fully observed until these students complete their educations and move into the workforce.

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Note

The data used herein is solely the property of PGUSD.

Disclosure statement

The authors declare no conflicts of interest.

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