Live Instruction Predicts Engagement in K–12 Remote Learning

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How does live instruction relate to student engagement in distance learning? Does the relationship differ across grade levels? This study addresses these questions by examining data from a random sample of families from a large urban school district in southern California. We find a strong correlation between live instruction and student engagement in online learning among elementary school students, with every additional hour of live instruction per week increasing the probability of reporting that students have completed all their schoolwork by 26%. The correlation is also significant though smaller in magnitude for middle and high school students.

Keywords: at-risk students; computers and learning; COVID-19; descriptive analysis; digital divide; distance learning; educational policy; educational technology; equity; live instruction; regression analyses; survey research; technology

Live instruction during the COVID-19 pandemic has required students, parents, and schools to work with educational technologies they may be unfamiliar with. Low-income families in particular have been shown to be more concerned with their children falling behind and have provided more instructional support to their children when compared with middle- and upper-income households (Horowitz & Igielnik, 2020). Work focused on online learning has shown that learning outcomes can be improved with synchronous activities that enhance students' perception of connectedness with teachers and peers (Shin, 2003). When resources for remote learning are inadequate; however, students tend to fare worse due to less feedback from teachers and loss of motivation from limited contact with peers (Galusha, 1997). Moreover, a meta-analysis by Alfieri et al. (2011) shows that unassisted "discovery learning" does not benefit students. Rather, enhanced or guided discovery learning, which includes teacher feedback, worked examples, and scaffolding were shown to be more effective, all of which require live instruction.

We investigated the barriers to distance learning faced by low-income K–12 students, and whether there is a relationship between reported participation in live instruction and reported student engagement. The data comes from a random survey of K–12 families from a large urban school district in southern California conducted shortly after the end of the 2019–2020 school year, and thus captures the distance learning period that spanned March-June 2020.

Method

Participants

We randomly sampled families (n = 1,181) with children enrolled in 19 high-need K–12 public schools located in a large urban district in southern California. To ensure representation across schools and subpopulations, the sample was stratified by school level (elementary, middle, and high school) and by the three communities where schools are located. Survey weights were used in the analysis to account for differences in selection probability.

The data were collected via telephone surveys (in English and Spanish) administered by the outreach team of the non-profit organization that manages the 19 schools, with each randomly selected family contacted twice before replacement (see Table 4 in Supplementary Materials, available on the journal website, for survey questions). A total of 3,473 calls were made with a final response rate of 34%. A total of 95.2% of respondents were Hispanic, nearly reflective of broader district-wide

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Table 1
Logit Model for Schoolwork Completion

	Elementary School			Middle and High School		
Variable	β	***SE***	e^{β}	β	***SE***	e^{β}
Minutes of live instruction	0.0044**	0.0009	1.0044**	0.0019707**	0.0007394	1.001973**
Technology at home						
No computer	0.37	0.53	1.47	–0.66	0.43	0.52
Mobile internet only	–0.59	0.59	0.56	–0.30	0.39	0.74
No internet	0.32	0.52	1.38	–0.28	0.31	0.76
Achievement data[a]						
English language arts						
Progressing toward grade standards	0.59	0.77	1.80	—	—	—
Meets grade standards	1.05	0.89	2.85	—	—	—
Exceeds grade standards	0.71	1.12	2.03	—	—	—
Math						
Progressing toward grade standards	1.32	0.76	3.73	—	—	—
Meets grade standards	1.40	0.83	4.07	—	—	—
Exceeds grade standards	2.81**	1.03	16.61**	—	—	—
GPA (HS/MS only)	—	—	—	0.96***	0.13	2.60***
Language classification[b]						
English only	–1.62**	0.58	0.20**	–0.37	0.45	0.69
Initial fluent English proficient	–1.09	0.82	0.34	–0.46	0.40	0.63
Limited English proficient	–1.32**	0.58	0.27**	0.18	0.28	1.20
Special education	–0.87	0.58	0.42	–0.58*	0.29	0.56*
Intercept	–1.82	1.12	0.16	–1.12	0.67	0.32
N	239			569		

Note. Other controls included are race, parental internet use, parental computer use, parental education, vulnerability to income loss, vulnerability to food insecurity, vulnerability to health insecurity, vulnerability to housing insecurity, grade level and school campus. See Supplementary Materials (available on the journal website) for full logistic regression results. Standard errors are in parentheses.
[a]Minimal progress toward grade level standards as reference.
[b]Reclassified fluent English proficient as reference.
*$p < .05$. **$p < .01$. ***$p < .001$.

demographics. Anonymized survey responses were merged with student administrative data provided by the district.

Outcome Measure

Due to changes in grading policies implemented by the district in response to the COVID-19 pandemic, grades were not a meaningful measure of student achievement during the study period. We therefore used student completion of schoolwork as a proxy for engagement during distance instruction and, indirectly, learning. Specifically, the survey asked parents to assess how many school assignments their child was able to complete during remote learning, using a 3-point scale (none/some/all). Since only about 2% of respondents selected "none," this category was combined with "some" to create a binary outcome measure that captured schoolwork completion.

Model Predictors

Our predictors combined household characteristics (including measures of vulnerability to the COVID-19 pandemic) with individual-level characteristics obtained through school records (e.g., language proficiency, GPA in the previous grading period, and special education status). Given the central role that digital technologies played in remote learning, we also included measures that captured technology resources available in the household (such as broadband connectivity and devices) and parental skill with digital technologies. (See Table 1 and Table 2 in Supplementary Materials for descriptive statistics, available on the journal website.)

Our main variable of interest was the amount of live instruction per week received by students (in minutes) as reported by parents ($M = 370$, $SD = 362$). The regression models include school and grade fixed effects to account for variations in live instruction offered across schools and grade levels (see Supplementary Materials available on the journal website). Due to differences in how GPA is computed across school levels, we specified two separate logit regression models, one for elementary ($n = 239$) and another for middle/high school students ($n = 569$).

Results

Results indicate that synchronous class activities positively predict engagement with distance learning as measured by homework completion. In the elementary school model, live

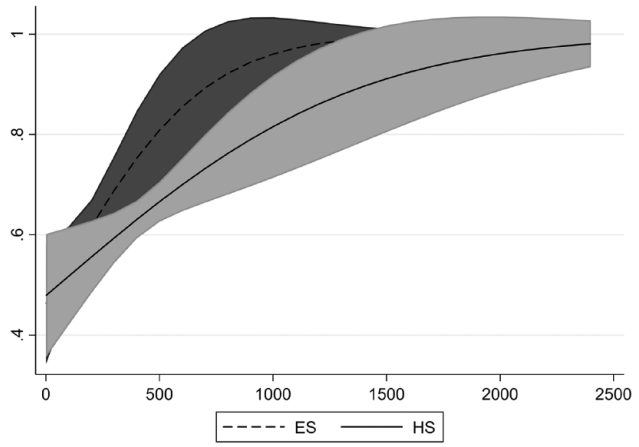

FIGURE 1. *Conditional probability of reporting "all" schoolwork completion by live instruction minutes (95% CI).*
Note. The fact that the conditional probability curve goes above "1" is expected given the imprecision of our outcome measure.

instruction positively predicted the odds of schoolwork completion ($p < .001$; Table 1). Calculated on the odds ratio scale (and assuming linear effects), for every additional hour of live instruction per week there is a 26% ($0.0044 \times 60 \times 100$) increase in the probability of reporting that students have completed all their schoolwork (as opposed to "some" or "none").

The relationship between the reported amount of live instruction hours per week and the reported completion of schoolwork was also statistically significant though somewhat smaller in magnitude for middle and high school students, with every hour of live instruction increasing the probability of reporting completion of "all" schoolwork by about 12%. The results of the two logit regressions are illustrated in Figure 1, which plots the conditional probability of reporting completion of "all" schoolwork over live instruction minutes for elementary and middle/high school students.

Discussion

The difference in magnitude between elementary school students and their high school and middle school counterparts is consistent with research indicating that elementary school students learn better with explicit, guided instruction (Alfieri et al., 2011), and thus require more activities that allow meaningful interaction with teachers and peers. The transition to remote learning following the COVID-19 pandemic in early 2020, and the variety of ways in which schools and families responded to the transition, represents an opportunity to better understand the factors that affect K–12 learning outside the classroom. Our findings support the hypothesis that live online instruction is important when students' engagement during distance learning, which may lead to more connectedness with teacher and peers. This is all the more important in earlier grades, when students are yet to build the required abilities for independent learning.

Our findings also highlight the need to address disparities in digital readiness among households (Galperin, 2020); additional live instruction will not enhance learning unless students can meaningfully take advantage of synchronous activities offered by teachers. The mismatch between what school districts offered and what students were effectively able to access represented a core hurdle to remote learning during the study period. Our findings support recent calls for distance learning initiatives to be attentive to the contexts where they are deployed (e.g., Aguilar, 2020a, 2020b).

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