

Impact of Online Learning and Students' Personal Factors on Students' NWEA Scores

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ABSTRACT

This study investigated the impact of online learning on students' math and ELA test scores through the lens of their personal skills in addition to students' reflections about their experience with online learning. We recruited Harmony Public Schools (HPS) 3rd–10th-grade students. We used paired t-test and multiple regression for the first and second research questions, respectively. We utilized mainly a qualitative approach for the third question. We found that HPS schools' students made progress in math and ELA (English Language Arts) although their regular schooling completely moved to online during the 2020-2021 school year. We also found that students with higher self-efficacy, growth mindset and engagement scores had higher test scores compared to their counterparts with lower of those values. Qualitative data findings revealed that students found online learning more comfortable and convenient, however, they disliked the motivation and technical problems, and lack of social component of it.

Keywords: Covid-19, ELA, Math, NWEA, Online learning, Social emotional skills.

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I. INTRODUCTION

The COVID-19 pandemic caused a massive shift in many spheres of life; the educational sector was profoundly disrupted during the shutdowns of Spring 2020 and the subsequent changes to the 2020-2021 school year, with school districts making a variety of decisions about modality (e.g., online only, in-person/online option, hybrid, etc.). Regardless of the mode of instruction, students' lives have been greatly changed by the pandemic.

The impact on student achievement because of the COVID-19 pandemic is still being uncovered. The purpose of this study is to contribute to the research on the shift to online instruction due to the pandemic through the lens of academic achievement. In particular, we examined the role of noncognitive factors as a potential source of resilience for students. Specifically, we hypothesize that students with a higher degree of these noncognitive factors (e.g., self-efficacy, growth mindset, self-management) would fare better in terms of test scores as compared to students with lower levels of these factors.

A. Theoretical Framework

This study's theoretical framework is formulated around the literature about the COVID pandemic, effects of online learning, and the potential role of noncognitive factors in academic achievement during the pandemic.

B. COVID Pandemic

The pandemic caused by the SARS-COV-2 virus rippled across the globe in Spring 2020, wreaking havoc to social,

economic, professional, educational, and personal domains. While the vast majority of schools shut down in-person instruction in the Spring of 2020, the plans for instruction in Fall 2020 were widely varying based on state and locality guidelines, with many large school districts and particularly large school districts serving nonwhite students opting for primarily online/remote instruction (Marshall & Bradley-Dorsey, 2020).

The educational disruptions caused by the pandemic are very likely to have impacted student learning in significant and meaningful ways. Kuhfeld *et al.* (2020) projected that student learning loss would occur due to pandemic-related disruptions in a number of scenarios and that student variability in learning would likely increase. Other researchers projected that students may return to school with experiencing only 70% of the learning gains they would have typically attained during a school year (Kuhfeld & Tarasawa, 2020). Principals anticipated learning losses among all students and particularly large losses for low-achieving students, students from low-income families, students with disabilities, English language learners, and students experiencing homelessness (Hamilton *et al.*, 2020). This is similar to projections of education researchers who anticipate widening achievement gaps between students from low-income and high-income families (Bailey *et al.*, 2021).

The impact of the pandemic on student learning is likely to have complex and long-lasting impacts. For instance, Huang *et al.* (2021) modeled the impacts of COVID-19 on Common Core mathematics learning. Not only was students' learning impacted during the pandemic, but further downstream effects would also be observed based on the linkages and

prerequisite skills for later learning (Huang *et al.*, 2021). Pier *et al.* (2021) found that students in California experienced a COVID-19-related “learning lag” (slower academic growth) of approximately 2.6 months in English/Language Arts and 2.5 months in math. There was a greater magnitude of learning lag for students who are economically disadvantaged, English learners, Latinx students, students with low prior achievement, and students experiencing homelessness. Even in countries with relatively short lockdowns and an equitable education system with access to technological resources, Engzell *et al.* (2021) reported “remote learning operated at 50% efficiency” and that students from disadvantaged backgrounds are more profoundly impacted.

C. Shift to Online Instruction during the Pandemic

As a result of the pandemic, many schools experienced an abrupt shift to online/remote instruction. During the spring of 2020, many school districts closed in-person instruction; many schools remained closed during the 2020-2021 school year. Although in-person schooling was limited, online learning increased during this period. This shift to online learning was problematic on a number of fronts.

For one, students have unequal access to technology and internet (Organisation for Economic Co-operation and Development [OECD], 2020). This digital divide between students of varying socioeconomic levels, ethnic backgrounds, and location (e.g., urban vs. rural) exists across different elements, such as devices as well as access to high-speed internet (Dolan, 2016). Beyond access to technology and infrastructure to receive online instruction, students and teachers need technological skills to benefit from online instruction; existing differences in technological skills may be exacerbated by the pandemic (OECD, 2020).

Secondly, teachers have limited training in teaching online and the types of training provided differ between schools/districts. Hamilton *et al.* (2020) found that while 62% of surveyed teachers received training on the use of a learning management system, only 29% received training on how to differentiate instruction to meet individual student needs in an online format and 24% received training on engaging families in remote instruction. Hamilton *et al.* (2020) found that 60% of principals surveyed reported training for teachers to deliver online/remote instruction as a moderate, major, or very major need. Many teachers were inexperienced in teaching online before the pandemic (Moser *et al.*, 2021), though it's important to distinguish between planned online teaching and learning and emergency remote instruction that was necessitated by the pandemic (Hodges *et al.*, 2020). Even experienced online educators may have experienced difficulties with the rapid transition to remote instruction.

Engagement with online instruction was also a common concern. Hamilton *et al.* (2020) found that a little over half of the almost 1,000 teachers surveyed reported that 50% or less of their students were completing the distance learning activities that were assigned. This is a particular concern given the negative impacts of absenteeism on academic progress and social-emotional outcomes, especially for vulnerable populations (Santibañez & Guarino, 2021).

Teachers and students experienced a variety of stressors as a result of the pandemic. Hamilton *et al.* (2020) found that

75% of the 990 teachers surveyed listed health concerns as either a major or moderate concern. In addition to health concerns, students and teachers additionally experienced a variety of other stressors, such as economic concerns and limited socialization.

Finally, the effectiveness of online learning generally in K-12 education is unclear (Kuhfeld *et al.*, 2020). In general, there is a lack of rigorous studies on distance learning (Sahni *et al.*, 2021). The quality of online learning likely contributes to the rate at which students' progress in their learning across the pandemic; given concerns with teachers' limited training in online pedagogy, it is reasonable to wonder whether high-quality online programs were widespread. According to Hamilton *et al.* (2020), 67% of teachers surveyed reported 50% or less of the formal curriculum that would have been implemented during the regular school year was being implemented via remote/online instruction. Based on these findings, it is reasonable to conclude that student learning may be hampered by the shift to online instruction necessitated by the pandemic.

D. The Potential Role of Noncognitive Factors in Academic Achievement during the Pandemic

Based on the evidence presented above, it is clear that student learning was likely disrupted due to the pandemic, and likely disrupted in significant ways. However, it is unclear the degree to which intrapersonal and interpersonal assets may buffer the impact of these stressors on academic achievement. Whether called non cognitive skills, social emotional learning, or 21st century skills, there has been a lot of interest recently on developing competencies outside of knowledge and cognitive skills that can facilitate academic success (West *et al.*, 2016). Researchers have acknowledged the role that noncognitive factors play in academic performance (e.g., Lee & Shute, 2010). This is reflected in many strands of research, one of which is the increasingly recognized importance of social and emotional competencies. Although the specific skills focused on and the measurement and relative contribution of each of the competency has not been fully illuminated it is clear that these variables can and do impact academic performance at the student level (West *et al.*, 2016). As an example of the relationship between these competencies and academic performance, a meta-analysis of 213 social and emotional learning programs conducted by Durlak *et al.* (2011) found that students participating in social and emotional interventions experienced academic benefits, such as an 11-percentile point gain in test scores, over control groups.

There are a number of different noncognitive factors that have been examined in the context of educational success. This review will define and briefly describe a few of these that are relevant to our research: personal factors, such as self-management, self-efficacy, growth mindset, and engagement and social factors, such as parent involvement and teacher-student relationships. Noncognitive skills may be especially important during the COVID-19 crisis and shift to online instruction, which may require a reservoir of motivation and self-directedness for students to succeed (OECD, 2020).

E. Self-Management

The Collaborative for Academic, Social, and Emotional Learning (CASEL) defines self-management as “the abilities

to manage one's emotions, thoughts, and behaviors effectively in different situation and to achieve goals and aspirations" (CASEL, n.d.). According to CASEL, self-management involves skills such as delaying gratification, displaying motivation and self-discipline, and using planning and organizational strategies (CASEL, n.d.).

Self-management encompasses interpersonal and cognitive self-management. More specifically, the measurement of self-management appears to fit within two broad components—cognitive (e.g., coming to class prepared, paying attention and resisting distractions) and interpersonal (e.g., keeping temper in check, remaining calm when others are bothering students). The cognitive component of self-management is related to other constructs such as self-regulation and self-control. According to Greene & Azevedo (2007), "self-regulated learners are generally characterized as active, efficiently managing their own learning through monitoring and strategy use" (p. 335), echoing the academic components of the above definition. In general, self-control is positively associated with academic success, including academic attainment, course grades, and standardized achievement test scores (Duckworth *et al.*, 2019) in addition to a host of adult outcomes, including health status and antisocial behaviors (Moffitt *et al.*, 2011).

Research supports that self-management skills are linked with academic success. Claro and Loeb (2019) found that self-management, defined similarly to CASEL as "the ability to regulate one's emotions, thoughts, and behaviors in different situations" (p. 6) predicts achievement gains for students even after controlling for student background variables. These authors find that both cognitive and interpersonal components of self-management predict academic achievement. Park *et al.* (2017) found that interpersonal factors (including interpersonal self-control) and interpersonal character (academic self-control) did predict student outcomes.

Self-management is likely of increased importance to learners during the COVID-19 crisis. Given that online learning may require a large degree of self-directedness and management of attentional resources (e.g., avoiding social media or other digital distractions while learning), it is hypothesized that students higher in self-management will experience less learning loss than other students.

F. Self-Efficacy

Research and theory (especially social cognitive theory and self-regulation theory) strongly support the notion that self-beliefs have a strong influence on behavior (Bong & Clark, 1999). In general, self-efficacy refers to one's beliefs about their abilities to accomplish a desired outcome and is reflective of the core component of human agency (Pajares, 1986). Self-efficacy, academic self-efficacy, in particular, has been shown to be a powerful predictor of academic performance; Honicke and Broadbent (2016) reviewed 59 research studies and determined academic self-efficacy had a moderate positive relationship with academic performance. This general finding holds true across a variety of populations; for instance, Manzano-Sanchez *et al.* (2018) synthesized 27 studies and concluded that there is a significant positive relationship between self-efficacy and academic performance for Latino/a students. Further, a meta-

analysis of longitudinal findings shows that academic performance and self-efficacy reciprocally influenced each other over time, although the relationship appeared to be more unidirectional for children (performance predicting self-efficacy) (Talsma *et al.*, 2018).

Self-efficacy is a powerful predictor of academic achievement in a general sense; it is likely that this holds true during the COVID-19 pandemic. Students high in self-efficacy may be more likely to sustain their attention and efforts during challenging circumstances, thus facilitating their academic achievement.

G. Growth Mindset

Growth mindset, or incremental view of intelligence, is the belief that intelligence and skills can be actively manipulated or improved through one's own efforts. This is contrasted with a fixed mindset, or entity view of intelligence, that suggests that intelligence and skills are fixed and internal (Dweck, 1999). Early research showed growth mindset to be associated with learning (as opposed to performance) goals, academic achievement, and views of effort (Dweck, 1999). Research supports that growth mindset predicts student learning even after controlling for a host of other variables (Claro & Loeb, 2019b). Recent research has additionally shown growth mindset interventions to improve academic achievement. For instance, Yeager *et al.* (2019) demonstrated the positive and substantial impact of a brief growth mindset intervention on the grades and other outcomes of a sample of lower-achieving students. Moreover, growth mindset predicts academic performance with possibly less reference bias than other non-cognitive factors (West *et al.*, 2016). We hypothesized that because students with growth mindset may be more likely to persist in their learning, students high in growth mindset would experience higher academic achievement even in the pandemic.

H. Engagement

Engagement is a multidimensional construct that has emerged as a key concept underlying dropout prevention program, as engagement is malleable variable predicting dropout risk (Appleton *et al.*, 2008; Reschly *et al.*, 2008). Engagement involves a variety of dimensions (though the number of theorized dimensions varies between researchers), such as psychological engagement (connectedness to school and teachers), cognitive engagement (valuing learning, self-regulation), behavioral engagement (attendance and participation), and academic engagement (earned credits, grades) (Appleton *et al.*, 2006). Engagement has been shown to be significantly predictive of educational performance (Lee & Shute, 2010). There is a rich literature that finds a link between behavioral engagement and achievement measures (Finn & Rock, 1997) and school completion (Fredricks *et al.*, 2004). A recent meta-analysis of 69 studies showed that engagement and academic performance are strongly and moderately correlated both overall and with each specific component, with behavioral and cognitive engagement having the largest effects (Lei *et al.*, 2018).

Given studies supporting the key role of engagement in academic outcomes as well as difficulties engaging students in online instruction during the pandemic, we hypothesized that students with higher engagement with school will also have higher academic achievement.

I. Parent Involvement

Parental involvement includes a variety of activities, including specific parenting behaviors, communication with school, facilitating learning activities at home, volunteering at school, shared decision-making between parents and schools, and making community connections to facilitate school success (Fishel & Ramirez, 2005).

Parental involvement, as observed through several meta-analyses does impact student academic performance (Fan & Chen, 2001; Jeynes, 2003, 2005).

Parental involvement became especially important during the COVID-19 pandemic as many families have taken on the additional role of supervising students' online/remote instruction and providing assistance (both technological and pedagogical) to students. However, a number of challenges, including digital skills, lack of time due to conflicting responsibilities, familiarity with the content, and existing parental educational achievement and attitudes (OECD, 2020) may present a barrier to parents' full participation in students' online instruction. Nonetheless, we believe that parental involvement predicts students' academic achievement in a pandemic context.

J. Teacher-Student Relationships

The classroom provides an interpersonal experience; as such, researchers have been interested in how relationships may impact academic achievement. Pianta and Stuhlman (2004) found teacher child relationships to have small but significant impacts on academic skills and social competence. Meta-analyses (e.g., Roorda *et al.*, 2011) showed that the literature supports positive teacher-student relationships positively associated with academic achievement and a negative relationship between negative teacher-student relationships and academic achievement; further, teacher-student relationships predict students' engagement with school.

Teacher-student relationships are a key facilitator of learning; however, it is unclear the degree to which these relationships carry over to an online format. Teachers likely need a different set of skills to develop relationships with students facilitative of their learning in an online context; given teachers' limited training in online teaching (Moser *et al.*, 2021). However, we believe that better quality teacher-student relationships predict student academic achievement.

K. Purpose of Study

The purpose of the study was to examine the COVID-19 shift to online instruction and its impact on academic achievement, specifically through the lens of noncognitive factors which may impact academic achievement.

The following research questions were used to guide our research:

- 1) RQ1: How have students' NWEA (Northwest Evaluation Association) ELA (English Language Arts) and Math test scores changed from Winter 2020 (as usual) to Winter 2021 after the pandemic when classes were mostly moved online?
- 2) RQ2: Are students' perceptions of noncognitive factors such as self-efficacy, growth mindset, self-management, engagement, parent involvement, and teacher-student relationships associated with changes

in their NWEA scores?

- 3) RQ3: What did 3rd-10th grade students think about their experience of online and in-person learning during the COVID-19 pandemic?

II. METHODS

A. Settings: Harmony Public Schools (HPS)

HPS is a non-profit open enrollment K-12 college preparatory school district in Texas. It has 58 campuses serving a diverse student population of over 36,000, where 60% of students receive free or reduced-price lunch and 70% are under-represented minorities.

HPS schools offered two learning models throughout the 2020-2021 school year: remote online learning or in-person at their respective HPS campuses (Back to School Playbook, 2020). According to their Back-to-School Playbook manual, they used an all-in-one online learning system called Schoology which contain assignments, grading, schedules, progress reports, and parent messaging options for both online and in-person learners. In addition to Schoology learning management system (LMS), HPS schools also utilized Nearpod an award-winning student engagement platform (Google Play, 2018) for transforming online and face-to-face classes to lead teachers' interactions with students, provide real-time feedback, and create fun and interactive experiences using polls, drawing boards, quizzes, videos, and more. Students also can use Nearpod to interact with their classmates in a safe virtual environment (Back to School Playbook, 2020). It seems students continued their regular day-to-day schooling via online and in-person settings. HPS schools have laid out all the details of their new normal school year in their 47-page Back to School Playbook.

B. Northwest Evaluation Association Assessments

We chose students' NWEA scores because this particular charter school system administers the reading, math, and science portions at least twice (fall and winter) a year annually and measure their students' scaled score and percentile growth nationally. These scores helped us track and see how students' performances changed during the pandemic.

The NWEA (Northwest Evaluation Association) offers state-aligned, computerized adaptive tests, called Measure of Academic Progress (MAP). These tests accurately reflect the instructional level of each student and measure growth over time (NWEA Psychometric Solutions, 2020). NWEA offers MAP tests in the subjects of Mathematics, Reading, Language Arts, and Science (NWEA, 2021).

MAP Growth uses a scale called RIT to measure student achievement and growth. RIT stands for Rasch Unit and is a measurement scale developed to simplify the interpretation of test scores. It is an equal-interval scale, like feet and inches on a ruler, so scores can be added together to calculate accurate class or school averages. RIT scores range from about 100-300. Students typically start at the 180-200 level in the third grade and progress to the 220-260 level by high school. RIT scores make it possible to follow a student's educational growth from year to year (Converse, 2016).

C. Participants

Out of 15,000 3rd-10th grade parents, 4,907 of them filled out the Parent Consent form for the study. Three thousand four hundred ninety-four (71.2%) parents gave consents for their child to be in the study. Of 3,494 students, 909 (26%) responded to the survey. Almost 97% (880) of them agreed to participate in the study. However, only 692 (76%) students completed the survey. Gender distribution were 396 (57.2%) females and 296 (42.8%) males. Students' ethnic portions were 149 (21.5%) Asian, 150 (21.7%) Black/African American (AA), 263 (38%) Hispanic, 126 (15%) White, and 26 other (3.8%) multi-ethnic minorities. Participants' grade distributions are given in Table I below.

TABLE I: GRADE DISTRIBUTION OF STUDENT PARTICIPANTS

Grades	3	4	5	6	7	8	9	10	Total
Frequency	59	60	85	124	121	117	71	55	692
Percent	8.5	8.7	12.3	17.9	17.5	16.9	10.3	7.9	100

D. Instruments

We developed a survey consisting of 49 questions. These questions included items about student demographics, students' perceptions of their self-efficacy belief (4 items; Transforming Education, 2016; 0.87 Cronbach's Alpha), growth mindset (4 items; Transforming Education, 2016; 0.70 Cronbach's Alpha), self-management (9 items; Transforming Education, 2016; 0.88 Cronbach's Alpha), academic engagement (5 items), family support for learning (4 items), and teacher-student relationships (9 items). In addition, we also asked several questions regarding students' experience of online versus in-person learning. For the current study, we had similar Cronbach Alpha's for self-efficacy (0.86), growth mindset (0.64), academic engagement (0.84), and self-management (85).

E. Data Collection

After we obtained consent from the parents, the survey link was shared with their children/students directly through HPS central office information department. Students received an email about the study with the link of the survey. Their teachers were also informed about the study in case students and parents might have questions about the study including whether the email was authentic. Data collection started with the Spring break holiday in Texas during 2021. We reminded them weekly after the first two weeks we shared the link first time. We finished the study on approximately six weeks later after sending three reminders.

F. Data Analyses

Quantitative analysis methods were used for the research questions 1, 2, and 3, with mainly a qualitative approach for research question 4. Specifically, to answer research question 1 we utilized a paired-sample t-test to compare the effects of instruction types on the same students' NWEA math and ELA scores. For the second question, we used multiple linear regression analyses. Before we ran the multiple linear regression, we tested for assumptions of linear relationship between the outcome variable and the independent variables, multivariate normality, and multicollinearity among independent variables. Independent sample t tests were used for the third question. For the final question, we did content

analysis by labeling/coding and categorizing student responses to come up with different themes. First, the first and third author read the students' answers thoroughly to understand the overall ideas of the answers. We created initial codes inductively. Then, we sat and evaluated our coding and reached a consensus on differences. We then re-coded the students' responses to the first open-ended question line by line. The inter-rater Cohen's Kappa coefficient was .78. For the remaining questions, the first author, a senior researcher carried out similar methods analyze the data to produce a narrative to answer the fourth research question.

III. RESULTS

A. Research Question 1: NWEA Mathematics

We ran dependent t-tests and found that students continued to make progress on NWEA math scores even though the pandemic interrupted their learning. Overall, 3rd through 10th grade HPS students' NWEA Winter 2020-2021 (online instruction) math scaled scores (RIT scores) had statistically significantly increased from the same students' 2nd through 9th grade NWEA Winter 2019-2020 (as usual) scores (see Table II). The Cohen d effect sizes for RIT scores changed from low medium (d=0.15) to large (d=0.84). Although NWEA has not updated the Spring Norm scores for the COVID time, HPS students' math scores surpassed all of those except for two grades (4th and 6th) where students barely missed the norm scores.

TABLE II: HPS STUDENTS' NWEA MATH SCORES BEFORE AND AFTER THE PANDEMIC

Grades	Mean RIT Scores			Spring Norm
	Winter 2020	Winter 2021	Cohen's d	
2 nd to 3 rd	186.07	196.89***	0.78	196.23
3 rd to 4 th	198.36	205.98***	0.84	206.05
4 th to 5 th	208.72	215.76***	0.80	214.7
5 th to 6 th	217.93	219.33***	0.15	219.56
6 th to 7 th	222.37	225.98***	0.36	224.04
7 th to 8 th	228.43	233.47***	0.5	228.12
8 th to 9 th	236.33	239.31***	0.28	228.67
9 th to 10 th	236.10	243.88***	0.42	231.21

Note: *** indicates p value less than 0.000.

B. Research Question 1: NWEA ELA

Even though K-12 education completely switched to online learning, the HPS 3rd through 10th grade students' NWEA 2020-2021 Winter (online) ELA scaled scores have statistically significantly increased in all grades from the same students' 2nd through 9th grade NWEA Winter 2019-2020 (as usual) ELA scores (see Table III). The Cohen d's effect sizes for ELA scores have changed from 0.25 (small) to 0.89 (high). Compared to the NWEA 2021 Spring norm scores, HPS 4th, 5th, 6th, and 7th grade students' Spring 2021 ELA scores slightly less than the Spring norm scores while remaining grades met and surpassed the respected norm scores.

C. RQ 2: NWEA Math RIT Scores and SEL Skills

Multiple regression analyses were used to test how much the students' perceptions of their self-efficacy belief, academic engagement, growth mindset, self-management,

TABLE III: HPS STUDENTS' NWEA ELA SCORES BEFORE AND AFTER THE PANDEMIC

Mean RIT Scores				
Grades	Winter 2020	Spring 2021	Cohen's <i>d</i>	Spring Norm
2 nd to 3 rd	183.00	193.95***	0.89	193.90
3 rd to 4 th	194.37	200.96***	0.60	202.50
4 th to 5 th	203.44	208.10***	0.42	209.12
5 th to 6 th	209.73	212.44***	0.25	213.81
6 th to 7 th	212.80	217.05***	0.27	217.09
7 th to 8 th	217.60	221.38	0.25	220.52
8 th to 9 th	221.23	224.56***	0.31	220.52
9 th to 10 th	224.47	228.10***	0.33	222.91

Note: *** indicates *p* value less than 0.000.

family support, and teacher-student relationships are related with students' NWEA Math RIT scores. We found that students' social emotional skills, parent support, and teacher-student relationships collectively and significantly explained some of the variances in the students' NWEA math scores (($F(6, 466)=16.424$, $p<0$, $R^2=0.16$). The individual predictors were examined further and found that students' self-efficacy belief ($t=7.047$, $p=0$), academic engagement ($t=6.358$, $p=0$), and growth mindset ($t=2.488$, $p=0.013$) significantly contributed to explain (16.4%) variation in students' NWEA Math RIT scores.

TABLE IV: CONTRIBUTION OF STUDENTS' SEL SKILLS IN EXPLAINING THEIR NWEA MATH RIT SCORES: COEFFICIENTS

	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
	B	Beta		
(Constant)	209.225		30.004	0***
Self-Efficacy	8.628	0.389	7.047	0***
SM	3.398	0.113	1.936	0.053
Engagement	8.624	0.389	6.358	0***
Family Sup	-1.042	-0.030	-0.587	0.557
Teach-Student Rel	1.934	0.053	0.918	0.359
GM	2.726	0.115	2.488	0.013*

The B unstandardized coefficient (see Table IV) indicated that every one-point change in students' Likert scale self-efficacy (SE) belief and academic engagement ratings, the students' NWEA Math RIT scores increased by 8.63 and 8.62 points, respectively. Lastly, every one Likert scale unit increase in students' growth mindset (GM) ratings, the dependent variable/Math RIT scores increased by 2.726 points.

D. NWEA ELA RIT Scores and SEL Skills

Another multiple regression analysis for the students' NWEA ELA RIT scores revealed that the students' social emotional skills, parent support, and teacher-student relationships collectively and significantly are related with the students' NWEA math scores (($F(6, 467)=16.306$, $p<0$, $R^2=0.173$). The individual predictors were examined further and found that students' self-efficacy belief ($t=5.282$, $p=0$), self-management ($t=2.077$, $p=0.038$), academic engagement ($t=6.915$, $p=0$), and growth mindset ($t=4.092$, $p=0$) significantly contributed to explain some (16.3%) of the variation in students' NWEA ELA RIT scores (see Table V below).

Based on unstandardized B coefficients, one Likert scale unit increase in the students' self-efficacy and academic

engagement ratings yielded 5.246 and 7.579 RIT points increase in their NWEA ELA scores. Similarly, one Likert scale point increase in the students' self-management and growth mindset increased the dependent variable by 2.950 and 3.618 RIT points, respectively.

TABLE V: CONTRIBUTION OF STUDENTS' SEL SKILLS IN EXPLAINING THEIR NWEA ELA RIT SCORES: COEFFICIENTS

	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
	B	Beta		
(Constant)	197.465		34.863	
Self-Efficacy	5.246	0.291	5.282	0.000***
Self-Management	2.950	0.120	2.077	0.038*
Engagement	7.579	0.420	6.915	0.000***
Fam Support	-0.438	-0.016	-0.304	0.761
Teacher-Student Rel.	3.315	0.112	1.949	0.052
Growth Mindset	3.618	0.189	4.092	0.013*

E. RQ3-Q1: What Did You Like Most About Online Learning?

We analyzed 683 student responses to this open-ended question and crafted 41 codes, 20 categories, and 4 themes (More convenient and comfortable, improved family connection, feel safer, and learning has become more personalized). Following the processes outlined by Corbin and Strauss (1990) regarding open and axial coding, we first read the students responses and noted key words and phrase with broad open codes. Then following Corbin and Strauss's (1990) second step those initial codes were grouped into categories. Following is a sample Table VI showing how we carried out the coding process in moving from codes to categories. Developing criteria for each of those categories assisted in consistently assigning codes to categories when comparing the statements. This then led to the develop of four themes which examined and grouped categories by commonalities.

TABLE VI: A SAMPLE CODING INDICATING THE BENEFITS OF ONLINE LEARNING

Codes	Categories	Themes	Sample Quotes
Comfort	Comfortable		I don't have to get up and rush to class and I am less stressed about getting to class on time.
Sleep			Being able to stay at home and sleep in a bit longer.
Pajamas		More convenient and comfortable	I like that there are less distractions from friends, and I can eat whenever I want.
Food	Convenient		We can learn in the comfort of our home.
Stress			It's more comfortable being in home specially when the weather or other circumstances are bad.
Rush			About you get to chat with your friends like texting

1) More convenient and comfortable

From hundreds of student statements, one of the themes we noted was explaining why students felt more comfortable, relaxed, motivated, and happier in distance learning:

4) The ease of being at home. Liberties like drinking

coffee during class or skipping a class that you know will be a free period anyway.

- 5) You do not have to wake up earlier than usual.
- 6) I get to wear anything.
- 7) Is that you have less restrictions which makes me feel free like a bird which makes me happy to focus.
- 8) That I can eat good food my mom makes.
- 9) I prefer being in the comfort of my home. Sitting on my couch and eating delicious food for lunch.

2) *Improved family connection*

Another theme we determined was how staying home and learning online helped. Students spend more time with their families and reconnect with them:

- 1) I can be at home and with my family.
- 2) Being able to spend more with my family.
- 3) That I can sometimes have free time and I can spend it with my family.
- 4) I can connect with my family.
- 5) The thing that I liked the most about online learning is that now I get to spend more.
- 6) time with my family at home.

3) *Feel safer*

Student responses revealed that they felt safer both from bullying and COVID-19 virus by attending school online from home:

- 1) About staying in my home where nobody can bother me.
- 2) Because I would like to be socializing with my friends during restarts with the only thing, I'm not too excited about is either getting bullied or getting hurt during P.E and stuff.
- 3) I'm not at risk at getting bullied or getting hurt.
- 4) No one can physically hurt me since these are the year's most people get bullied.
- 5) I have issues with social interactions and so being at home feels safer to me, even without Covid.
- 6) Because I feel safer at home then at school because it is easier to get COVID with a bunch of people at school then with people at home.
- 7) Because it is safer to stay home during Covid-19.

4) *Schooling become more personalized*

One of the important themes that emerged explained how distance education helped some students more by providing them opportunities to move and learn at their own pace. It seems that students are happy to move forward at a rate that is best suited for them to allow for maximal learning and mastery of content over time rather than strictly by time itself:

- 1) I can do assignments at my own pace and have my dog with me for emotional support during classes.
- 2) I can learn at my pace.
- 3) The ability to be able to go at my own pace.
- 4) I'm usually able to work at my own pace as long as I get things finished before the day is over.
- 5) It allowed me to go at my own pace.
- 6) You have the opportunity to do things at your own pace.

F. Q2: What Did You Dislike Most About Online Learning?

We used the same process of code, category, and theme development to qualitatively analyzed 683 student open

responses on what they were not happy about regarding online/distance education. We started with 55 codes, then regrouped those codes into 10 categories, and ultimately 3 themes (*social component of learning is missing, Wi-fi and technology-related problems, hard to focus and get engaged in online instruction*). Table VII shows a sample coding of the related data.

TABLE VII: SAMPLE CODING SHOWING WHAT STUDENTS DISLIKED ABOUT ONLINE LEARNING

Codes	Categories	Themes	Quotations
Wi-fi	Internet problems		The bad internet always happening
Connection			I dislike that you can get kick out of the class because the wi-Fi
Access	Internet problems		Internet cutting out
Kick-out			Sometimes my computer gets leggy and kicks me out of zoom. Then, I have to restart it to make it better.
Laptop	Technology problems	Wi-Fi and Technology-related issues	Umm like sometimes on zoom it kicks you out of the class and it is a bit annoying.
Chromebook			That whenever the teachers talked, they were always breaking up.
Computer	Technology problems		The stress of power or internet going out or just the Chromebook not working
Glitch			When I/Someone would have computer issues.

1) *Social component of learning is missing*

HPS students kept reporting how much they missed seeing, interacting, and being with their friends and teachers physically. The first theme we found was about the importance of social component of learning where students missed during the pandemic.

- 1) No interaction with peers.
- 2) Difficult to focus on class. No interactions with other students.
- 3) Not being able to socialize.
- 4) The fact that we can't socialize with our friends as much, and we can't exactly share our ideas physically.
- 5) Not seeing my friends.
- 6) What I dislike most about online learning is obviously not seeing my friends or teachers.

2) *Wi-fi and technology-related problems*

Tens of students reported internet and technology-related problems. Their complaints changed from bad wi-fi connections to technology-related problems such as poor audio quality which hindered their learning.

- 1) I dislike the internet problems.
- 2) That the internet would kick you out of the meetings sometimes.
- 3) Technical difficulties.
- 4) I disliked that we sometimes had connection issues because I couldn't hear a teacher or maybe not get into an assignment which mainly ruined the experience.
- 5) Sometimes technology isn't always on our side.
- 6) Then when I get to class my computer gets glitchy and it shuts down in zoom.

3) *Harder to focus and remain engaged*

Students indicated that it became harder to focus on online school and remain engaged in online learning. Difficult to focus on class. No interactions with other students. Schoology is sometimes down, and access is slow. I feel like the classes are harder online vs in school:

- 1) I can barely focus during class when the teacher is talking.
- 2) I don't like that it is hard to learn and focus through Zoom, because other things are happening around me.
- 3) I had trouble focusing, staying engaged and motivated, and completing work on time because we are assigned an abundance of it.
- 4) I can't focus, it's pretty hard to keep up. Not because of the teachers or classes but because there isn't any more excitement about school anymore.
- 5) Not seeing anyone, and it was just harder to focus online. I didn't really have a visual for classes like math which need visuals to help kids.
- 6) It's extremely difficult to focus and I often procrastinate and do my work last minute. Also, we don't interact as much or do labs as before in in-person school.

G. Q3: Do You Prefer Taking Online or In-person Courses after the COVID-19 is Over?

As with the previous questions, we followed the same process in analyzing the data for question 3. Out of 679 responses, the majority of students who answered the question chose in-person (68%) education over online (25%) education. There were 49 nine students (7%) who indicated the hybrid learning model where students liked both and wanted mixture of those.

HPS students' grade levels and their instruction choice are significantly related ($\chi^2(4, 702)=13.60, p=0.009$). From the analysis, it seems that younger students are more likely to choose in-person instruction than older students (see Table VIII).

TABLE VIII: HPS STUDENTS' INSTRUCTION CHOICE BY THEIR GRADES

	Grades			Total
	Elementary	Middle	High School	
Count Hybrid	6	32	17	55
% Within Grades	2.8%	8.9%	13.2%	7.8%
Count In-person	154	237	80	471
% Within Grades	72.6%	65.7%	62.0%	67.1%
Count Online	52	92	32	176
% Within Grades	24.5%	25.5%	24.8%	25.1%
Total	212	361	129	702

IV. DISCUSSION

In this present study, we examined the impact of online learning due to the COVID-19 on students' NWEA math and ELA test scores compared to the same group of students' previous years' scores when the instruction took place in the usual modality. In addition, we studied how the students' perceptions of their self-efficacy, self-management, growth mindset, academic engagement, parent support, and teacher-student relationships were related with their NWEA scores during the pandemic. Finally, we investigated what the 3rd-10th grade students experienced with online learning. The

results of the present study are encouraging and informative because the COVID-19 is still around, and online learning has become part of common school practices regardless of grades and ages of the children. The findings suggest that overall, online learning has helped the HPS students continue to grow academically since they were measured in Winter 2020. For the second question, we found that students with higher perceptions of their self-efficacy, growth mindset, and self-management scores had higher NWEA scores compared to their counterparts with lower of those values. Qualitative data findings revealed that online learning was beneficial for some students; especially for those who have difficulties of keeping up with rest of their classmates due to the external factors in regular instruction. Participating students complained most about the difficulties of motivation, engagement, technical problems, and lack of social component of online learning.

A. Students Continued to Progress Academically

Our study used paired-sampled t-tests to see the changes for the HPS schools' 2020-2021 3rd-10th grade students' NWEA math and ELA test scores from the same students' 2019-2020 2nd-9th grade NWEA math and ELA scores. We found that HPS system's students continued to make progress in math and ELA although their regular schooling completely moved to online during 2020-2021 school year. We also found a very encouraging results where the amount of progress made during distance learning was similar to what NWEA would expect in a non-pandemic year. These findings are very similar with what Renaissance (2021) found when they examined at a large sample of about 3.8 million first through eighth grade students who had taken their Star assessments in math or reading during the winter of the 2020-2021 school year. Renaissance (2021) compared students' scores for those who also took fall 2019 and fall 2020 tests. Overall, they found that students' scores rose during the first half of the 2020-2021 school year in the amount of what Renaissance (2021) would expect in a non-pandemic school year.

B. Having Higher Self-efficacy, Engagement, Management, and Growth Mindset Scores Made Difference During COVID-19

We found that students' perceptions of their self-efficacy belief, academic engagement, and growth mindset significantly contributed to explain (16.4%) variation in students' NWEA math RIT scores. We had similar results for ELA scores where students with higher self-efficacy, self-management, academic engagement, and growth mindset scores had higher NWEA ELA scores.

The results were not surprising because there is much available literature already indicating the positive impact of having high beliefs of self-efficacy, academic engagement, growth mindset, and self-management skills on students' academic success (e.g., Claro & Loeb, 2019; Duckworth *et al.*, 2019; Finn & Rock, 1997; Honicke & Broadbent, 2016; Manzano-Sanchez *et al.*, 2018). In other words, students with higher beliefs of the aforementioned skills did better during the COVID-19 compared to the similar groups with lower beliefs of those.

C. Students Liked the Comfort, Family Connection, Safety, and Personalization of the Online Learning Most

From examining the comments of the participating students, we found that students talked positively about the comfort/flexibility, family presence, safety, and self-pace of online learning. They indicated that they liked online learning from home because they had the flexibility and convenience of sleeping more, eating home food, dressing freely, and the flexible schedule including breaks with the comfort of being at home. Indeed, this theme is one of the most cited benefits of online learning (e.g., Appanna, 2008; Brittany, 2015; McCready, 2017; National Association of Independent Schools [NAIS], 2010) in general. Similarly, one of the most recent research studies on the benefits of remote online learning took place in China. The more than a million participants also reported flexibility and convenience as one of the benefits of remote learning during the pandemic (Yan *et al.*, 2020).

The second theme we documented focused on how staying home and learning from home provided more opportunities for students and parents to reconnect and spend more time with each other (Gadermann *et al.*, 2021; Wong, 2020). Another important theme why students liked remote learning more was because of its safe side both covid-wise and behavior (Wong, 2020). Students felt safer at home from being caught with COVID-19 virus and being physically or verbally bullied. The fourth and the last more academic theme noted students liked the self-pace feature of online learning from their home settings, as frequently mentioned in the literature (e.g., Apex Learning, 2017; Appanna, 2008; Brittany, 2015; Hou, 2020; NAIS, 2010).

D. Students Disliked Lack of Social Component of Learning, Technical, and Focus and Engagement Problems Most

Participants repeatedly complained about not being able to see, talk, interact, socialize with their classmates and teachers, as well as internet and technology-related problems that hindered their learning including focus and engagement. This large-scale shift to online education was a first time and very rare experience. Almost all students had to learn from home and online. Not surprisingly, similar research of this period has found similar findings with this study where students complained about lack of social interaction and difficulty of engaging with their learning, teachers, and friends (e.g., Eye, 2021; Ewing & Cooper, 2021; Gadermann *et al.*, 2021). Researchers also found that some students experienced internet connection and technological preparedness problems. For example, in the US, there is a significant gap between those from privileged and disadvantaged backgrounds; whilst virtually all 15-year-olds from an advantaged background said they had a computer to work on whereas nearly 25% of those from nonprivileged backgrounds did not (Li & Lalani, 2020).

E. Students Want to Return to Brick and Mortar Schools

Interestingly, we found that younger kids are more interested in-person instruction than older kids do. This might stem from the fact that younger students are still children and miss their friends and teachers more for socialization and fun purpose. Another may be because younger kids need more

pedagogical and specialized knowledge to be educated compared to the older kids who need more structured and common support. Indeed, a more recent survey study (Henderson *et al.*, 2020) demonstrated that the younger the child, the more likely the instruction is to be delivered in person, which we also found in our study. Similarly, high schoolers, are roughly 11 percentage points more likely than the youngest learners to be in hybrid or online instruction model (Henderson *et al.*, 2020). Clearly students missed the physical social interaction and being with their friends and teachers instead of being isolated with/without their family all the time whole year and so.

F. Limitations and Future Research

One of the limitations of this study relates to the measurement of variables for the second question. Although student self-report measures have been used widely in efficacy studies (e.g., Filippou, 2019; Koseoglu, 2015; Taylor, 2014), there are some concerns about the use of such measures due to the possible large measurement error with self-reporting items (Bertrand & Mullainathan, 2001). Future studies could address this limitation by including other data resources to triangulate the data (Denzin, 2012).

Another limitation of the study is about the first question as most of the students had to take NWEA Winter 2021 tests at home due to the pandemic. This might have caused some reliability issues of the students' NWEA scores of that specific semester. However, the initial analyses of the data did not recognize any abnormalities of the data such as randomly choosing students to see if their scores were similar to their scores when took it online at school.

For the future research, we might include a regular public school district to our sample to see how students from different school districts experienced online learning and/or the quality of online instruction they were provided. Also, including analyses of subgroups by gender, race, and SES would shed more lights to our study. Due to page restrictions, we had to sacrifice some of the analyses.

V. CONCLUSION AND IMPLICATIONS

This study makes several important contributions to understand the impacts of COVID-19 on students' learning. First, the design of the study included both quantitative and qualitative data which helped in understanding not only the impact of the pandemic numerically but also enabled us to listen firsthand experiencing people. Second, the instrument used in the study included several well-known and educationally critical non-cognitive constructs such as self-efficacy, growth mindset, parent support, academic engagement, and self-management that might also make differences in students' learning apart from apparent factors including students' demographic factors.

Although the correlational and qualitative nature of the results does not allow causal inferences, the findings of this study provide valuable information to teachers, administrators, and researchers involved in K-12 education. For instance, it seems that the HPS was ready to switch instruction rapidly and comprehensively to online education when needed. Indeed, their enrollment numbers during the first year of the COVID-19 school year has increased more

than 5% although their average enrollment number has been around 2% last five years. This flexibility in delivering quality learning experiences to students through varying modalities should be noted by traditional K-12 schools and other alternative settings. Although our investigation focused on instructional type changes as a result of COVID-19, in actuality there are other situations where a school may need to quickly change modalities (e.g., natural disasters, poor air quality). Having prior preparations already in place would provide students and parents with a sense of normality during such stressful situations.

Additionally, it appears appropriate to recommend school districts to incorporate social emotional learning modules, including self-efficacy beliefs and growth mindset, to their everyday curriculum so students learn to handle unexpected challenges they encounter both in school and life, like COVID-19. Schools have been charged to not just focus on academics, but other skills such as physical and emotional health. Schools need to be prepared to continue to such programs no matter what teaching modality is implemented.

The student success with online instruction, as demonstrated in this study, might also be due to the respectively smaller size of charter schools and limited regulations teachers have to go through to make faster changes compared to the regular public schools which are more crowded and tied with more state-required regulations to follow through. Therefore, this study findings imply more than whether online or in-person education provides better education. Being able to pivot quickly based on current situations should not just apply to the teaching modality used for instructing students, there must also be thoughtful reflection on curricula and assessments. We learned much about students' thoughts regarding online instruction by asking them directly and should also provide them the opportunity to reflect these educational topics as well.

APPENDIX

Self-efficacy

How confident are you about the following at school?

- 1) *I can earn an A in my classes.*
Not at all confident.
A little confident.
Somewhat confident.
Mostly confident.
Completely confident.
- 2) *I can do well on all my tests, even when they're difficult.*
Not at all confident.
A little confident.
Somewhat confident.
Mostly confident.
Completely confident.
- 3) *I can master the hardest topics in my classes.*
Not at all confident.
A little confident.
Somewhat confident.
Mostly confident.
Completely confident.

- 4) *I can meet all the learning goals my teacher set.*
Not at all confident.
A little confident.
Somewhat confident.
Mostly confident.
Completely confident.

Growth Mindset

Please think about your learning in general. Please indicate how true each of the following statements is for you:

- 1) *My intelligence is something that I can't change very much.*
Not at all true.
A little true.
Somewhat true.
Mostly true.
Completely true.
- 2) *Challenging myself won't make me any smarter.*
Not at all true.
A little true.
Somewhat true.
Mostly true.
Completely true.
- 3) *There are some things I am not capable of learning.*
Not at all true.
A little true.
Somewhat true.
Mostly true.
Completely true.
- 4) *If I am not naturally smart in a subject, I will never do well in it.*
Not at all true.
A little true.
Somewhat true.
Mostly true.
Completely true.

Self-Management

We would like to learn more about your behavior, experiences, and attitudes related to school. Please answer how often you did the following during the past 30 days. During the past 30 days...

- 1) *I came to class prepared.*
Almost never.
Once in a while.
Sometimes.
Often.
Almost all the time.
- 2) *I remembered and followed directions.*
Almost never.
Once in a while.
Sometimes.
Often.
Almost all the time.
- 3) *I got my work done right away instead of waiting until the last minute.*
Almost never.
Once in a while.
Sometimes.
Often.
Almost all the time.

- 4) *I paid attention, even when there were distractions.*
Almost never.
Once in a while.
Sometimes.
Often.
Almost all the time.
- 5) *I worked independently with focus.*
Almost never.
Once in a while.
Sometimes.
Often.
Almost all the time.
- 6) *I stayed calm even when others bothered or criticized me.*
Almost never.
Once in a while.
Sometimes.
Often.
Almost all the time.
- 7) *I allowed others to speak without interruption.*
Almost never.
Once in a while.
Sometimes.
Often.
Almost all the time.
- 8) *I was polite to adults and peers.*
Almost never.
Once in a while.
Sometimes.
Often.
Almost all the time.
- 9) *I kept my temper in check.*
Almost never.
Once in a while.
Sometimes.
Often.
Almost all the time.

Engagement

How much do you agree with following statements?

- 1) *How excited are you about going to your classes?*
Not at all excited.
Slightly excited.
Somewhat excited.
Quite excited.
Extremely excited.
- 2) *How focused are you on the activities in your classes?*
Not at all focused.
Slightly focused.
Somewhat focused.
Quite focused.
Extremely focused.
- 3) *In your classes, how excited are to participate?*
Not at all excited.
Slightly excited.
Somewhat excited.
Quite excited.
Extremely excited.
- 4) *When you are not in school, how often do you talk about ideas from your classes?*
Almost never.

Once in a while.

Sometimes.

Often.

Almost all the time.

- 5) *How interested are you in your classes?*

Not at all interested.

Slightly interested.

Somewhat interested.

Quite interested.

Extremely interested.

Family Support for Learning

How supportive your parents in your online learning:

- 1) *My family/guardian are there for me when I need them.*
Strongly disagree.
Disagree.
Agree.
Strongly agree.
- 2) *When I have problems at my school, my family/guardian(s) are ready to help me.*
Strongly disagree.
Disagree.
Agree.
Strongly agree.
- 3) *My family/guardians want to know when something good happens at school.*
Strongly disagree.
Disagree.
Agree.
Strongly agree.
- 4) *My family/guardians want me to keep trying when things are tough at school.*
Strongly disagree.
Disagree.
Agree.
Strongly agree.

Teacher-student relationships

We would like to know what you think about your relationships with your teachers during online learning due to COVID-19.

- 1) *Adults at my school are fair towards most of the time.*
Strongly disagree.
Disagree.
Agree.
Strongly agree.
- 2) *Adults at my school listen to the students.*
Strongly disagree.
Disagree.
Agree.
Strongly agree.
- 3) *Teachers at my school care about students.*
Strongly disagree.
Disagree.
Agree.
Strongly agree.
- 4) *My teachers are there for me when I need them.*
Strongly disagree.
Disagree.
Agree.
Strongly agree

- 5) *The rules at my school are fair.*
Strongly disagree.
Disagree.
Agree.
Strongly agree.
- 6) *My teachers are honest with me.*
Strongly disagree.
Disagree.
Agree.
Strongly agree.
- 7) *I like talking to the teachers here.*
Strongly disagree.
Disagree.
Agree.
Strongly agree
- 8) *I feel safe at school.*
Strongly disagree.
Disagree.
Agree
Strongly agree
- 9) *Most teachers care about me as a person, not just a student.*
Strongly disagree.
Disagree.
Agree.
Strongly disagree.

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CONFLICT OF INTEREST

Dr. Sahin and Dr. Matteson have no conflict of interest related to this study.

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