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# Are Parents Logged in? The Importance of Parent Involvement in K-12 Online Learning

GINA RICKER
*Pearson Online & Blended Learning*
gmricker@gmail.com

DANIEL BELENKY
*Pearson Online & Blended Learning*
Dan.Belenky@pearson.com

MATHEW KOZIARSKI
*Pearson Online & Blended Learning*
mathew.koziarski@pearson.com

Among the many factors that impact student performance in traditional K-12 settings, parent involvement (PI) is consistently identified as critical for student success. However, less is known about parent involvement for full-time virtual schools, where most learning takes place asynchronously in a Learning Management System (LMS). The present study attempts to close this gap by using data from three virtual schools' LMS to measure the impact of parent involvement on mathematics achievement, across grade bands where PI is known to vary. After controlling for factors known to impact education outcomes, parental involvement - as measured by LMS logins - had a small, but positive, impact on student performance in mathematics across elementary, middle, and high school. These results, coupled with the elevated role of the parent, suggest that parental involvement is just as critical, if not more so, in virtual schools as in traditional settings.

Enrollment in full-time virtual K-12 schools has steadily increased over the last 20 years. In 2019, two percent of all students in the United States were enrolled in a full-time online school (Digital Learning Collaborative, 2020). In 2020, the COVID-19 virus forced nation-wide brick-and-mortar school closures. This caused a dramatic increase in enrollment for full-time virtual schools as families sought reliable alternatives to online models developed by their traditional schools in response to COVID-19 (Carpenter & Dunn, 2021). Full-time virtual schools were well-positioned to respond to the influx of students with already established learning management systems (LMS) and curriculums specifically designed to be taught online.

During the pandemic, many students, families, and educators became more familiar with learning online (some, in full-time virtual schools, and some in what has been called "emergency remote teaching", see Hodges, et al., 2020). In doing so, they became more aware of the different factors that impact student success in virtual learning. While student learning in full-time virtual schools and traditional settings are clearly not identical, there are several factors that have been identified as contributing to a student's academic performance in both. One factor that has been consistently associated with student performance in traditional in-person settings is parent involvement (PI) (Broderick et al., 2011; Đurišić & Bunijevac, 2017; Oswald et al., 2018). Parent involvement has been defined in a variety of ways to cover parent actions that support student performance. Hashmi and Akhter (2013) defined it as anything parents do, at home or at school, to improve their student's academic success. Research has also identified specific behaviors, such as monitoring student schoolwork, that constitute PI (Holloway et al., 2008). With the increased enrollment in full-time virtual K-12 schools, there is a clear need for research to better elucidate the relationship between parent involvement and student performance in the online environment (Borup et al., 2015; Curtis & Werth, 2015; Liu et al., 2010).

When students are learning at home (often using a flexible or asynchronous curriculum), parents are expected to play an even larger role in their student's education (Borup, 2016; Stevens & Borup, 2015). For example, in the online learning environment, the parent is sometimes referred to as the learning coach because of how closely their role and involvement mirrors the teacher's (Currie-Rubin & Smith, 2014; Waters & Leong, 2014). However, parents new to the online environment may not know the appropriate level of involvement, have the technical literacy to utilize the digital tools (Alcena; 2014, Callaway, 2020; Chen et al., 2019; Rice & Ortiz, 2021), or have other circumstances that affect how involved they can be in their child's education (Hornby & Blackwell, 2018; Wilder, 2017). Considering these factors, recent research has highlighted the importance and impact of parent involvement in such activities as monitoring student learning and progress (Bergman, 2016; 2020; Hasler-Waters et al., 2014).

## RESEARCH QUESTIONS

PI in the online learning environment could positively impact outcomes such as student performance. The current study uses amount of parent logins to the LMS as a proxy for PI. Using this measure, the following questions can be addressed:

1. Does parent involvement as measured by logins impact performance in mathematics above and beyond prior performance, socioeconomic status, enrollment status, race, and student participation?
2. Does this effect differ across elementary, middle, and high school students?

The findings of this study contribute to understandings about how parent involvement impacts student performance, in the full-time virtual school environment, with a focus on mathematics. The findings expand upon the current understanding of parent involvement (largely based on the brick-and-mortar environment) by providing a quantitative measure of the impact of PI, via the LMS, on student performance in mathematics across grade levels in full-time online schools. Future research can use these findings as a reference point to better understand PI as it relates to online learning, and for designing programs or tools to increase PI in the online environment.

## REVIEW OF LITERATURE

The teacher, parent, and student all play separate but important roles to support student learning and achievement in K-12 education (Callaway, 2020; Park et al., 2017). However, the level of teacher and parent involvement will vary depending on the learning environment. In many online environments, the curriculum and learning activities are structured in such a way that the presence of the teacher is reduced, and the role of the parent is elevated (Drysdale et al., 2016). Parents are expected to take on more of a teacher-like role of monitoring student progress and performance using the online tools (Waters & Leong, 2014). This often requires more time from the parent than if the student was enrolled in a brick-and-mortar school, at least until a routine and expectations have been established (Callaway, 2020). Parents are expected to provide more support and assistance to the student as they navigate their courses (Chen et al., 2019), especially at the elementary and middle school levels (Currie-Rubin & Smith, 2014). However, as the student approaches high school, PI decreases, despite the well-documented importance (Alcena, 2014; Curtis, 2013; Jaiswal & Choudhuri, 2017).

There are reasons to believe that the move to online learning affords an opportunity to better study PI. Historically, PI has mostly been assessed subjectively via questionnaire. Such self-report measures of PI have been shown to have high levels of variability and be subject to bias (Borup et al., 2013). However, the LMS presents much of the information a parent would need to act as a learning coach and monitor student learning. This presents an opportunity to leverage data to measure PI more directly via parent interactions with the LMS, which few studies have done to date. Broderick et al. (2011) looked at parent logins to an online learning tool and found that after alerting parents to updates on student learning, they logged in significantly more to monitor students. Similarly, Davidovitch and Yavich (2015) found that parents who had access to the LMS, and used it consistently, reported high levels of involvement in their student's learning. Yet, several studies have found that many parents never log into the online tool or LMS due to a variety of factors including access to technology and internet, perceived importance, and how to understand and/or act on the student data (Bergman, 2016; Bergman & Chen, 2017; Mac Iver et al., 2021).

This indicates that simply providing access to the LMS where student information is presented is not sufficient for parents to use it to productively support students. Despite the ability of parents to monitor student learning via an LMS and associated tools, the effects of this type of parent involvement in online learning are not well known. There is very little research on using the LMS employed by online schools to better understand how parents participate in their students online learning (Borup et al., 2013).

### PI Framework for K-12 Online Learning

There are several frameworks for PI in brick-and-mortar education (Epstein, 1987; Hoover-Dempsey & Sandler, 1995), but they do not generalize well to the online environment (Stevens & Borup, 2015). Online parent engagement frameworks are still emerging, but they generally emphasize the importance of motivating and monitoring student learning. Specifically, Curtis (2013) set forth a three-part model of parent engagement in the online environment that best aligns with the current study. The model breaks down involvement into actions that motivate, monitor, and mentor the student. More importantly for the current study, it considers the role of the LMS which is a prominent feature and tool in full-time virtual schools. Parents of online learners can leverage the LMS to monitor their students schedule, prepare materials, communicate with the teacher, school staff, and check activity, progress, and performance (Alcena, 2014). This framework provides a foundation with which to both approach the current study as well as future research around online learning PI in K-12.

### PI and Student Performance

In traditional settings, it has been widely observed that parent involvement is positively related to student academic performance (Hornby & Blackwell, 2018; Santana et al., 2019), with home-based PI (e.g., involvement with homework) showing a more consistent and larger impact than school-based PI (e.g., volunteering or participating in a Parent-Teacher association; Park, Stone, & Holloway, 2017). Choi, Chang, Kim, and Reio (2015) tested a variety of factors on student achievement in mathematics and found parents with a higher income tend to be more involved and have higher performing students. Bergman (2020) replicated these findings when looking at parent logins to the LMS. However, after nudging families to login, both parent LMS usage and student performance improved. Similarly, Santana et al. (2019) found that nudging parents via text message to engage in non-academic involvement, including encouragement, resulted in a significant increase in student math performance compared to students whose parents were not nudged. These findings demonstrate that helping families to engage in different forms of PI might mitigate the gap that learning technology may otherwise aggravate (Bergman, 2020).

However, PI has not always been found to have a positive relationship with student outcomes. For example, inverse relationships between PI activities like homework help and student academic performance have been found (Robinson & Harris, 2014). Additionally, PI can also be indicative of a greater need for academic intervention. For example, Niia et al. (2015) found that increased PI reported by schools, was negatively associated with student performance, likely explained by school staff seeing parents working more with students performing poorly. Even in those cases, however, there is still evidence that the PI can positively impact persistence and performance (Silinskas & Kikas, 2019; Shapira-Lishchinsky & Zavelevsky, 2020).

Moreover, parent involvement has not always been found to have a direct impact on student performance. There are some social-emotional learning skills known to support academic outcomes for students that have been associated with parent involvement like self-regulation and self-confidence (Daniel et al., 2016; Yildrim, 2019). PI has been shown to boost students' perceptions of control and competence, reassuring students they have support, and increasing the value students see in their education, among others (Gonzalez-DeHass et al., 2005). Mwangi et al. (2019) and Daniel et al. (2016) found parent involvement to be positively related to college-readiness skills, like self-regulation. Specific to online learning, mentoring learners in effective learning behaviors is critical, because the environment requires students to exhibit autonomy and self-regulated learning skills more than the traditional classroom, due to lack of teacher presence and its flexible nature (Chen et al., 2019; Huh & Reigeluth, 2018). Broderick et al. (2011) asserted that parents who monitor student activity (such as through an LMS) can encourage students to practice vital time management skills. Research has consistently demonstrated that these kinds of skills contribute to students' success (Dent & Koenka, 2016), and that parental involvement with online education could help develop the necessary perseverance and regulatory skills students need to succeed (Liu et al., 2010). Finally, Russell (2004) believed for these reasons, that parent involvement could be more influential to students learning online.

## METHODS

### Participants

Three full-time virtual schools in the United States agreed to participate in the study by providing consent to share their LMS data via electronic form within the LMS. Only enrolled families who had consented via electronic form to have their LMS data used for research were included. Due to data constraints, only families with one student enrolled in the full-time virtual school were included. This provided confidence that when families logged into the LMS, they were doing so to monitor and support a particular student. Additionally, only students enrolled on time, and those who completed the course with a grade were retained in the sample. On-time was defined as a student who was enrolled on or before the first day of their fall semester. There were 1,755 students across the Elementary (grades 3 – 5, $n$ = 1,060), Middle (grades 6 - 7, $n$ = 555), and High School (grade 9, $n$ = 140) samples.

### Measure of PI

The time-stamped logins of parents were captured by servers of the proprietary LMS. It is important to clarify what qualifies as a parent for the purposes of this study. The definition that most closely aligns to the nature of online learning includes biological or adoptive parents, legal guardians, caregivers, or any other adult who is responsible for the student (Title 20, 2014). Thus, for all listed parents, caretakers, and learning coaches in the household of a student, logins were combined, and totaled across the semester for a single measure of all PI logins that could be linked to a single student.

### Measure of Mathematics Course Performance

All students, no matter school location, used the same curriculum, mathematics course (except high school Algebra, where only a single school was used, see Descriptive Statistics), and LMS. Finalized Fall semester course scores were used as the dependent variable of interest.

### Covariates

In line with prior research, there are several factors that impact student performance and parent involvement. Family income level, race/ethnicity, and prior student performance have been related to parent involvement (Daniel, Wang & Berthelsen, 2016; Wilder, 2017). Upon enrollment, families provided information relating to their student's race and ethnicity, as well as income (which was used to determine free and/or reduced meals status – FARM) . All students took the same benchmark Renaissance STAR

360® mathematics pre-test, and the subsequent performance percentile was extracted from the LMS for all students as the measure of prior performance in mathematics. The time-stamped logins of students were captured by servers of the proprietary LMS and their logins across the entire fall 2020 semester were summed and accounted for the level of student effort. Student participation in the course was defined by the average number of lessons completed on time and was included to control for students that were more on-track than others throughout the math course. Status as either a new or returning student was also obtained, as it has been found that new students can struggle to adjust to the online school environment and may require additional support from parents and the school (Rumberger, 2015). Lastly, gender was initially included, but due to non-significance across all grade levels, it was removed for parsimony.

## RESULTS

### Descriptive Statistics

As shown in Table 1, elementary students had the largest sample group (n = 1060), while high school had the smallest (n = 140). This is because every high school who participated in the study had a unique high school Algebra 1 course curriculum. Therefore, only one school was retained for the high school sample (the one with the largest sample size). The average total sum of parent logins across the semester decreased as the grade bands increased, consistent with prior research. However, average sum of student logins across the semester was stable across each grade band. Each grade band had varying numbers of newly enrolled students but had similar amounts of students who qualified for FARM. FARM households also had slightly lower average weekly PI logins compared to non-FARM households, consistent with prior research (see Table 2). Similarly, average weekly PI logins seemed to differ slightly by student race and ethnicity.

**Table 1**
**Sample Descriptive Statistics by Grade Band**

| Grade Band | N | Avg. Sum Student Logins | Avg. Sum PI Logins | % FARM | % New | % White | Avg. Participation | Avg. Pretest Percentile | Avg. Math Course Score |
|---|---|---|---|---|---|---|---|---|---|
| Elementary | 1060 | 317.665 | 264.220 | 41.604 | 71.698 | 67.264 | 97.521 | 65.296 | 83.667 |
| Middle | 555 | 308.977 | 209.494 | 49.910 | 54.955 | 66.126 | 97.216 | 49.623 | 78.706 |
| High | 140 | 314.750 | 196.021 | 40.000 | 38.571 | 80.000 | 97.961 | 59.521 | 77.186 |

**Table 2**
**Average PI Logins per Week by FARM Eligibility and Student Race/Ethnicity**

| Grade Band | FARM | Non-FARM | White | African American | Latino | Multiple | Other[a] |
|---|---|---|---|---|---|---|---|
| Elementary | 10.420 | 12.981 | 12.799 | 9.322 | 10.326 | 10.085 | 11.502 |
| Middle | 8.824 | 10.403 | 10.315 | 7.450 | 8.752 | 8.431 | 7.629 |
| High | 7.309 | 9.996 | 9.617 | 3.144 | 7.024 | 5.279 | 16.065 |
| Average | 8.851 | 11.127 | 10.910 | 6.639 | 8.701 | 7.932 | 11.732 |
| (n) | (774) | (981) | (1192) | (149) | (282) | (101) | (31) |

[a] Category combined students identifying as Asian, Native Hawaiian, Pacific Islander, American Indian, or Alaskan Native due to low n

Hierarchical multiple regressions were run to determine if the addition of PI logins in the LMS helped to explain student math performance over and above a model with only covariates that would otherwise explain student mathematics performance (student logins, prior math performance, participation, FARM status, new/returning status, and race). This procedure was repeated separately for elementary school, middle school, and high school grade band samples. See Tables 3 - 5 for full results on each hierarchical regression model.

### *Elementary School*

Due to heteroskedasticity of errors, as assessed by a plot of residuals and fitted values, weighting was employed to correct for the violation and to help achieve noticeably more homoscedastic and robust errors. The same plot showed linearity and no other pattern, so the assumptions of linearity and independence of errors were met. The assumption of normality was met as well, as assessed by a histogram and Q-Q plot. There was also no evidence of multicollinearity, as assessed by tolerance values greater than 0.1, and VIF values greater than 5. Although some outliers were detected via leverage values greater than 0.2 and Cook's distance above 1, there was no sensible reason to remove them.

For elementary school, the initial block in the regression model containing just the covariates of student logins, prior math performance, participation, FARM status, new/returning enrollment status and race to explain math performance (Block 1), had a combined statistically significant impact on student mathematics performance. However, a student being new or returning was not a significant contributor. The full, weighted model, with the addition of PI logins (Block 2), was statistically significant, $R^2 = 0.200$, $F$ $(7, 1052) = 141.400$, $p < .001$; WLS $R^2 = 0.485$, WLS adjusted $R^2 = 0.481$.

The addition of PI logins to the model led to a statistically significant increase in $R^2$ of 0.014 (and WLS $R^2$ of 0.024), $F$ (1, 1051) = 47.597, $p < .001$ (See Table 3). This indicates that including PI logins, how frequently parents monitor their student via LMS, helped better explain student performance in mathematics over the covariates alone. Specifically, it accounted for an additional 2.4% of variance (weighted) in student course scores. Special attention should be given to the fact that student logins and race no longer significantly impacted mathematics performance when PI logins were considered. This suggests that at the elementary level, where parents are expected to be more involved in the learning process, the act of monitoring students has more of an impact on mathematics performance and supersedes the relationship between previously considered impactful student factors and student performance.

**Table 3**
**Weighted Hierarchical Multiple Regression Explaining Elementary[a] School Math Performance from PI Logins and Student Covariates**

| | Math Performance | | | |
|---|---|---|---|---|
| | Block 1 | | Block 2 | |
| Variable | b | B | b | B |
| Constant | 23.957* | | 28.154** | |
| PI Logins | | | 0.004** | 0.062 |
| Student Logins | 0.011** | 0.114 | 0.002 | 0.024 |
| Pretest | 0.136** | 0.304 | 0.102** | 0.227 |
| Student Participation | 0.496** | 0.261 | 0.493** | 0.259 |
| FARM | -5.294** | -0.205 | -4.792** | -0.185 |
| New | -0.519 | -0.018 | -1.559* | -0.055 |
| Race (White) | 2.445** | 0.090 | 1.134 | 0.042 |
| | | | | |
| $R^2$ (WLS $R^2$) | 0.186 (0.461) | | 0.200 (0.485) | |
| F | 150.300** | | 141.400** | |
| $\Delta R^2$ ($\Delta$WLS $R^2$) | | | 0.014 (0.024) | |
| $\Delta$ F | | | 47.597** | |

Note: *N=1,060. * p < .05, ** p < .001*
[a]Students in 3rd, 4th, and 5th grade

### *Middle School*

There was some evidence of heteroskedasticity in errors, as assessed by a plot of residuals and fitted values, however, the results of the weighted model did not differ much from those of the unweighted model, though weighting, did help achieve more homoscedastic errors. Therefore, we present both the unweighted and weighted models. The same plot showed linearity and no other pattern, so the assumptions of linearity and independence of errors were met. The assumption of normality was met as well, as assessed by a histogram and Q-Q plot. There was also no evidence of multicollinearity, as assessed by tolerance values greater than 0.1, and VIF values greater than 5. Although some outliers were detected via leverage values greater than 0.2 and Cook's distance above 1, there was no sensible reason to remove them.

For middle school, only the unweighted results will be addressed for the purposes of discussion. The initial block in the unweighted regression model containing just the covariates of student logins, prior math performance, participation, FARM status, new/returning enrollment status and race to explain math performance (Block 1), had a combined statistically significant impact on student mathematics performance. However, enrollment status and race were not significant. The full, unweighted model with the inclusion of PI logins (Block 2) was statistically significant, $R^2$ = 0.227, $F$ (7, 547) = 22.940, $p$ < .001; adjusted $R^2$ = 0.217. The addition of PI logins to the model (Block 2) led to a statistically significant increase in $R^2$ of 0.008, $F$ (1, 546) = 5.588, $p$ < .05 (See Table 4), meaning that including PI helped to better explain student performance than the covariates alone. Specifically, it accounted for about an additional 1% of variance in student course scores in mathematics, which is less than the elementary model. This was expected as parents are less involved as students get older. Lastly, how much the student logged into the LMS was still significant in the presence of how much their parent(s) logged in, unlike the elementary model. This could suggest that at these middle school grade levels individual student involvement maintained importance.

**Table 4**
**Hierarchical Multiple Regression Explaining Middle[a] School Math Performance from PI Logins and Student Covariates**

| | Weighted | | | | Unweighted | | | |
|---|---|---|---|---|---|---|---|---|
| | Block 1 | | Block 2 | | Block 1 | | Block 2 | |
| Variable | b | B | b | B | b | B | b | B |
| Constant | 7.417 | | 7.769 | | 6.162 | | 6.055 | |
| PI Logins | | | 0.009** | 0.085 | | | 0.010* | 0.096 |
| Student Logins | 0.011* | 0.093 | 0.008* | 0.065 | 0.016** | 0.134 | 0.013* | 0.114 |
| Pretest | 0.171** | 0.273 | 0.159** | 0.254 | 0.189** | 0.302 | 0.182** | 0.290 |
| Student Participation | 0.627** | 0.259 | 0.620** | 0.256 | 0.610** | 0.252 | 0.600** | 0.248 |
| FARM | -4.077** | -0.119 | -4.087** | -0.120 | -3.791* | -0.111 | -3.691* | -0.108 |
| New | -0.837 | -0.024 | -1.575 | -0.046 | -1.859 | -0.054 | -2.617 | -0.076 |
| Race (White) | 0.489 | 0.014 | 0.063 | 0.002 | 0.071 | 0.002 | -0.296 | -0.008 |
| $R^2$ | 0.216 | | 0.223 | | 0.219 | | | 0.227 |
| (WLS $R^2$) | (0.187) | | (0.198) | | | | | |
| F | 20.970** | | 19.290** | | 25.620** | | | 22.940** |
| $\Delta R^2$ | | | 0.007 | | | | | 0.008 |
| ($\Delta$WLS $R^2$) | | | (0.011) | | | | | |
| $\Delta$ F | | | 7.675* | | | | | 5.588* |

Note: *N=555. * p < .05, ** p < .001*
[a]Students in 6th and 7th grade

### *High School*

For high school, all assumptions were tested and met. The initial block in the regression model containing just the covariates of student logins, prior math performance, participation, FARM status, new/returning enrollment status and race to explain math performance (Block 1), had a combined statistically significant impact on student mathematics performance. However, student logins, enrollment status, FARM, and race were not significant. The full model, including PI logins (Block 2), was statistically significant, $R^2$ = 0.334, $F$ (7, 132) = 9.476, $p$ < .001; adjusted $R^2$ = 0.299. The addition of caretaker/learning coach logins to the model (Block 2) led to a statistically significant increase in $R^2$ of 0.022, $F$ (1, 131) = 4.381, $p$ < .05 (See Table 5). This means that including PI logins helped to better explain student performance than the covariates alone. Specifically, it accounted for an additional 2.2% of variance in student course scores in mathematics. This was unexpected because parent involvement is lowest at the high school level. Additionally, some of the covariates did not have significant impact on high school student mathematics performance like with the other grade levels. Yet, the act of parents monitoring students had a significant, albeit small, impact on mathematics performance for this sample of high school students. This could indicate that by the time students reach high school, mathematics performance may be less impacted by previously considered student factors but more so, by their own prior performance, participation, and to a lesser extent, parent involvement.

**Table 5**
**Hierarchical Multiple Regression Explaining High School[a] Math Performance from PI Logins and Student Covariates**

| | Math Performance | | | |
|---|---|---|---|---|
| | Block 1 | | Block 2 | |
| Variable | b | B | b | B |
| Constant | 12.970 | --- | 12.02 | --- |
| PI Logins | --- | --- | 0.007* | 0.156 |
| Student Logins | 0.008 | 0.139 | 0.008 | 0.136 |
| Pretest | 0.205** | 0.415 | 0.191** | 0.386 |
| Student Participation | 0.478* | 0.210 | 0.482* | 0.212 |
| FARM | -1.622 | -0.076 | -1.227 | -0.058 |
| New | -1.616 | -0.076 | -2.341 | -0.110 |
| Race (White) | 2.716 | 0.104 | 2.109 | 0.081 |
| $R^2$ | 0.312 | | 0.334 | |
| F | 10.070** | | 9.476** | |
| $\Delta R^2$ | --- | | 0.022 | |
| $\Delta F$ | --- | | 4.381* | |

Note: *N=140. * p < .05, ** p < .001*
[a]Students in 9th grade

## DISCUSSION

The present study used the number of times the parents of a student logged into the LMS as a direct and unobtrusive measure of PI. Because PI is a multifaceted construct, this measure likely acted as a proxy, specifically, for parental monitoring. Findings revealed a significant relationship to student performance across the elementary, middle, and high school grade bands. This provides evidence that, just as in brick-and-mortar settings, having parents involved with their students' education helps improve student outcomes. Despite the relatively small size of the effect, the impact is evident above and beyond student factors that typically impact student performance, such as prior student performance and household income. The ability to control for such factors contributes to a more realistic view of the effect parent involvement has on student performance (Wilder, 2014).

Prior brick-and-mortar research has shown parents to be more involved in the elementary grade levels and become less involved as students matriculate through school (Jaiswal & Choudhuri, 2017). The current study of fully online students looked at three grade bands simultaneously, and parent involvement showed a similar trend. The results for the elementary model indicated that parents are more involved, compared to other grade bands, and the effect of their involvement overtakes the effect that variables such as enrollment and race had on student academic performance. Alternatively, while parent involvement is expected to be lower for high school students, the results indicate that how much parents logged into the LMS still had a significant impact on mathematics performance in the online environment. However, this was the smallest sample size of all the grade bands examined in this study, therefore generalizability of findings is limited.

Returning to Curtis' (2013) framework, it is likely that PI in this study captures monitoring behaviors, which may lead to increased ability for parents to mentor and motivate students with the information gleaned from the LMS. Specifically, there are several things a parent can do in the proprietary LMS used in the current study, such as to check their student's schedule and gradebook, look at course lessons and materials, and communicate with the school and teachers. Providing additional support to students who have difficulty with autonomy, motivation, and self-directed learning can be a powerful tool in improving outcomes (Alcena, 2014). While the current study demonstrated a connection between PI and student performance, there were a few limitations. First, the study only examined households with a single student enrolled in online school. It is reasonable to think that PI would look different with multiple students enrolled and more to monitor, consequently more research is required to better understand the level of PI for those households. Additionally, there is a need for more fine-grained analyses of parental behavior which was not in the focus of the current study.

Future research should consider how activity data for specific behaviors in the LMS could be used to further explore the depth of monitoring taking place (i.e., how many times the gradebook was checked vs. emailing the teacher).

Last, there was a difference in PI for lower-income households, echoing the findings of prior research (Chen et al., 2019; Choi et. al., 2015; Mwangi et al., 2019). Future studies should continue to investigate parent involvement levels, and their potential to close the performance gap between these groups. The current study contributed to the growing evidence that PI positively impacts student academic performance. However, more research is required to determine the specifics of this relationship and the actions parents take in the LMS and their potential to benefit various student populations who are learning online.

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