Custodial Grandchildren's School Attendance and Academic Performance during COVID-19: The Role of Technology

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Abstract: Due to COVID-19, many schools switched to remote instruction, creating an urgency to address the technology needs of many families, including grandparent-headed families. Many grandparent-headed families (i.e., custodial grandparents) have limited access to digital devices and stable internet. Moreover, many of these grandparents lack the skills and confidence to use technology, which may affect both their grandchildren's ability to attend school as well as their academic performance. This study investigates both the associations of grandfamilies' access to technology and custodial grandparents' comfort level with technology with their grandchildren's academic attendance and performance during COVID-19. We analyzed cross-sectional survey data collected from grandparents raising grandchildren between March 2021 and February 2022 in the United States. Ordered logistic regression analyses were conducted using STATA. The key results suggested that grandfamilies' more stable access to technology ($OR = 1.54$, $p = 0.048$) and grandparents' high comfort level with technology ($OR = 2.18$, $p = 0.003$) during grandchildren's remote learning were significantly associated with higher odds of grandchildren's better school attendance. Similarly, more stable access to technology ($OR = 1.53$, $p = 0.048$) and higher comfort level with technology ($OR = 1.67$, $p = 0.030$) were significantly associated with higher odds of grandchildren's better academic performance. The results imply the need to provide stable internet and digital devices to grandfamilies without access to these services or devices, as well as technical assistance and technical-related education workshops to custodial grandparents who are not tech-savvy.

Keywords: access to technology; comfort level with technology; grandfamilies; custodial grandchildren; custodial grandparents; school attendance; academic performance

1. Introduction

In March 2020, the COVID-19 pandemic disrupted traditional face-to-face education in the United States and many other countries. Schools were forced to switch from in-person to remote instruction temporarily, creating an urgency to address the technology needs of many families. During the shutdown in Spring 2020, 42% of households with children between the ages of 5 to 17 had no access to a computer or broadband in the United States [1]. Despite the declining rates in the fall of 2020, a third of households (31%) still had limited access to digital devices and the internet [1]. This limited access to technology, including digital devices and the internet, is a function of an individuals' age, race/ethnicity, socioeconomic status (SES), education, and location (e.g., rural vs. urban) [2]. In addition to limited access to technology, the less proficient use of technology to facilitate remote learning has been well documented as a challenge for some families, including grandfamilies [3,4]. Relatedly, during COVID-19, an increase in absenteeism and a decrease

in academic performance were commonly found among students, particularly those from lower SES families [5,6].

1.1. Grandfamiles in the United States

In the United States, grandfamilies are disproportionately represented by females, between 60 and 69 years of age, members of American Indian/Alaskan Native, Hispanic, and Black racial/ethnic groups, and those living in poverty [7,8]. Historically, these grandfamilies face barriers in accessing educational assistance and technical support to promote their grandchildren's educational outcomes [9,10]. Therefore, grandchildren raised by custodial grandparents have been found to have lower educational achievement outcomes than counterparts living in parent-headed families [3,11], but it is worth noting that these children tend to have better academic performance than their peers in other types of nonparental care [12]. These poorer outcomes are likely due to less school engagement by custodial grandparents, insufficient resources in school to support custodial grandchildren, as well as a lack of communication between grandparents and schools to promote the academic success of vulnerable custodial grandchildren [13,14]. Furthermore, some previous studies have even suggested that the origins of lower academic performance may date back to the time when grandchildren were residing with their biological parents. In such cases, biological parents may create challenges that hinder their grandchildren's ability to focus on their schoolwork [15].

The unprecedented COVID-19 crisis seriously exacerbated preexisting educational inequalities and achievement gaps among ethnic minority students and those who are from low-income families [16], including students whose primary caregivers are grandparents. During the COVID-19 pandemic, grandfamilies were particularly vulnerable in the face of remote learning because many grandparent-headed families had limited access to digital devices and stable internet [17] and some grandparents also lacked the skills and confidence to use technology to assist their grandchildren's remote learning [18]. Moreover, research has reported challenges related to accessing technology and remote learning support, as well as managing the demands of remote learning, which exacerbated grandchildren's educational issues during the COVID-19 pandemic [4,19].

1.2. Access to Technology, Comfort Level with Technology, and Grandchildren's Educational Outcomes

Although older adults' adoption of technology is growing compared to decades ago, not all grandparents have access to and feel comfortable with technology. Only two in three older adults over the age of 65 own a smartphone and less than one in two use social media in the U.S. [20–22]. Of note, these percentages refer to all older adults in the U.S. regardless of their socioeconomic status (SES), and the percentage would be lower among a group of older adults with lower SES, such as custodial grandparents. Particularly, U.S. adults who reported not using the internet were more likely to be over the age of 65, have lower annual household income (i.e., less than $30,000), and have lower educational attainment (i.e., high school diploma or lower; [23]). It has been widely acknowledged that access to technology was critical for children's school attendance and academic performance during COVID-19 [24]. Although most schools provided digital devices to students during the pandemic, many families from lower SES or rural areas still did not have access to stable internet [3,17,18,25]. Furthermore, empirical studies consistently showed that parents' confidence levels in the use of technology were associated with their children's academic achievement outcomes during the COVID-19 pandemic [26]. For example, a study found that parents from upper/middle-class families were likely to have higher self-efficacy in using technology and thus felt better able to support their children in remote learning [27]. On the other hand, parents from working-class families were less likely to have access to, and familiarity with, remote learning tools, and thus feel less equipped to support their children in remote learning [27]. Similarly, qualitative studies among grandfamilies have documented grandparents' challenges in using school-related technology to assist with

their grandchildren's remote learning, and grandparents have expressed that unstable internet and difficulties with technology were primary concerns during COVID-19 [3,4].

1.3. Purpose of the Study

While empirical studies illuminate that custodial grandchildren were at risk of low educational achievement and learning loss during the COVID-19 pandemic [3,4], less is known about how grandfamilies' access to technology and grandparents' comfort level with technology are associated with their grandchildren's educational outcomes.

This study aims to examine the associations between grandfamilies' access to technology and grandparents' comfort level with technology and custodial grandchildren's school attendance and academic performance during COVID-19. The research hypotheses are (1) grandfamilies' more stable access to technology is positively associated with higher odds of grandchildren's better school attendance and better academic performance; (2) grandparents' higher level of comfort with technology is positively associated with higher odds of grandchildren's better school attendance and better academic performance.

2. Methods

2.1. Study Design

The present study used a cross-sectional survey design, and we collected data from two sources, including a South Carolina community-based study ($n = 71$) and Qualtrics Panels (an online survey panel; $n = 216$) in the United States except for South Carolina. For grandparents recruited from South Carolina, we recruited participants via community partners, including the Department of Social Services, the Department on Aging, local nonprofit organizations serving kinship families, foster parent association, schools, and churches from May 2021 to February 2022. To recruit these grandparents, we shared the survey link with our community partners to distribute in their email listservs or online newsletters. Furthermore, we also mailed some hard copies of surveys to community partners. The majority of the survey was completed online, while some were completed in hard copy. Regarding data collected from Qualtrics Panels between January and February 2022, we used the following inclusion criteria to select custodial grandparents: (1) grandparents who self-identified as a primary caregiver for at least one grandchild younger than 18 years old in the United States; (2) were 40 years old or older; and (3) had neither of the grandchild's parents living in the household. Because we recruited grandparents in South Carolina prior to the launch of our survey on Qualtrics Panels, we included an additional screening question to exclude grandparents from South Carolina who had already filled out our survey. If grandparents had multiple grandchildren in the household, they were asked to report on one grandchild's information throughout the survey.

2.2. Sample Selection

Because our study questions focused on grandchildren's remote learning, we excluded 76 grandchildren who had never engaged in remote learning between March 2020 and the time when they filled out the survey. Therefore, our final analytic sample size was 209.

2.3. Measures

Dependent variables: Grandchildren's educational outcomes were measured using two indicators: grandchildren's school attendance and academic performance in the past six months. Grandchildren's school attendance was measured using a five-point scale: "How has your grandchild's school attendance been during the pandemic?" The response options were presented in parentheses (1 = *very poor*, 2 = *poor*, 3 = *average*, 4 = *good*, and 5 = *very good*). Due to extremely uneven distributions among responses across these five categories, we collapsed the responses into a three-category variable (1 = *very poor/poor*, 2 = *average*, and 3 = *good/very good*). Similarly, grandchildren's academic performance was rated by their grandparents to assess their overall academic performance in the past six months on a five-point scale (1 = *very poor*, 2 = *poor*, 3 = *average*, 4 = *good*, and 5 = *very*

good), and similarly due to very uneven distributions, we collapsed this variable into a three-category variable (1 = *very poor/poor*, 2 = *average*, and 3 = *good/very good*).

Independent variables: Grandfamilies' stable access to technology during grandchildren's remote learning was measured by adapting questions from the barriers to technology use scale [28,29]. Participants rated four questions on a 6-point scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *slightly disagree*, 4 = *slightly agree*, 5 = *agree*, and 6 = *strongly agree*), including: (1) the internet connection at my home is fast and reliable; (2) technologies often fail when I am trying to support my grandchild's learning; (3) my grandchild has access to a device at home that we can use to access everything needed for school; and (4) when there is a problem with a technological tool, my grandchild receives quick and effective assistance from the school or another source. Question two was reverse-coded, and an average score of these four items was used. The reliability of this scale was 0.73 in the present study (see detailed reliability information in Appendix A).

The measure of grandparents' comfort level with technology was adapted from both the 2018 community needs survey: 2018 Technology Access and Adoption Study [30] and the Barriers to Technology Use scale [28,29]. Four items included: (1) I feel confident about my ability to use a computer; (2) I feel confident about my ability to use a smartphone; (3) I feel confident about my ability to use a computer tablet (e.g., iPad); and (4) it is easy for me to find and use new learning resources, websites, and apps to support my grandchild's learning. Responses were rated on a 6-point scale (1 = *strongly disagree*, 2 = *disagree*, 3 = *slightly disagree*, 4 = *slightly agree*, 5 = *agree*, and 6 = *strongly agree*). An average score was used, and the reliability of this scale was 0.86 in the present study (see detailed reliability information in Appendix A).

2.4. Control Variables

Grandchild race/ethnicity (1 = *White*, 2 = *Black*, and 3 = *other, White as a reference group*), gender (0 = *female* and 1 = *male*), age (measured using years), grade (1 = *preschool or kindergarten*, 2 = *elementary school*, 3 = *middle school*, and 4 = *high school; preschool or kindergarten as a reference group*), grandchild disability status (1 = *yes* and 0 = *no*), and their additional educational intervention assistance need (0 = *no need* and 1 = *need*) were controlled as covariates. Grandparent race/ethnicity (1 = *White*, 2 = *Black*, and 3 = *other, White as a reference group*), gender (0 = *female* and 1 = *male*), age (measured using years), grandparent education (0 = *some college and above* and 1 = *high/technical school and below*), and grandparent family income (1 = 0–$25,000, 2 = $25,000–$40,000, and 3 = >$40,000; 0–$25,000 *as a reference group*) were controlled as well. Due to the differences in data collection, we controlled the data source (0 = *South Carolina data* and 1 = *Qualtrics Panels data*) in the analysis.

2.5. Data Analysis

Data cleaning, descriptive analyses, correlations, and ordered logistic regression were conducted using Stata 16.0. Two ordered logistic regression models were run for school attendance and academic performance as dependent variables, respectively. Thirteen indicators (i.e., two independent variables and 11 control variables) were simultaneously included as predictors for each model. Ordered logistic regression model assumptions were examined. Particularly, the parallel regression assumption (dependent variable: school attendance; Brant chi^2 = 11.11, p = 0.920; dependent variable: academic performance, Brant chi^2 = −482.9, p = 1.000) was not violated with non-significant results of an approximate likelihood-ratio test of proportionality of odds. Missing data percentages ranged from 0.48% (grandchild's age) to 1.91% (grandparents' race/ethnicity).

3. Results
3.1. Descriptive Results

Descriptive results are presented in Table 1. Regarding grandchildren's school attendance, grandparents reported that 8.61% (*n* = 18) had a very poor/poor performance,

16.27% (*n* = 34) had an average performance, and 75.12% (*n* = 157) had a good/very good performance. Regarding these grandchildren's academic performance, grandparents reported that 10.05% (*n* = 21) had a very poor/poor academic performance, 22.01% (*n* = 46) had an average performance, and 67.94% (*n* = 142) had a good/very good performance. The correlation between grandchildren's school attendance and academic performance was 0.42 (*p* < 0.001). Grandfamilies' stable access to technology was rated as 4.85 (*SD* = 1.02; *n* = 209) out of 6, whereas their comfort level with technology was 5.10 (*SD* = 0.96; *n* = 209) out of 6. The correlation between stable access to technology and comfort level with technology was 0.58 (*p* < 0.001).

Table 1. Descriptive results.

Variable	*n*	%/Mean (SD)
Academic performance		
Very poor/poor	21	10.05%
Average	46	22.01%
Good/very good	142	67.94%
School attendance		
Very poor/poor	18	8.61%
Average	34	16.27%
Good/very good	157	75.12%
Stable access to the technology	209	4.59 (1.02)
The comfort level with technology	209	4.95 (0.96)
Grandchild race		
White and non-Hispanic	122	58.37%
Black and non-Hispanic	57	27.27%
Other	30	14.35%
Grandchild gender		
Male	107	51.20%
Female	102	48.80%
Grandchild age	208	9.89 (3.56)
Grandchild grade		
Preschool or kindergarten	21	10.19%
Elementary school	120	58.25%
Middle school	27	13.11%
High school	38	18.45%
Grandchild disability		
Yes	23	11.00%
No	186	89.00%
Grandchildren's educational assistance needs		
Yes	109	52.15%
No	100	47.85%
Grandparent race		
White and non-Hispanic	129	62.93%
Black and non-Hispanic	54	26.34%
Other	22	10.73%

Table 1. *Cont.*

Variable	*n*	%/Mean (SD)
Grandparent gender		
Male	70	33.49%
Female	139	66.51%
Grandparent age	209	56. 86 (8.82)
Grandparent education		
Some college and above	141	72.31%
High/technical school and below	54	27.68%
Grandparent income		
$0–$25,000	28	13.40%
$25,000–$40,000	50	23.92%
>$40,000	131	62.68%
Data source		
South Carolina data	60	28.71%
Qualtrics Panels data	149	71.29%
Correlation between grandchildren's school attendance and academic performance	r = 0.42	*p* < 0.001

In the present study, 58.37% (*n* = 122) of grandchildren were White and non-Hispanic, 27.27% (*n* = 57) were Black and non-Hispanic, and 14.35% (*n* = 30) were identified as other race/ethnicity. Other race/ethnicity included American Indian or Alaska Native, Asian or Asian American, Hispanic, Native Hawaiian or other pacific islander, and more than one race. Further, 48.80% (*n* = 102) of grandchildren were female with an average age of 9.89 years, and 11% (*n* = 23) of grandchildren had disabilities. More than half of grandchildren (58.25%; *n* = 120) were in elementary school, 13.11% (*n* = 27) in middle school, 18.45% (*n* = 38) in high school, and 10.19% (*n* = 21) in preschool or kindergarten when they filled out the survey. Grandparents reported that more than half of these grandchildren (52.15%; *n* = 109) needed educational assistance in the past six months.

Regarding grandparents' characteristics, 62.93% (*n* = 129) were White, 26.34% (*n* = 54) were Black, and 10.73% (*n* = 22) were identified as other. The majority of grandparents (66.51%; *n* = 139) were female, 72.31% (*n* =141) of them had some college and above education, and the majority of them (62.68%; *n* = 131) had a family income higher than $40,000.

3.2. Ordered Logistic Regression Results
3.2.1. Outcome: School Attendance

Ordered logistic regression results (see details in Table 2) showed that for a one-unit increase in access to technology (OR = 1.54, *p* = 0.048), the odds of good/very good school attendance versus the combined average and poor/very poor school attendance categories were 1.54 times greater, given the other variables were held constant in the model. Likewise, for a one-unit increase in the comfort level with technology score (OR = 2.18, *p* = 0.003), the odds of good school attendance versus the combined average and poor/very poor school attendance categories were 2.18 times greater, with the other variables being held constant. The results also showed that grandchildren from the Qualtrics panels sample compared to their peers from South Carolina were significantly associated with higher odds of good/very good school attendance compared to the combined average and poor/very poor school attendance (OR = 3.33, *p* = 0.043). The other control variables were not significant in predicting grandchildren's school attendance.

Table 2. Ordered logistic regression (N = 187).

Variable	School Attendance			Academic Performance		
	Odds Ratio	*p*	[95% CI]	Odds Ratio	*p*	[95% CI]
Stable access to technology	1.54	0.048	[1.00, 2.39]	1.53	0.048	[1.00, 2.32]
The comfort level with technology	2.18	0.003	[1.31, 3.61]	1.67	0.030	[1.05, 2.67]
Grandchild race (ref: White)						
Black	1.60	0.669	[0.19, 13.66]	2.55	0.397	[0.29, 22.35]
Other	0.28	0.077	[0.07, 1.15]	1.44	0.646	[0.30, 6.78]
Grandchild gender (ref: male)	1.46	0.365	[0.64, 3.31]	1.49	0.309	[0.69, 3.18]
Grandchild age	0.88	0.282	[0.71, 1.11]	1.07	0.421	[0.91, 1.26]
Grandchild grade (ref: preschool or kindergarten)						
Elementary school	0.40	0.360	[0.06, 2.86]	0.51	0.341	[0.13, 2.05]
Middle school	0.42	0.529	[0.03, 6.17]	0.40	0.350	[0.06, 2.76]
High school	0.53	0.678	[0.03, 10.50]	0.37	0.372	[0.04, 3.30]
Grandchild disability (ref: no)	0.43	0.125	[0.15, 1.26]	0.11	<0.001	[0.04, 0.31]
Grandchild educational assistance need (ref: no)	1.08	0.867	[0.43, 2.73]	1.22	0.663	[0.50, 3.00]
Grandparent race (ref: white)						
Black	1.63	0.677	[0.16, 16.07]	0.26	0.244	[0.03, 2.53]
Other	1.30	0.731	[0.29, 5.88]	0.91	0.907	[0.17, 4.72]
Grandparent gender (ref: male)	0.60	0.267	[0.24, 1.48]	0.48	0.088	[0.20, 1.12]
Grandparent age	0.88	0.282	[0.71, 1.11]	0.98	0.402	[0.94, 1.03]
Grandparent education (ref: some college and above)	0.96	0.429	[0.40, 2.30]	0.78	0.553	[0.34, 1.78]
Grandparent income (ref: $0–$25,000)						
$25,000–$40,000	0.29	0.100	[0.07, 1.26]	0.93	0.909	[0.28, 3.15]
>$40,000	0.52	0.359	[0.13, 2.10]	0.85	0.779	[0.28, 2.60]
Data source: Qualtrics Panels data (ref: South Carolina data)	3.33	0.043	[1.04, 10.70]	1.05	0.924	[0.36, 3.05]
Model fit	LR chi^2(19) = 57.30 Prob > chi^2 = 0.0000	Log likelihood = −109.05	Pseudo R^2 = 0.2081	LR chi^2(17) = 51.03 Prob > chi^2 = 0.0001	Log likelihood = −124.20318	Pseudo R^2 = 0.1704

3.2.2. Outcome: Academic Performance

The ordered logistic regression results showed that for a one-unit increase in access to technology, the odds of good/very good academic performance versus the combined average and poor/very poor academic performance categories was 1.53 times greater (OR = 1.53, $p = 0.048$), controlling for the other variables. Similarly, for a one-unit increase in the comfort level with technology score, the odds of good academic performance versus the combined average and poor/very poor academic performance categories was 1.67 times greater (OR = 1.67, $p = 0.030$), controlling for the other variables. In addition, for grandchildren with disabilities, the odds of good academic performance versus the combined average and poor/very poor academic performance categories were 0.11 (OR = 0.11,

p < 0.001) times smaller, with the other variables being held constant. The rest of the control variables were not significant in predicting grandchildren's academic performance.

4. Discussion

The findings of the present study suggest the important role of technology regarding students' school attendance and academic performance among grandparent-headed families during COVID-19. Aligned with this study's hypotheses, our findings contribute to the existing literature, confirming that grandfamilies' more stable access to technology and grandparents' higher comfort level with technology significantly contribute to grandchildren's school attendance and academic performance during COVID-19.

Our results first confirm the positive associations between grandfamilies' more stable access to technology and grandchildren's better school attendance and academic performance. As schools switched to online instruction during COVID-19, having stable access to the internet and digital devices was critical to students' learning [24]. Some grandfamilies had no access to technology, including stable internet and digital devices at home prior to and during COVID-19 [3,17,18]. Despite school districts providing digital devices for students to use for virtual learning, prior studies have found that the connectivity to the internet for online classes was still one of the main barriers to students' virtual learning during the pandemic, particularly for students who were located in rural areas and/or from lower SES families [25,31].

Furthermore, our results indicate positive associations between grandparents' comfort level with technology and grandchildren's school attendance and academic performance. It is widely acknowledged that many grandparents lack technological savvy [3]. For instance, [21] study found that half of the grandparents in their study had difficulty using grandchildren's school-related technology. While internet use among older adults, including grandparents, has dramatically increased in the past two decades, their confidence in using technology has not [20,21]. Our findings suggest that grandparents' lack of technological savviness affects their confidence in assisting their grandchildren with virtual learning, resulting in grandchildren's relatively poor school attendance and academic performance. This is consistent with findings in qualitative studies where grandparents wished they would have received more support from their children's schools regarding how to use the school's technologies during COVID-19 [3,4].

Additionally, our study found that a grandchild's disability status is associated with worse academic performance, which is in keeping with Santibañez and Guarino's findings [32]. Grandchildren with disabilities were at a disadvantage compared to their counterparts without disabilities, particularly in their academic performance prior to COVID-19. The pandemic might have exacerbated disadvantages in access to virtual learning during COVID-19 [33]. Children with disabilities may have experienced additional barriers, such as inaccessible hardware or software, difficulties with using technology, and engaging successfully with virtual learning during COVID-19. Further, it is possible that opportunities for tailored virtual learning to accommodate students with disabilities may not have been developed or were not very effective during COVID-19 [34].

Interestingly, the data collected on grandchildren in our Qualtrics panels suggest that they were more likely to attend school than their peers from the South Carolina community-based sample which was gathered through online or hard copy surveys. Qualtrics panels is an online survey research platform that has millions of U.S. residents. Taking into account the inherent bias in the recruitment process for this research platform, it is probable that individuals who participate in this survey research platform possess a higher likelihood of being proficient in technology. Thus, it may suggest that grandparents who were able to fill out the survey via Qualtrics panels were more likely to have stable internet at home and were able to assist with their grandchildren's school attendance.

Prior research has suggested that some variables, such as grandchildren's and grandparents' race/ethnicity, grandparents' educational level, and income, to some extent determined older adults' use of technology [2,23,27]. However, we did not find that any

demographic variables contributed to grandchildren's educational outcomes. A potential explanation would be that there is less heterogeneity among this sampled group of grandparents and the similarity in demographics among grandparents made these variables non-significant.

Lastly, while other factors (e.g., previous grades, learning motivation, learning habits, housing instability, physical illness) might have contributed to grandchildren's problems with school attendance and academic performance, we did not consider them. School attendance, along with lower academic performance due to absenteeism, has been identified as a more significant problem during COVID-19 [5,6,35]. In a previous study conducted during the COVID-19 pandemic, some grandparents shared the lack of motivation their grandchildren displayed in engaging with virtual learning [4], which might have affected school attendance. In addition, it might have been challenging for grandparents to manage their physical and mental health, social life, and grandchildren's school demands simultaneously during COVID-19. All of these challenges might have affected grandchildren's school attendance, particularly if grandparents needed to serve as a significant monitor of their grandchildren's educational engagement. As a result, these students might be subject to significant learning loss with lower academic performance.

4.1. Limitations

The current study has several important limitations. First, the generalizability of the study is limited due to both our sampling strategy and data collection methods. Our study made use of a combination of in-state convenience sampling and a national online survey panel, limiting the capacity to generalize to the state of South Carolina or nationally. It is important to note that different states had implemented different COVID-19-related policies and different school districts had different policies on switching back to in-person education. In particular, South Carolina returned to in-person schooling much earlier than many other states, which may have caused the differences in outcomes of interest between the two samples. A further limitation of this study was its cross-sectional nature, which limited our interpretation of the effects of technology on grandchildren's educational outcomes. Additionally, this study was limited by a lack of detailed information about grandparents' access to various digital devices; nevertheless, although our survey asked grandparents to report on whether their grandchild had access to a device at home, it did not ask which specific devices (e.g., Apple or Android-based tablets, laptops, or phones) grandparents had in the home. Also, grandchildren's previous grades, motivation, learning habits, and other factors contributing to virtual learning outcomes were not controlled for in the present study. Moreover, grandchildren's educational outcomes were self-reported by grandparents. Finally, the study was limited by the two survey instruments used to measure key variables: (1) quality of access to technology and (2) comfort level with technology. While the instruments had good internal consistency (Cronbach's alpha was 0.73 and 0.86, respectively), we abridged the scale from the version used by the original authors to keep the overall survey length manageable for grandparents.

4.2. Implications for Research

The current study, its findings, and its limitations have several implications for future research on custodial grandparents and their grandchildren's educational outcomes. First, a future iteration of the study might include a more intentional random or stratified random sample of custodial grandparents from a national database for greater generalizability rather than relying on a patchwork of statewide community partners or paid Qualtrics panelists. Second, future research on this topic should include detailed information about grandparents' access to various digital devices. For instance, it might be useful to know if grandparents have their own devices that they use independently of their grandchildren, and it also would be beneficial to know which specific devices (e.g., Apple or Android-based tablets, laptops, or phones) grandchildren have access to at home. As previously mentioned, other factors contributing to grandchildren's educational outcomes, such as grandchildren's

previous grades, learning motivations, learning habits, housing stability, and physical illness, should be considered as well. Third, in keeping with the limitations of the shortened "use of technology" instrument, future research might develop a more comprehensive instrument to look at grandparents' use of technology to support their grandchildren's academic success. Future studies might use the more established scales with psychometric information to achieve higher reliability. Fourth, future research in this area might also benefit greatly from the inclusion or use of more objective measures of grandchildren's educational outcomes, including their grades/report cards, student achievement scores, and discipline or attendance records rather than relying on self-reported measures from custodial grandparents. These measures might be accessed directly from schools or school districts. Finally, future work might instead take a longitudinal approach to examine the role of grandparents' comfort with technology on their custodial grandchildren's academic attendance and performance both early on in the COVID-19 pandemic, and during its aftermath.

4.3. Implications for Practice

The results of this study provide valuable implications for practice. As demonstrated in our study, when grandparents had more access to technology and greater comfort in using technology, their grandchildren had a greater likelihood of increased school attendance and better academic performance. The results first imply the need to provide digital devices and increase stable internet accessibility for grandparent-headed families to improve grandchildren's educational outcomes.

Second, schools and other community-based organizations need to provide technical assistance, technical-related education workshops, and peer support groups to grandparents who are not tech-savvy to better support grandchildren's educational learning. Findings from several studies [21,36] suggest that grandparents need to be supported in their use of computers and other technologies. These support services can be provided in a variety of forms, such as technical support from an organization, educational workshops, and even peer instruction. Additionally, there are several online programs focused on educating older adults on how to use technology (e.g., Center on Research and Education for Aging and Technology Enhancement, CREATE, Senior Net; [36–38]). While some programs have face-to-face opportunities, not all do. The irony in hosting programs online is that older adults must know how to access them; therefore, organizations and agencies that work with older adults need to have local and consistent access to technology training and resources [36]. Thus, if possible, in-person instruction would be better, and even one-time instruction on a computer in-person would improve the mastery of technology among older adults [21].

Third, our study's findings indicating that grandchildren with disabilities have lower academic performance suggest the importance of providing additional assistance to students with special education needs. The more support provided to these students and their families, the less stress is felt by everyone involved in the students' learning process. In the end, adjusting the support provided to families based on their needs would promote a more equitable education for all children [39].

5. Conclusions

Although the public health emergency of the COVID-19 pandemic has ended, the influence of technology on students' learning has changed dramatically as a result of the pandemic. For instance, some schools now offer more virtual classes. Even if grandchildren who are raised by grandparents are not enrolled in any virtual classes, they still need to use technology to assist their learning and complete assignments. Grandchildren are disadvantaged when they need school-related technological assistance from their primary caregivers. Thus, grandparents' technological literacy is still important for their grandchildren's educational outcomes. Schools and community-based organizations need to work closely with these children and their families to ensure they have equitable access to

technology and are technologically savvy to reduce the negative effects of technology on their grandchildren's educational outcomes.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the Institutional Review Board of University of South Carolina (Pro00106849 on 3/15/2021).

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: Data available on request due to restrictions (e.g., privacy or ethical).

Conflicts of Interest: The authors declare no conflict of interest.

Appendix A Scale Reliability

Table A1. Scale 1: Grandfamilies' stable access to technology.

Item	N	Sign	Item-Test Correlation	Item-Rest Correlation	Average Interitem Covariance	Alpha
The internet connection at my home is fast and reliable	209	+	0.84	0.67	0.58	0.57
Technologies often fail when I am trying to support my grandchild's learning	209	+	0.73	0.47	0.76	0.69
My grandchild has access to a device at home that we can use to access everything needed for school	209	+	0.74	0.54	0.76	0.65
When there is a problem with a technological tool, my grandchild receives quick and effective assistance from the school or another source	209	+	0.66	0.40	0.90	0.73
Test scale					0.75	0.73

+ indicate a positive relationship.

Table A2. Scale 2: Grandparents' comfort level with technology.

Item	N	Sign	Item-Test Correlation	Item-Rest Correlation	Average Interitem Covariance	Alpha
I feel confident about my ability to use a computer.	209	+	0.90	0.82	0.72	0.78
I feel confident about my ability to use a smartphone.	209	+	0.86	0.77	0.82	0.81
I feel confident about my ability to use a computer tablet (e.g., iPad).	209	+	0.91	0.83	0.70	0.77

Table A2. *Cont.*

Item	N	Sign	Item-Test Correlation	Item-Rest Correlation	Average Interitem Covariance	Alpha
It is easy for me to find and use new learning resources, websites and apps to support my grandchild's learning	209	+	0.74	0.50	0.91	0.93
Test scale					0.79	0.86

+ indicate a positive relationship.

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