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A Pandemic Silver Lining: Remote Learning and Increased Intergenerational Technology Guidance within Lower-Income Families

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The COVID-19 pandemic acted as an accelerant in many aspects of social life, speeding up existing social trends rather than fostering entirely new behaviors. This was particularly evident in relation to technology use. We examine *intergenerational technology guidance*—how parents help children, and how children help parents—within lower-income families one year into the pandemic. We draw on nationally representative, cross-sectional surveys of lower-income U.S. parents with school-age children in 2015 and 2021 to compare families' pandemic experiences to an earlier point in time. We ask whether sociodemographic patterns of intergenerational technology guidance changed between 2015 and 2021 and identify factors that might explain these changes. Logistic regressions show that intergenerational technology guidance increased within these families—but also, that sociodemographic differences in parental technology guidance evident in 2015 had largely fell away by 2021. This suggests a "silver lining" of the pandemic period: a key form of digital inequality among lower-income U.S. parents was much less pronounced by 2021. Our findings have important implications for policy and practice in the aftermath of pandemic remote learning.

Keywords: digital inequalities, intergenerational technology guidance, lower-income families, surveys, COVID-19 pandemic

The COVID-19 pandemic acted as an accelerant in many aspects of social life, in that it sped up existing social trends instead of fostering entirely new behaviors (Hogan, Howlett, & Murphy, 2022). The accelerant effect has been particularly evident in relation to technology use. When school (for all) and work

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(for many) went remote in the United States in March 2020, technology moved from the periphery to the center of family life.

Parents' and children's reliance on technology in the United States increased dramatically as digital devices became their main conduit to the outside world. Reliance on other members of their households increased in equal measure because social distancing meant that parents and children could not easily access other sources of assistance as they learned how to navigate the unfamiliar learning platforms, apps, and devices that were now essential for accessing services and resources. For families who were *under-connected*, meaning that their Internet connections and digital devices were too inconsistent or inadequate to meet their needs (Katz & Rideout, 2021), household negotiations also involved strategizing how to manage those forms of digital inequality.

We examine intergenerational technology guidance—how parents help children, and how children help parents—within lower-income U.S. families one year into the pandemic; a year in which parents and children were obliged to engage with technology more broadly and intensively than before. Our analyses draw on nationally representative, cross-sectional cellular and landline telephone surveys of lower-income U.S. parents with school-age children in 2015 and 2021. We are therefore able to compare pandemic experiences to an earlier time point, tracing evolutions in digital inequality and family technology engagement without assuming that the pandemic fostered entirely new forms of family interaction. We ask whether sociodemographic patterns of intergenerational technology guidance changed between 2015 and 2021 and identify factors that might explain such changes.

We begin by reviewing prior scholarship related to how families negotiate intergenerational technology engagement and support, followed by an overview of our methodology and data sources. We then present results from descriptive analyses and binary logistic regressions. We discuss what our findings mean within the larger evidence base on digital inequalities in family life and how the COVID-19 pandemic may have accelerated changing dynamics of these inequalities. Finally, we discuss how our findings can inform policy and practice to address digital inequalities among U.S. lower-income families with school-age children at home and in school settings.

Families and Intergenerational Technology Engagement

For years, scholars treated family members' influence on each other's media and technology engagement as unidirectional: how parents influence their children. Beginning with family television use, the parental mediation literature has documented how parents' decisions shape whether children engage with particular media, what content they are permitted to access, and, if parents engage in co-viewing alongside their children, how parents influence what children learn from that content (Sasson & Mesch, 2019).

Bidirectional models of family technology engagement, in which parents and children influence each other's experiences, have become more common in recent years. There are two reasons for this shift. The first reflects changes in families' technology environments because new communication technologies facilitate more dynamic forms of family interaction than mass media. Clark (2011) proposed a parental

mediation theory for the digital age, moving away from co-viewing (which was appropriate for television), to focus on co-learning with digital technologies. Clark (2011) applies Vygotsky's (1978) definition of learning as a socially situated activity, wherein interactants can fluidly exchange expert and learner roles, to the context of family technology engagement. In doing so, Clark (2011) argues that the interactive affordances of digital technologies enable parents and children to support each other in acquiring and honing new digital skills and knowledge through co-learning.

The second reason that bidirectional models of family technology engagement have become more widely accepted is that scholars have broadened their focus to more diverse children and families. Research on children, adolescents, and media had traditionally focused on WEIRD populations; that is, Western, educated, industrial, rich, and democratic (Henrich, Heine, & Norenzayan, 2010). Within Western nations, research has focused primarily on White, middle-class, and native-born families (Alper, Katz, & Clark, 2016). Research in global contexts, and in populations within Western nations that are lower-income, racial/ethnic minority groups, and/or headed by immigrant parents, have revealed much greater diversity in how families orient to each other as learning partners with technology and have shown the essential roles that children and adolescents play in these family experiences.

Investigating Intergenerational Technology Engagement in International Context

Scholarship across the globe offers important insight into the dynamics of intergenerational technology engagement. For example, research conducted in Chile emphasizes the "bottom-up" influence of children on their parents' technology engagement, especially in families with lower household incomes and parental educational attainment (Correa, Straubhaar, Chen, & Spence, 2015). Correa and colleagues (2019) subsequently found that Chilean parents report both *learning* and *leaning* effects, meaning that they learn how to use the Internet from their children while also relying on them to do things online for them. Household survey data from Bolivia, Colombia, Ecuador, Mexico, Peru, and Uruguay similarly found that low-income parents were more likely to rely on their children to do things for them online (Galperin & Arcidiacono, 2019).

In Slovenia, Dolničar and colleagues (2018) found that Internet nonusers who had children or grandchildren in their social support networks were more likely to engage in Internet proxy use by having someone use the Internet on their behalf. Similarly, Grošelj and colleagues (2022) found that children and grandchildren play an important role in Internet nonusers' engagement in proxy use. Taken together, these studies underscore that intergenerational exchanges of expert and learner roles in technology engagement are a common feature of family life in diverse national contexts, especially within lower-income families and those where parents have lower levels of educational attainment.

Intergenerational Technology Engagement in the U.S. Context

A burgeoning literature now documents intergenerational technology engagement and guidance across diverse social groups in the United States as well. For example, Katz, Moran, and Gonzalez (2018) found that lower-income African American and U.S.-born Hispanic parents reported roughly equal cross-

generational exchanges of technology guidance, whereas White parents reported more parent-driven technology assistance, even when controlling for educational attainment.

Katz and colleagues (2018) also found that families headed by immigrant Hispanic parents reported the highest levels of reliance on their children as *technology brokers*. When children broker technology, they engage in activities that facilitate their parents' connections to and understandings of new communication technologies, which may include searching for information, teaching parents how to use new devices or platforms, and, in the case of children with immigrant parents, translating digital content into their parents' native language (Katz et al., 2018).

The distinctive differences between families headed by U.S.- and foreign-born Hispanic parents reflect the latter group's more limited English proficiency, educational attainment, and opportunities to develop digital skills through daily use in the workplace (Sanchez, Mayorga-Calleros, & Pedroza, 2020). In line with Clark's (2011) formulation of co-learning, studies in this vein do not treat children's brokering as a problematic result of parents' digital challenges. Rather, they document how patterns of intergenerational technology engagement across diverse families reflect the innovative ways that parents and children can pool their skills and knowledge to support mutual learning and achieve shared goals (e.g., Katz & Gonzalez, 2016; Yip, Gonzalez, & Katz, 2017).

Because the extant literature reveals sociodemographic variation in families' intergenerational technology guidance before the COVID-19 pandemic, we ask whether one year into the pandemic, these forms of sociodemographic variation had endured or evolved in the U.S. context:

RQ1: Have sociodemographic differences between lower-income U.S. families, with regard to intergenerational technology guidance, changed between 2015 and 2021?

In the weeks and months following the onset of the COVID-19 pandemic in the United States, stay-at-home orders and closed schools obliged families to rely on technology—and on each other—for a broad range of activities. Remote learning became a central focus for families with school-age children, and parents had no option but to become the primary guides for their children to continue learning at home. Parents across the socioeconomic spectrum experienced enormous role strain; even professional-class parents with graduate degrees and flexible work schedules struggled to manage day-to-day learning activities for their children (Kamenetz, 2022).

The challenges faced by less privileged parents were much more daunting. Even if parents were not deemed "essential workers" who had to report for work shifts in person, being obliged to manage their children's remote learning invoked intersecting difficulties. Most fundamentally, lower-income U.S. households were less likely to have a computer for every school-age child or to have high-speed broadband that could support live-streamed classes (Francis & Weller, 2022). Even in households with access to Internet and devices, the majority of lower-income parents reported being under-connected because devices were not in good working condition, their Internet was slow or inconsistent, or a combination of these factors (Katz & Rideout, 2021).

The families that were most likely to report limitations in their digital access, and in the consistency and quality of the access they did have, were not randomly distributed across the U.S. population. Families experiencing digital inequality are disproportionately lower-income and/or members of racial/ethnic minority groups, as well as headed by parents without bachelor's degrees (Robinson et al., 2015). Extant research on U.S. parents' confidence interacting with their children's schools and teachers suggest similar patterns: parents who are lower income, foreign born, and/or have lower levels of educational attainment seldom feel entitled to advocate for their children at school, actively involve themselves in their children's educational trajectories, or ask questions of teachers (Castro et al., 2015).

Remote learning effectively forced the interaction between these bodies of evidence because parents were obliged to actively participate in their children's formal learning, and to do so digitally. We therefore ask how parents' self-reported confidence in their abilities to actively guide their children's remote learning is related to their intergenerational technology engagement more broadly. We also compare how intergenerational technology engagement is associated with the general measures of parental technology confidence in 2015:

RQ2: Does parental confidence—with technology generally in 2015 and specifically with guiding children's remote learning in 2021—explain variations in intergenerational technology engagement among lower-income families in the United States?

Methods

Our analyses rely on cross-sectional, nationally representative, probability-based telephone surveys of lower-income U.S. parents with children aged 6–13 years conducted in 2015 and 2021. These datasets are distinctive from other studies of U.S. families' technology experiences in three important ways.

First, both surveys include only parents raising children below the national median income for households with minor children. This focus on lower-income families enables deeper investigation of the varied ways that family income affects digital inequality. It also facilitates more extensive comparisons because subsamples are large enough to identify more textured differences by, for example, parents' education levels and dominant language among Hispanic respondents.[2]

Second, both surveys were conducted via cellular and landline telephone rather than online panels. We contend that investigations of digital inequality and its effects are inherently more inclusive when respondents do not have to use those same technologies to participate in a study.

Third, because the two surveys were conducted using the same research design and sampling strategy, we can meaningfully compare families' pandemic experiences to an earlier time point and trace

[2] The survey asked respondents if they identify as Hispanic and/or Latino/a. We use Hispanic as a referent for these respondents throughout this manuscript, guided by the Pew Hispanic Center findings that Americans who identify with these ethnic designations most often use the two interchangeably (54%), followed by those who prefer Hispanic (27%) to Latino/a/x (18%; Lopez, Krogstad, & Passel, 2022).

evolutions in digital inequality and family technology engagement without assuming that the pandemic fostered entirely new forms of family interaction.

The 2021 dataset includes 1,010 parents raising children aged 3–13 who reported total household incomes below $75,000, the U.S. national median for households with minor children that year.[3] The analyses in this article include the 799 parents whose children are ages 6–13 to enable direct comparison with the 2015 dataset. The survey was conducted from March 10 to April 18, 2021, roughly one year into the COVID-19 pandemic in the United States. It was fielded by the research firm SSRS, offered in English and Spanish, and took an average of 20 minutes to complete. All respondents were offered a $10 incentive for participation.

The 2015 dataset includes 1,191 parents of children aged 6–13 with total household incomes below the then-national median of approximately $65,000 per year.[4] The survey was fielded by SSRS from April 16 through June 29, 2015, via landline and cell phones in both English and Spanish. This survey also took an average of 20 minutes to complete, and respondents were provided a $5 incentive for participating.

The 2015 and 2021 surveys were conducted using the same sampling strategy to enable direct comparisons between the two datasets. The SSRS Omnibus telephone survey is conducted weekly and uses a fully replicated, single-stage, random-digit-dialing (RDD) sample of landline telephone households and randomly generated cell phone numbers. Respondents who had previously taken the Omnibus survey and met our study criteria were recontacted to ask if they wished to participate in our survey. SSRS also recruited qualified participants from Omnibus surveys conducted during the weeks that the 2015 and 2021 surveys were in the field. SSRS verbally secured informed consent from participants before beginning both the 2015 and 2021 surveys, in accordance with Institutional Review Board-approved procedures at Rutgers University.[5] Table 1 outlines the sociodemographic composition of the 2015 and 2021 samples and includes variables used in the subsequent analyses.

[3] Notice PDR-2020-1, issued April 1, 2020 (U.S. Department of Housing and Urban Development, 2020), "Estimated Median Family Incomes for Fiscal Year 2020." The median national income for U.S. families in 2020 was $78,500. Because the survey captured family income in $5,000 increments, parents were eligible to participate in the 2021 survey if their annual income was below $75,000/year.

[4] U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplement, Table FINC-03, "Presence of Related Children Under 18 Years Old—All Families by Total Money Income 2014." The median income for families with one or more children under 18 was $63,767 in 2014, so parents were eligible for the 2015 survey if their annual income was below $65,000 per year.

[5] Katz, PI for this project, was a faculty member at Rutgers University when both the 2015 and 2021 surveys were conducted.

Table 1. Sociodemographic Characteristics of the 2015 and 2021 Samples.

	2015	2021
Focal child demographics		
Female (%)	45	46
Median age (years)	9	8
Parent demographics		
Female (%)	61	61
Median age (years)	38	37
Race/ethnic origin (%)		
Non-Hispanic White	51	47
Black	16	18
Hispanic (English-dominant)[6]	15	16
Hispanic (Spanish-dominant)	18	18
Education (%)		
Less than a high school degree	22	8
High school degree or some college	64	64
College degree or more	14	28
Household demographics		
Median household size	4	4
Annual household income in USD (%)		
<25,000	33	21
25,000–<39,999	30	27
40,000–<$64,999	38	42
65,000–$75,000	N/A	10
Family Internet connection (%)		
Home broadband access	64	82
Home dial-up access	7	3
Mobile-only access	23	11
Family device ownership (%)		
Laptop computer(s)	68	86
Desktop computer(s)	51	33
Smartphone(s)	80	96
Tablet(s)	67	75
Family tech activities (%)		
Any parent tech guidance	78	90
Any child tech brokering	55	72

Note. *N* varies because of missing values.

[6] We differentiate Hispanic respondents by their preferred language for completing the survey as opposed to their country of origin because adults' comfort and confidence online is closely tied to their proficiency in English, the primary language of the Internet. Language preference is closely tied to place of birth, with 92% of Spanish-dominant respondents reporting that they were born outside of the United States in 2015, and 98% in 2021.

Measures

To match the 2015 data, we coded measures in the same way for the 2021 data wherever possible. Where this was not possible because of changes in question wording, we matched measures as closely as possible.

Race and Ethnicity

Both questionnaires (2015 and 2021) asked questions about race, ethnicity, and main language spoken at home. Participants were coded as non-Hispanic White, Black, and Spanish-dominant or English-dominant Hispanic, depending on whether they spoke mainly Spanish or English at home.

Education

Parents' education was coded as less than a high school degree (0), high school degree or some college (1), and college degree or more (2).

Poverty Level

Based on participants' responses to income questions, they were coded as below (0) or above (1) the federal poverty level in both datasets.

Child Tech Brokering and Parent Tech Guidance

We measured general child tech brokering by asking parents whether their child ever helped them use devices that connect to the Internet. In 2015, the response options were "Yes" (1) or "No" (0). In 2021, there were four response options: never, hardly ever, sometimes, and often. To match the 2015 dataset, we recoded "never" into "No" (0) and the remaining response options into "Yes" (1). Only parents with a focal child aged 10–13 years were asked this question.

We measured general parent tech guidance by asking parents whether they ever helped their child use devices that connect to the Internet. Similar to the child brokering questions, the response options were "Yes" (1) or "No" (0) in 2015, whereas parents were able to choose from four response options in 2021 (from "never" to "often"). We recoded "never" into "No" (0) and hardly ever, sometimes, and often into "Yes" (1) to match the 2015 data.

Covariates

We included covariates in our analyses of parental tech guidance that extant research indicates might affect whether and how parents help their children with using technology. The 2015 survey asked parents how long they had been using the Internet, how often they use the Internet, and how confident they feel about their Internet use. These measures were unfortunately not available in the 2021 dataset. However, the 2021 dataset asked various questions about parents' confidence in helping their children with

their schoolwork in a remote learning environment. We use these questions as a proxy for parents' confidence with technology because the majority of surveyed parents (89%) reported that their children were still attending school fully or partially remotely at the time of the survey, meaning that guiding children's schoolwork still involved intensive technology use and parental guidance.[7]

Years Online

Participants were asked how many years they had been using the Internet. Response categories were as follows: 1 = "1–4 years," 2 = "5–9 years," 3 = "10–14 years," 4 = "15–19 years," and 5 = "20 or more years ago" (M = 3.09, standard deviation [SD] = 1.41).

Internet Use Frequency

Participants were asked how often they used the Internet, ranging from "never" (0) to "every day" (7; M = 6.48, SD = 1.19).

Internet Confidence

Participants were asked, "How confident do you personally feel about using the Internet?" Response options ranged from 1 = "not at all confident" to 4 = "very confident" (M = 3.45, SD = 0.73).

Parents' Confidence Guiding Remote Schoolwork

In the 2021 questionnaire, four questions assessed parents' self-rated confidence in guiding their child's learning one year into the COVID-19 pandemic. Parents were asked how much they agreed with four statements, measured on a 5-point Likert scale, from strongly disagree to strongly agree: "I am more comfortable communicating with my child's teachers now than I was then," "I know my child's strengths and weaknesses as a learner better now than I did then," "I know more about what my child is learning in school now than I did then," and "I feel more confident helping my child with their schoolwork now than I did then." For the logistic regressions, we recoded as follows: "disagree strongly" and "disagree somewhat" as "disagree" (1), "neither agree nor disagree" (2), and "agree somewhat" or "agree strongly" as "agree" (3). These four questions are informed by virtual focus groups with parents in Detroit, Michigan; Pittsburgh, Pennsylvania; and Santa Clara, California, as part of the broader research design for this study.[8] The questions comprise the aspects of guiding children's remote learning that parents themselves highlighted as essential to building a sense of confidence that they could, in fact, be successful guides for their children (Katz & Rideout, 2021).

[7] The proportion of our sample whose children were still fully or partially remote learning a year into the pandemic may be higher than the national average; in September 2020, 67% of parents nationally reported having children in remote or hybrid learning (National Center for Education Statistics, 2021).

[8] Research briefs for each focus group location and the full study report are available at https://www.newamerica.org/education-policy/collections/learning-at-home-while-under-connected-project/

Results

There are important differences to note as we compare Internet access and use among low-income parents and children in 2015 to 2021, a year into the COVID-19 pandemic. In the following sections, we first describe general changes in intergenerational technology guidance, followed by more nuanced analyses of parental tech guidance and child tech brokering in 2015 and 2021.

Parental Tech Guidance and Child Tech Brokering Over Time

Although the sociodemographic characteristics of both samples are largely the same in terms of age (of parent and child), gender (of parent and child), household size, and race/ethnicity, we see an overall increase in home broadband Internet access and an increase in laptop, tablet, and smartphone ownership. We also see an overall increase in intergenerational technology guidance in both directions: parents reported helping their children more in 2021 than in 2015, as well as benefiting more from their children's assistance. When we differentiate respondents into four groups (Table 2), parents' and children's mutual technology guidance increased significantly from 2015 to 2021 (by 25 percentage points), and households reporting unidirectional support or no intergenerational tech guidance were significantly less common in 2021.

Table 2. Intergenerational Technology Guidance in 2015 and 2021 (%).

	2015		2021	
Child helps parent	Yes	No	Yes	No
Parent helps child				
Yes	40.0	37.7	65.5	24.6
No	13.0	9.2	6.5	3.4
N	995		736	

As indicated by cross-tabulations (Table 3), intergenerational technology guidance is significantly affected by race/ethnicity in both years, with Black and Hispanic families being more likely to report intergenerational exchanges of technology guidance than White families. Parent-driven technology guidance is more common in White families in both 2015 and 2021, although the relationship weakened over time.

Table 3. Intergenerational Technology Guidance by Race/Ethnicity in 2015 and 2021 (%).

	White		Black		Hispanic (English Dominant)		Hispanic (Spanish Dominant)	
	2015	2021	2015	2021	2015	2021	2015	2021
Parent and child help each other	34.8	58.4	46.2	72.2	42.0	64.9	49.4	78.0
Parent only helps child	48.1	31.4	27.2	23.0	31.5	24.3	20.5	6.8
Child only helps parent	10.5	5.6	13.6	4.0	16.8	7.2	17.3	11.9
Parent and child don't help each other	6.7	4.7	13.0	0.8	9.8	3.6	12.8	3.4
N	526	322	169	126	143	111	156	118

Pearson Chi^2: <.001

Parents' education is also a significant factor for intergenerational technology guidance in both 2015 and 2021 (Table 4). Although mutual support is much more common in 2021, parent-driven technology guidance is most common in families with parents who have higher educational attainment, whereas child-driven relationships are more common in families with parents who do not have a high school degree.[9]

Table 4. Intergenerational Technology Guidance by Parental Education in 2015 and 2021 (%).

	Less than HS		HS or Some College		College Degree or More	
	2015	2021	2015	2021	2015	2021
Parent and child help each other	41.7	71.2	39.4	65.5	40.3	63.4
Parent only helps child	26.7	10.2	38.5	23.6	48.6	31.0
Child only helps parent	19.8	11.9	12.8	7.8	5.6	2.3
Parent and child don't help each other	11.8	6.8	9.4	3.0	5.6	3.2
N	187	59	663	461	144	216

Pearson Chi^2: <.001

Whereas household incomes above and below the federal poverty level was a significant factor in intergenerational technology guidance in 2015, it was not in 2021 (Table A2). Likewise, the gender of both the responding parent and the focal child was significant in 2015 but not in 2021 (Table A3). In 2015, mothers were more likely to indicate mutually supportive technology guidance with their focal child than fathers. Mothers were also more likely to report child-driven tech guidance, or that neither parents nor children relied on each other for technology support. In 2015, respondents whose focal child was a son were more likely to indicate mutual tech support, parent-driven tech guidance, and child-driven tech brokering, whereas respondents whose focal child was a daughter were significantly more likely to indicate that neither generation relied on each other for tech guidance.

Parental Tech Guidance Over Time

Logistic regressions of parental tech guidance, and of child tech brokering, provide a more nuanced picture and further evidence that many of the sociodemographic factors that were significant predictors in 2015 were no longer significant in 2021 (Table 5, Model 1a, Model 1b). In 2015, older parents and women

[9] It is important to note the strong, significant relationship between race and education in our samples between White, Black, and English-dominant Hispanic respondents as compared with Spanish-dominant Hispanic respondents, who disproportionately do not have a high school degree (Table A1 in Appendix). When we separate subsamples by race/ethnicity to run education versus brokering relationship crosstabulations, education is significant only for English-dominant Hispanic parents. When we separate by education to run race versus brokering relationship crosstabulations, race/ethnicity is significant only for those who have less than a high school degree. However, that effect likely stems from the low numbers of White (N = 3), Black (N = 3) and English-dominant Hispanic respondents (N = 1) who do not have a high school diploma, as compared with Spanish-dominant Hispanic respondents (N = 50). Due to low Ns in subcategories, we were unable to run more sophisticated analyses to further examine these relationships.

were less likely to indicate that they routinely provide parental tech guidance, as did parents of older children (ages 10–13). Black and Hispanic parents were also less likely to provide tech guidance to their children than White parents. Parents with high school diplomas or college degrees were more likely to provide tech guidance than parents with no high school degree. In 2021, most of these effects had disappeared. Only the age of the parent and child reduced the likelihood of parents providing tech guidance, whereas parents with a college degree were still significantly more likely to provide tech guidance than parents without a high school degree.

Controlling for parents' Internet confidence in 2015 and for their confidence in guiding their children's remote learning in 2021 in the logistic regressions improved the overall model fit (R^2) considerably and affected the significance of other predictors (Table 5, Model 2a, Model 2b). In 2015, adding Internet confidence meant that race/ethnicity played a less significant role, as did parents' education. Internet confidence itself was a strong and significant predictor of parental tech guidance (Katz et al., 2018).

After adding parental confidence in guiding their children's remote learning in 2021, the child's gender became significant within the model, with parents of girls being twice as likely to provide tech guidance. In addition, poverty level became a significant predictor, with parents below the federal poverty level being less likely to provide tech guidance than those above the poverty level. Although most of the 2021 confidence factors did not have a significant effect on parental tech guidance, respondents who were unsure whether they felt more confident in helping their child with their homework a year into pandemic remote learning were also significantly less likely to report providing more general tech guidance to their children.

Table 5. Binary Logistic Regressions for Parent Tech Guidance (Yes/No).

	2015				2021			
	Model 1A		Model 2A		Model 1B		Model 2B	
	Odds Ratios	Sig.	Odds Ratios	Sig.	Odds Ratios	Sig.	Odds Ratios	Sig.
Parent age	**.952*** **	.001	**.963*** **	.001	**.963** **	.016	**.951** **	.006
Parent female	**.675** **	.024	**.653** **	.018	.683	.197	.626	.180
Child age	**.884*** **	.001	**.884*** **	.001	**.756*** **	.001	**.766*** **	.001
Child female	.827	.244	.802	.192	1.306	.332	**2.031***	.035
Race (White)								
Black	**.588** **	.018	**.554** **	.011	1.974	.149	1.307	.599
Hispanic (English-dominant)	**.549** **	.011	.623	.057	1.037	.924	2.366	.103
Hispanic (Spanish-dominant)	**.624***	.051	.741	.251	1.010	.980	.602	.291
Education (less than HS)								
HS or some college	**1.633***	.021	1.167	.497	2.220	.116	1.321	.632
College degree+	**3.723*** **	.001	**2.082***	.046	**5.507** **	.006	**5.703***	.023
Poverty level (above)	1.080	.680	.910	.635	.560	.087	**.407***	.026
2015 Measures of Internet Confidence								
Years online			1.163	.056			—	—
Internet use frequency			**1.265** **	.006			—	—
Internet confidence			**1.592*** **	.001			—	—
2021 Measures of Confidence Guiding Remote Schoolwork								
More comfort communicating w/ child's teacher (disagree)								
Neither/nor			—	—			.608	.276
Agree			—	—			1.728	.212
Know child's strengths/weaknesses as learner better (disagree)								
Neither/nor			—	—			2.863	.077
Agree			—	—			1.615	.232

Know more about what child is learning in school (disagree)								
Neither/nor			—	—			2.010	.228
Agree			—	—			1.143	.729
More confident helping with schoolwork (disagree)								
Neither/nor			—	—			**.395***	.049
Agree			—	—			.467	.081
Constant	85.662	.001	2.342	.299	424.269	.001	1161.507	.001
Nagelkerke R^2	.119		.184		.154		.241	
N	969		958		711		626	

Notes. Reference categories listed in parentheses. *$p < .05$. **$p < .01$. ***$p < .001$.

An analysis of specific parent tech guidance activities in 2015 (Table 6) demonstrates that younger parents, fathers, parents of younger children, and parents with more than a high school degree were significantly more likely to help their children learn how to use a device. Hispanic, English-dominant parents were less likely to help find online information. Younger parents, fathers, and those with higher educational attainment were more likely to help children with downloading things.

Table 6. Binary Logistic Regressions for Specific Parent Tech Guidance Activities in 2015 (Yes/No).

	Learning How a Computer or Mobile Device Works		Finding Information They Are Looking for Online		Downloading Things Such as Apps, Software, Music, or Movies	
	Odds Ratios	Sig.	Odds Ratios	Sig.	Odds Ratios	Sig.
Parent age	**.964****	.003	.992	.581	**.958*****	.001
Parent female	**.678***	.042	.888	.571	**.595****	.003
Child age	**.875*****	.001	1.084	.074	1.053	.156
Child female	1.122	.529	1.161	.464	.955	.778
Race (White)						
Black	.650	.084	1.620	.151	1.443	.131
Hispanic (English-dominant)	.823	.476	**.565***	.040	1.040	.873
Hispanic (Spanish-dominant)	.932	.809	.597	.087	.988	.962
Education (less than HS)						
HS or some college	**1.673***	.054	1.181	.559	1.556	.067
College degree+	**2.157***	.029	1.771	.155	**1.883***	.045
Poverty level (above)	.666	.070	.978	.926	1.165	.425
Constant	56.421	.001	2.964	.101	5.551	.002
Nagelkerke R^2	.074		.041		.054	
N	733		732		732	

Notes. Reference categories listed in parentheses. *$p < .05$. **$p < .01$. ***$p < .001$.

In 2021 (Table 7), younger parents, fathers, parents of younger children, and parents of daughters were significantly more likely to help their child to learn how a computer or mobile device works. Similarly, younger parents, parents of girls, and Black parents were significantly more likely to help their child locate information online. Younger parents, parents of younger children, Spanish-dominant Hispanic parents, and parents with college degrees were significantly more likely to report guiding their children in how to download things.

Table 7. Binary Logistic Regressions for Specific Parent Tech Guidance Activities in 2021 (Yes/No).

	Learning How a Computer or Mobile Device Works		Finding Information They Are Looking for Online		Downloading Things Such as Apps, Software, Music, or Movies	
	Odds Ratios	Sig.	Odds Ratios	Sig.	Odds Ratios	Sig.
Parent age	**.970****	.004	**.967*****	.003	**.961*****	.001
Parent female	**.666***	.029	.957	.824	1.184	.352
Child age	**.839*****	.001	.967	.403	**.853*****	.001
Child female	**1.549****	.011	**1.725****	.004	1.193	.294
Race (White)						
Black	.1.494	.096	**2.075****	.013	.977	.920
Hispanic (English-dominant)	.950	.830	1.256	.390	.778	.284
Hispanic (Spanish-dominant)	.710	.213	.704	.219	**.532***	.023
Education (less than HS)						
HS or some college	1.557	.211	1.237	.556	1.915	.074
College degree+	**2.419***	.028	2.138	.072	**2.730****	.014
Poverty level (above)	**.676***	.051	.758	.204	.915	.650
Constant	22.292	.001	9.358	.001	13.836	.001
Nagelkerke R^2	.137		.101		.139	
N	710		711		710	

Notes. Reference categories listed in parentheses. *$p < .05$. **$p < .01$. ***$p < .001$.

Child Tech Brokering Over Time

Similar patterns are observed for child tech brokering (Table 8, Model 1A and Model 1B). In 2015, parents reported their children were providing more support if they were boys, older, and/or if the responding parent was older or female. Children in Black and Hispanic families were significantly more likely to provide tech brokering than White children. Although the age and gender of the parent still play a role in 2021, the age of the focal child was a significant predictor in 2021 but not the gender. Whereas Black children and Hispanic children with Spanish-speaking parents were still more likely to provide tech brokering to their parents than are White children, Hispanic children with English-speaking parents were not any more likely to provide tech brokering than White children.

Controlling for parents' Internet confidence in 2015 improved the R^2 considerably and changed some of the coefficients for other significant factors (Table 8, Model 1A and Model 2A). For example, the focal child's gender became nonsignificant once we controlled for parents' Internet confidence. Internet confidence measures were also significant predictors of child tech brokering, with parents who had been online for longer and those who rated their Internet skills higher reporting less tech brokering assistance from their children. Interestingly, parents' Internet use frequency had the opposite effect, with parents who reported more frequent Internet use being more likely to indicate that their focal child helps them do things

online. Controlling for parents' confidence in guiding their children's pandemic remote learning in the 2021 sample only slightly improved the model fit and did not affect the significance of any other factors. None of the remote learning confidence items were significant predictors of children's tech brokering for parents (Table 8, Model 1B and Model 2B).

Table 8. Binary Logistic Regressions for Child Tech Brokering (yes/no).

	2015				2021			
	Model 1A		Model 2A		Model 1B		Model 2B	
	Odds Ratios	Sig.	Odds Ratios	Sig.	Odds Ratios	Sig.	Odds Ratios	Sig.
Parent age	**1.033*** **	.001	**1.027** **	.006	**1.049*** **	.001	**1.063*** **	.001
Parent female	**1.755*** **	.001	**1.720*** **	.001	**1.564***	.029	**1.750***	.017
Child age	**1.230*** **	.001	**1.235*** **	.001	**1.171*** **	.001	**1.161** **	.002
Child female	**.754***	.042	.727	.032	.894	.552	.951	.811
Race (White)								
Black	**1.796** **	.002	**1.867** **	.002	**2.020** **	.006	**1.829***	.034
Hispanic (English-dominant)	**1.856** **	.003	**1.857** **	.003	1.315	.284	1.278	.392
Hispanic (Spanish-dominant)	**2.259*** **	.001	**1.731***	.020	**5.376*** **	.001	**5.023*** **	.001
Education (less than HS)								
HS or some college	.762	.165	.923	.702	1.328	.571	.739	.670
College degree+	.649	.100	.893	.688	.880	.810	.622	.525
Poverty level (above)	1.060	.718	1.148	.415	1.276	.273	1.293	.307
2015 Measures of Internet Confidence								
Years online			**.777*** **	.001			—	—
Internet use frequency			**1.214***	.023			—	—
Internet confidence			**.731** **	.006			—	—
2021 Measures of Confidence Guiding Remote Schoolwork								
More comfort communicating w/ child's teacher (disagree)								
Neither/nor			—	—			.715	.270
Agree			—	—			.744	.305
Know child's strengths/weaknesses as learner better (disagree)								
Neither/nor			—	—			1.170	.690
Agree			—	—			1.130	.709

Know more about what child is learning in school (disagree)								
Neither/nor			—	—			.802	.549
Agree			—	—			.707	.252
More confident helping with schoolwork (disagree)								
Neither/nor			—	—			.968	.915
Agree			—	—			1.191	.523
Constant	.033	.001	.059	.001	.039	.001	.056	.008
Nagelkerke R^2	.149		.188		.161		.171	
N	970		959		710		626	

Notes. Reference categories listed in parentheses. *$p < .05$. **$p < .01$. ***$p < .001$.

Binary logistic regressions examining specific child tech brokering activities in 2015 (Table 9.) show that children who were older and children in Spanish-dominant Hispanic households were significantly more likely to assist their parents with all three activities. Parents who were older or female were more likely to report their children helping them with learning how to use a device or downloading things. Children in English-dominant Hispanic households were significantly more likely to help their parents find information online or with downloads.

Table 9. Binary Logistic Regressions for Specific Child Tech Brokering Activities 2015 (Yes/No).

	Learning How a Computer or Mobile Device Works		Finding Information They Are Looking for Online		Downloading Things Such as Apps, Software, Music, or Movies	
	Odds Ratios	Sig.	Odds Ratios	Sig.	Odds Ratios	Sig.
Parent age	**1.029***	.033	1.016	.237	**1.030***	.028
Parent female	**1.969*****	.001	1.227	.321	**1.601***	.022
Child age	**1.295****	.003	**1.268****	.006	**1.366*****	.001
Child female	.775	.200	.703	.078	.686	.055
Race (White)						
Black	1.327	.309	1.642	.071	.850	.565
Hispanic (English-dominant)	1.718	.059	**2.280****	.004	**1.933***	.021
Hispanic (Spanish-dominant)	**3.159*****	.001	**4.290*****	.001	**1.811***	.042
Education (less than HS)						
HS or some college	.774	.361	.938	.823	1.240	.443
College degree+	.476	.063	.510	.095	.877	.736
Poverty level (above)	.832	.426	.743	.199	.897	.636
Constant	.009	.001	.024	.002	.004	.001
Nagelkerke R^2	.136		.144		.100	
N	507		507		507	

Notes. Reference categories listed in parentheses. *$p < .05$. **$p < .01$. ***$p < .001$.

In examining specific child tech brokering activities in 2021, we found that mothers, parents with older children, older parents, Black parents, and Hispanic Spanish-dominant parents were significantly more likely to indicate that their child helped them learn how a computer or mobile device works. Similarly, mothers, parents of older children, older parents, Black parents, and Hispanic English- and Spanish-speaking parents were significantly more likely to indicate their child helps them locate information online. In contrast, parents who had a college degree were significantly less likely to indicate their children help them find information online. Similar patterns were evident for downloading apps, software, music, or movies: mothers, parents with older children, older parents, and Black parents were significantly more likely to report that their children help with these tasks than parents who had a high school or college degree (Table 10).

Table 10. Binary Logistic Regressions for Specific Child Tech Brokering Activities 2021 (Yes/No).

	Learning How a Computer or Mobile Device Works		Finding Information They Are Looking for Online		Downloading Things Such as Apps, Software, Music, or Movies	
	Odds Ratios	Sig.	Odds Ratios	Sig.	Odds Ratios	Sig.
Parent age	**1.064*** **	.001	**1.107*** **	.001	**1.067*** **	.001
Parent female	**1.792***	.032	**2.315****	.005	**1.887***	.022
Child age	**1.717*** **	.001	**1.670*** **	.001	**1.855*** **	.001
Child female	.625	.059	1.330	.284	1.193	.966
Race (White)						
Black	**1.996***	.044	**3.053****	.003	**3.288*** **	.001
Hispanic (English-dominant)	1.276	.484	**2.304***	.024	.778	.229
Hispanic (Spanish-dominant)	**5.802*** **	.001	**9.932*** **	.001	.532	.075
Education (less than HS)						
HS or some college	1.023	.963	.569	.280	**.193*** **	.001
College degree+	.511	.240	**.305***	.052	**.108*** **	.001
Poverty level (above)	.939	.829	.867	.646	.833	.532
Constant	.000	.001	.000	.001	.000	.001
Nagelkerke R^2	.372		.433		.377	
N	491		711		490	

Notes. Reference categories listed in parentheses. *$p < .05$. **$p < .01$. ***$p < .001$.

Discussion and Implications

The goal of these analyses was to establish whether and to what extent families' cross-generational technology engagement changed between 2015 and 2021, one year into the COVID-19 pandemic. Comparing nationally representative cross-sectional survey data from 2015 and 2021, we investigated whether sociodemographic differences among lower-income U.S. families changed with regard to intergenerational technology guidance (RQ1). We also examined whether parental confidence with technology (in 2015) and confidence with guiding children's pandemic remote learning (in 2021) helps explain variations among lower-income U.S. families' intergenerational technology engagement (RQ2).

Our results suggest that pandemic conditions were an accelerant for intergenerational technology guidance within lower-income U.S. families with school-age children, as opposed to generating wholly new family technology practices. Although studies that were conducted only during the pandemic might claim parent-child technology engagement was at unprecedented levels, we find that parents and children were already engaged in intensive cross-generational technology guidance in 2015. However, we found that parents and children were significantly more likely to help each other in 2021 than unidirectionally in either direction.

More intensive technology use during the pandemic was expected, given that remote teaching and learning was widespread in the United States in 2020 and 2021. However, the sociodemographic differences noted in 2015 having largely falling away by 2021 was an unexpected and important finding (RQ1). This suggests a "silver lining" of the pandemic period, in that a key form of digital inequality among lower-income U.S. parents was much less pronounced in 2021 as compared to 2015. A year after being obliged into much deeper reliance on technology, parents reported considerable gains in their home broadband access and digital device availability as compared to 2015. As importantly, they reported greater capabilities to guide their children's technology use and engage in reciprocal exchanges of learning with and via technology with their children.

The first year of the pandemic also obliged parents into technology use for a specific purpose: guiding their children's remote learning. We find that parents' self-rated confidence in guiding their children's learning one year after pivoting to remote instruction increased the amount of explained variance in the 2021 logistic regression model as much as the more standard measures of self-reported technology confidence did in the 2015 models (RQ2). Given that technologically mediated remote and hybrid learning modalities were still more common than fully in-person schooling at the time of data collection, this finding suggests that the pandemic experience accelerated lower-income parents' confidence with technology in general, and in guiding their children's formal learning specifically.

Our analyses also reveal that although sociodemographic differences are softening with regard to children's tech brokering, they have not fallen away as they have for parents' tech guidance. We think there are a few reasons for this. Having to guide children's remote learning provided extraordinary opportunities for parents' exposure and experience with technology—especially for the parents who were most likely to have previously avoided such engagement. However, parents having to assume the role of at-home educational guides for their children likely highlighted the limits of some parents' skills, resulting in children stepping in to provide tech brokering support. This explanation is supported by children's tech brokering remaining particularly high in families with children who were the oldest in our sample (ages 10–13), children with older parents, and those with Spanish-dominant parents (who were also the subsample least likely to have attained a high school diploma). Our findings corroborate Correa and colleagues' (2019) conclusion that parents learning how to use technology with their children co-occurs with leaning on their children as sources of support. Learning and leaning effects may have been especially likely during the pandemic because securing assistance from other people was particularly difficult due to social distancing.

We also note an important exception to our general findings related to children's tech brokering: English-dominant Hispanic parents' reliance on children's support declined in 2021, such that they most closely resemble non-Hispanic White parents in our 2021 models. In contrast, we see that among families headed by Spanish-dominant parents, reliance on children's tech brokering increased from 2015 to 2021. We consider our ability to compare subsamples of Hispanic parents[10] one of the strengths of our analysis because crucial differences can be masked by treating these parents as one undifferentiated group.

[10] Per footnote 3, parents' country of origin and preferred language for the survey were strongly correlated.

Study Limitations

Although our 2015 and 2021 samples were closely matched in terms of sociodemographic background, we rely on cross-sectional data. We can provide general trend data, but we cannot conclude causation. Future studies employing a panel design could provide more conclusive insights into which factors lead to stronger intergenerational technology engagement. We also rely on parents' perspectives on parental tech guidance and child tech brokering; the survey was not distributed to minors. Paired parent-child sample data may have provided different and more detailed perspectives on these issues.

There are also a few important limitations related to our measures. We unfortunately did not ask whether the device families were using for remote schoolwork in 2021 had been provided by children's schools. The increases we note in family device ownership in 2021 are likely inflated by including devices that will need to be, or have been, returned to schools. We also rely on parents' self-reported Internet confidence (in 2015) and confidence in guiding their children's remote learning (in 2021). Although we cautiously use the latter in comparison to traditional measures of Internet confidence, these measures are not equivalent. Given the vast proliferation of online learning during COVID and guided by focus group data collected during the same study (see Katz & Rideout, 2021), we consider guidance of children's remote learning as a loose proxy for parents' more general technology confidence in this limited context. However, these measures do not necessarily infer that parents' confidence translated into effective guidance, especially given the dramatic drop in the number of lower-income and racial/ethnic minority students meeting grade-level standards in reading and math in the wake of the pandemic (Mervosh, 2022).

Recommendations for Policy and Practice

Our findings have important implications for policy and practice by finding that guiding children's learning at home leveled up lower-income U.S. parents' technology engagement with their children, made them more confident that they can communicate with their children's teachers, and made them feel they better know their child's strengths and weaknesses as a learner. Our results show that even the most challenging of circumstances can provide opportunities for growth.

School district leaders and teachers should actively build on parents' hard-won gains by offering ongoing opportunities to hone technology-related skills and engage meaningfully in their children's learning and in schools' organizations and activities. Such efforts will need to work hand in glove with more traditional digital equity initiatives to ensure that families have affordable access to high-speed broadband and digital devices that are reliable and function well. The bipartisan Infrastructure Deal, passed by Congress in 2021, includes the single-biggest allocation for broadband expansion in U.S. history ($65 billion), much of which is earmarked for subsidizing access to lower-income households and promoting digital inclusion. It is our hope that school districts serving lower-income children and families will benefit from these federal investments and increase families' access to subsidized broadband and digital device initiatives, in addition to offering trusted and convenient locations for technological maintenance when devices need fixing (Gonzales, Kim, & Wang, 2022).

Our findings also underscore that it is essential for U.S. policymakers and practitioners to treat families as dynamic systems. While we celebrate the gains of parents who have traditionally faced constrained access to their children's teachers and to technology, initiatives that build on what parents have learned must also recognize the essential contributions of their children. Parents gained new skills to guide remote learning because they needed to support their children—while they also learned from and leaned on those same children. Traditionally, digital inequality research, policy, and practice have emphasized the effects of constrained technology access at the individual level of analysis (Katz & Hampton, 2016). It is time to start considering how family members can be motivators, learning partners, and beneficiaries of efforts toward digital equity and inclusion as collective units.

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Appendices

Table A1. Race by Education (2021).

	Less Than HS	HS or Some College	College Degree+	*N*
White	0.7	64.1	35.2	437
Black	3.0	65.3	31.7	167
Hispanic (English-dominant)	0.7	70.2	29.1	151
Hispanic (Spanish-dominant)	41.4	53.8	4.7	169

Pearson Chi^2: <.001

Table A2. Parent and Child Guidance/Brokering by Poverty Level in 2015 and 2021 (%).

	Below Poverty Level		Above Poverty Level	
	2015	2021	2015	2021
Parent and child help each other	43.7	67.0	38.6	65.4
Parent only helps child	30.8	24.8	40.6	23.8
Child only helps parent	10.4	4.9	14.1	7.4
Parent and child don't help each other	15.1	3.4	6.8	3.5
N	279	206	690	517

Pearson Chi^2: 2015: <.001; 2021: <.682

Table A3. Parent and Child Guidance/Brokering Groups by Parent Gender 2015 (%).

	Father		Mother	
	2015	2021	2015	2021
Parent and child help each other	33.5	62.1	44.3	44.3
Parent only helps child	46.3	29.4	32.2	32.2
Child only helps parent	13.6	5.6	12.6	12.6
Parent and child don't help each other	6.6	3.0	10.9	10.9
N	391	269	603	466

Pearson Chi^2: 2015: <.001; 2021: <.143