Journal of Rural and Community Development

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Authors: Trent Noel, J. Mitchell Vaterlaus, & Madeline Erickson

Citation:
Noel, T., Vaterlaus, J. Mitchell, & Erickson, M. (2024). Family and community member experiences with internet access in a rural county during the COVID-19 pandemic. *The Journal of Rural and Community Development*, *19*(4), 62–82.

Publisher:
Rural Development Institute, Brandon University.

Editor:
Dr. Doug Ramsey

ISSN: 1712-8277 © Authors
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Family and Community Member Experiences with Internet Access in a Rural County During The COVID-19 Pandemic

Trent Noel
Montana State University
Bozeman, MY, USA
trent.noel@montana.edu

J. Mitchell Vaterlaus
Montana State University
Bozeman, MT, USA
j.vaterlaus@montana.edu

Madeline Erickson
Montana State University
Bozeman, MT, USA

Abstract

Our study explored experiences with internet access among families with school aged children in a rural county in Montana. Interviews were conducted with families (n = 4), school staff (n = 5), and public librarians (n = 2). Three themes were identified through qualitative case study analysis: (a) organizational support for internet access, (b) internet-based learning and teaching, and (c) rural home internet use. Challenges included initially only having one internet provider, bandwidth, and school staff reported that some of the families they served had no home-based internet access. Improving internet access involved federal policy that allocated resources to organizations—schools, libraries—in the community. Future pandemic planning should consider the internet needs of rural families and recognize that solutions can be found through policy, schools, and public libraries.

Keywords: COVID-19, rural, internet, bandwidth, children

Expériences des familles et des membres de la communauté avec l'accès à Internet dans un comté rural pendant la pandémie de COVID-19

Trent Noel
Montana State University
Bozeman, MY, USA
trent.noel@montana.edu

J. Mitchell Vaterlaus
Montana State University
Bozeman, MT, USA
j.vaterlaus@montana.edu

Madeline Erickson
Montana State University
Bozeman, MT, USA

Résumé

Notre étude a exploré les expériences d'accès à Internet parmi des familles avec des enfants d'âge scolaire dans un comté rural du Montana. Des entretiens ont été menés auprès des familles (n = 4), du personnel scolaire (n = 5) et des bibliothécaires publics (n = 2). Trois thèmes ont été identifiés grâce à l'analyse qualitative d'études de cas : (a) le soutien organisationnel à l'accès à Internet, (b) l'apprentissage et l'enseignement basés sur Internet, et (c) l'utilisation d'Internet à domicile en milieu rural. Au départ, les difficultés incluaient le fait de n'avoir qu'un seul fournisseur d'accès Internet et de bande passante, et le personnel de l'école a signalé que certaines des familles desservies n'avaient pas d'accès Internet à domicile. L'amélioration de l'accès à Internet a impliqué une politique fédérale allouant des ressources aux organisations (écoles, bibliothèques) de la communauté. La planification future en cas de pandémie devrait tenir compte des besoins Internet des familles rurales et reconnaître que des solutions peuvent être trouvées par le biais des politiques, des écoles et des bibliothèques publiques.

Mots-clés : COVID-19, rural, Internet, bande passante, enfants

1.0 Introduction

Declared a national emergency in the United States in March 2020 (The White House, 2020), the COVID-19 pandemic significantly disrupted typical family life with many completing their employment and school responsibilities at home (Prime et al., 2020). To accomplish employment and work from home during the pandemic across North America, access to the internet became an essential tool (Hambly et al., 2022; Ruiz-Martínez & Esparcia, 2020). School closures during the COVID-19 pandemic made several critical services inaccessible for children (Chaabane et al., 2021). Innovations in the online learning process were important during the COVID-19 pandemic (Setiawan et al., 2020). Less is known about the experience of internet use in rural communities during the transition to remote work and school. Hambly and colleagues (2022) examined a "wide-angle look at rural broadband in Canada [and concluded that more] granular analysis" is especially needed for rural households with school-age children and telecommuters (p. 241). Aligning with this recommendation, the current qualitative exploratory case study was designed to explore internet access among families with school aged children in the context of a rural county in Montana. Prime et al. (2020) concluded that pandemic would have varied impacts for families, and understanding the internet experiences of families within rural communities may illuminate some of the variations of pandemic influence. During the pandemic, internet access and quality could be related to overall family well-being (Hambly et al., 2022). Our study included perspectives from families and people (e.g., schoolteachers, school administrator, public librarians) providing services to families in the community during the pandemic.

1.1 Theoretical Framework

Bronfenbrenner's (1979, 1994) general ecological model posits that people develop through bidirectional interactions within concentric environments. The concentric environments include the microsystem (human's most frequent and enduring interactions; family relationships, school), mesosystem (interactions between two or more microsystems), exosystem (indirect developmental influence that is initiated by interactions between systems where a human is not a part of at least one of the systems; parent's employment influence on parent-child relationship), macrosystem (larger cultural, community and societal elements), and chronosystem (accounts for time and sociohistorical conditions). The theory provides a framework to understand how individuals and families adapted to changes in their microsystems (e.g., school) during unique sociohistorical conditions—chronosystem—within a rural community—macrosystem. As the internet became central to life during the pandemic the model allows for examining how different system levels influenced children and families in a rural community.

1.2 Rural Internet

Conceptually, a 'digital divide' is "the gap in access to new technology which exists between different groups of people" (Martins Van Jaarsveld, 2020, p. 3). The digital divide considers many potential factors (e.g., age, race), including geographic location (i.e., rural-urban continuum; Hambly et al., 2022). In the United States, 20% of the population resides in rural areas (U.S. Census Bureau, 2022a). Rural areas have historically been underserved by internet providers due to "smaller rural populations providing fewer customers, decreased rural adoption rates, and more difficult rural terrain in comparison to urban areas" (Dobis et al., 2021, p. 10). As of 2019, only 72% of rural residents had access to the internet and were less likely than their urban

counterparts to have internet subscriptions. When there is internet accessibility in rural communities, the lack of competition among limited providers may limit speed options and drive-up prices. Rural areas in the western Mountain States, including Montana, are represented as having "low internet availability" (Dobis et al., 2021, p. 11).

1.3 Internet & COVID-19 Pandemic

Among adults in the United States, 90% reported that the internet was essential or important during the COVID-19 pandemic, but for some, affordability (26%) and broadband connection quality (48%) posed challenges (McClain et al., 2021). At the beginning of the COVID-19 pandemic parents explained that they had to find new balance as they were working from home while they also had to assist their children with learning at home because of school closures (Vaterlaus et al., 2021). In sum, 93% of families with K-12 children in their home reported that they had to navigate at least some online instruction during the pandemic. Many parents (62%) reported that online learning went well and most (70%) felt at ease helping their children navigate the online learning technologies. Teachers also had to adapt their curricula to remote learning, and this led to some ambiguity, feelings of stress and emotional exhaustion, and many felt they had a lack of training to effectively use distance learning technology (Chan et al., 2021). Further, teachers also explained that some parents did not know how to use the learning technologies to support their children. It is clear that the internet was an important tool to adapt during the pandemic, but less is known about whether these experiences with the internet were similar or different in rural communities specifically.

In terms of internet access in rural communities during the pandemic, Dobis et al. (2021) postulated that those without home internet access or slower internet speeds experienced more difficulties in accomplishing school and work assignments during the pandemic. Specifically, in a study on internet access in rural Canadian communities, it was concluded that rural households with multiple telecommuters need support as they "struggle with affordability and low quality of service for available Internet access" (Hambly et al., 2022, p. 240). Creating access to technology and internet during pandemics could be seen as a school responsibility. For example, nearly half of adults (49%) across political ideologies said that it was the K-12 schools' responsibility to provide students with technology to complete schoolwork during the COVID-19 pandemic (McClain et al., 2021). Further, while most public libraries (98%) closed for in-person services during the pandemic, many libraries (93%) left the public Wi-Fi on when the building was closed allowing for use around the building (Public Library Association, 2020). Some libraries (23%) also provided Wi-Fi hotspots for check out. It is possible that rural public libraries may have provided similar services, but proximity to a library may have been a barrier in rural communities. At present, more research is needed about internet issues in rural households with school-aged children during the pandemic (Hambly et al., 2022) and any related community–school resources that provided support. Understanding how a rural community responded to meeting internet needs for families with school-aged children during a global pandemic may provide guidance in terms of what worked or did not work to inform future prevention planning and highlight areas of support needed by families in the pandemic recovery process. The present qualitative case study was designed to contribute research in this area, and guided by the following research question: What were the experiences of families with school-age children, as well as service providers to these families, regarding internet use during the COVID-19 pandemic in a rural Montana county?

2.0 Methods

2.1 Design and Setting

A qualitative case study design was selected, as this approach focuses on answering 'how' and 'why' questions about a contemporary phenomenon within "its real-world context" (Yin, 2018, p. 13). Critical to case study design is defining the case. The present case focused on the contemporary phenomenon of rural internet use in one rural Montana County. Case study evidence was collected from Blaine County, Montana. Blaine County's population is 6,936 (U.S. Census Bureau, 2022b). Communities are considered rural when there are less than 500 people per square mile (Economic Research Service, n.d.). Blaine County's total land mass is 2,730,880 acres or 4,267 square miles (Blaine County Montana, n.d.), which equates to 1.62 people per square mile. Due to low population density, Blaine County is considered a *frontier* county (Montana Department of Health and Human Services, n.d.). Frontier counties face challenges typical of sparsely populated areas, where conventional public policy frameworks consistently fail to provide adequate services (National Center for Frontier Communities, n.d.).

Within Blaine County there are eight elementary schools, eight junior high schools and four high schools (M. Skoyen, personal communication, August 3, 2023). Blaine county also includes the Fort Belknap Indian reservation, which accounts for 25% of the county's landmass (Fort Belknap Indian Community, n.d.). In Blaine County farming and ranching are the backbone of the economy (Central Montana, n.d.). At the start of the COVID-19 pandemic there was only one internet provider in the county. This internet provider had fiber optic service to some areas of the county and not in others. As the pandemic progressed, a new internet provider came in and started to supply internet services. According to the Blaine County Health Department (T. Collins, personal communication, June 5, 2023), there was a total of 3,259 COVID-19 cases from March of 2020 through June of 2023. There was a total of 37 COVID-19 related deaths in Blaine County. Effective case study design uses multiple sources of evidence to triangulate or converge into study findings (Yin, 2018). The current study collected interview evidence from families, teachers, a school administrator, and librarians in the county. Further, participants also shared artifacts (e.g., local internet advertisements) that shed light on the phenomenon.

2.2 Participants

Details about all case study evidence used in this study are available in Table 1. The sample consisted of families (n = 4) with school-aged children (n = 6; 11-17 years old, n = 1; 10-year-old) living in Blaine County (see Table 1). All parents (n = 7) were in mixed-sex relationships. Also, five public school staff and two public library staff working in Blaine County participated. All family members were invited to participate in the interview, and (n = 5) members of the participating families elected to not participate.

2.3 Data Collection

Prior to data collection, permission was obtained from the university's institutional review board. The lead researcher lived and worked as a Cooperative Extension agent in Blaine County, which allowed him to start recruitment processes with key stakeholders. To begin, the lead researcher reached out to community members in Blaine County on social media sites, through posting flyers in public places around

the different communities in Blaine County, and through word-of-mouth among key stakeholders. Participants were notified of the study; interviews were conducted in person. Interviews were conducted between September 2022 and June 2023. For each participant, data was collected using voice and video recording systems. Each interview lasted an average of 30 minutes. For family interviews, the parents and children were each asked if they wanted to participate in the study. Written parental consent was obtained for all the children and adolescents prior to interviewing. All participants signed institutional review board approved consent forms before interviewing. Participants received $15 or $10 amazon gift cards based on a family or a single person interview respectively. Interviews were transcribed verbatim by the lead researcher. Pseudonyms that were culturally appropriate and unrelated to the participants' real identities were assigned by researchers to ensure confidentiality.

Each group of people interviewed (school staff, library staff, and families) had specific interview guides which contained between six and 10 questions, but attempts were made to ask similar questions across groups (tailored to their position or role). Questions were created using existing related research (Dobis et al., 2021; Hambly et al., 2022; McClain et al., 2021; Public Library Association, 2020). Items included topics related to parental employment and school-age children (e.g., *How did the COVID-19 pandemic and internet access affect your* [for parents: *your children's*] *schooling?* [families], *How did your students' internet access at home stay the same or change during the pandemic?* [school staff]), local resources and the internet (e.g., *Were there any resources in the community that helped you gain access to internet in your homes? Please explain*. [families], *In what ways, if any, did you or your employer address school-age children's internet access during the pandemic in your community?* [librarians]), internet and device use in the homes and schools (e.g., *How did your experience with the internet change or stay the same throughout the pandemic?* [all interviews], *In what ways, if any, did the COVID-19 pandemic influence your use of internet connected devices?* [all interviews]), and the experiences of people during the COVID-19 pandemic within the context of their county (*How do you think the rural and small community influenced your experience with internet and internet connected devices during the pandemic?* [families]).

2.4 Data Analysis

Inductive qualitative case study design analytic methods were implemented (Yin, 2018; Vaterlaus et al., 2018). To begin, three researchers read and re-read all of the interview transcriptions. They met together to agree on a format (key headings to organize information) by which to write or organize case descriptions for each participant. Case descriptions are used to provide a similar organized format for case study evidence (Vaterlaus et al., 2018). Two researchers divided the writing of case descriptions and then checked each other's work with the raw data. Three researchers then read and re-read the case descriptions and then met together to identify uniform categories (i.e., codes; Stake, 2006). Word tables were then constructed for each uniform category (e.g., all information from each source related to personal internet access was organized into one table). Two researchers divided the word table creation and then checked each other's work. Finally, in line with the analytic approach, three researchers reviewed the word tables and collapsed them into themes.

3.0 Results

The case study includes the collective experiences with the internet during the COVID-19 pandemic among families with school-aged children (n = 4) and those providing services for families (n = 5 school staff, n =2 librarians) in Blaine County, Montana. Three themes were developed through qualitative case study analysis: (a) organizational support for internet access, (b) internet-based learning and teaching, and (c) rural home internet use. Pseudonyms were included when direct quotes were shared for context (see Table 1).

3.1 Organizational Support for Internet Access

Public schools and libraries supported internet access for families and individuals in Blaine County during the COVID-19 pandemic. While internet was available in libraries and schools prior to the pandemic, public heath restrictions required adaptations to provide internet access.

Libraries. There are two libraries in Blaine County, and at the onset of the pandemic the libraries had to shut down for approximately a three-week period to follow the guidelines set in place by the county commissioners, the local county health department, and the Montana State Library. During this closure, library staff members spent hours cleaning and sanitizing their spaces. The library staff worked diligently to create reopening plans. Before fully opening to the public, the libraries implemented a curbside pickup and delivery service for patrons to continue to access library resources. To support continued internet access, reservations could also be made during this time to use the computers in the libraries. Social distancing guidelines were enforced, and a limited number of people could make reservations at a time. The Montana State Library created a grant application process for libraries to apply to receive extra money to help upgrade Wi-Fi (e.g., internet cabling, wiring). With the grant funding the libraries provided Wi-Fi to their parking areas for 24 hours every day of the week. Families with limited internet access made use of this. For instance, a teacher (Wilma) explained, “[The library] left their Wi-Fi on longer so then the kids could do their homework up there, so they did it in their cars or outside if the library was closed." Libraries in the county also facilitated more personal internet access for individuals and families through lending Wi-Fi hotspots. The Montana State Library funded and provided each library in Montana with three Wi-Fi hotspots. To be eligible to check out hotspots, patrons had to be over the age of 18 and had to be in good standing in the library system (i.e., no overdue books or holds on their account). The two county libraries shared different experiences with the hotspot service. One library had a high demand with a waiting list. The librarian (Wanda) explained:

> We had eight or nine people on our waiting list for serval months at all times. Once the schools went back to in person learning that use somewhat lessened, but we still have people who are interested in using the hotspots because we don't have a good percentage of people that have internet at home.

The demand was so high that the library looked for ways to increase access to Wi-Fi hotspots. The librarian elaborated, “then we also had such a high demand for use especially when the schools were virtual, that we applied for a grant from Humanities Montana to get two more hotspots." (Wanda) This library was most

accessible to the reservation in the county. In contrast, the other library had low demand and had a hard time getting people to use the hotspot service. A librarian (Jane) shared "The use of the hot spots from this library was really slow, even after advertising." A librarian (Jane) noted:

> Well, I think that more people started using smartphones and tablets after Covid hit. Our wireless usage went way up after Covid hit, and it continues to be high. Our internet usage on our computers went way down and has never returned to numbers prior to Covid.

Table 1. *Case Study Evidence and Characteristics*

Source of Evidence						
Families*						
	Parent Gender (age)	Parent Occupation	Number of Children	Child gender	Child age	Gender current grade in school
Smith	Mother (45)	Pre-school teacher	2	Female	11	6th grade
	Father (56)	Rancher		Female	11	6th grade
Peterson	Mother (54)	Stay-at-home parent	2	Male	15	9th grade
	Father (49)	Mechanic		Male	17	11th Grade
Phillips	Mother (41)	Teacher	1	Female	10	4th Grade
Anderson	Mother (39)	Self-employed farmer	2	Female	11	6th Grade
	Father (39)	Self-employed farmer		Female	12	7th Grade
School Staff						
	Position	Years of Experience				
Stevie	5th Grade Teacher	21 years				
Joan	6th Grade Teacher	4 years				
Mary	5th Grade Teacher	9 years teaching, 16 years as paraprofessional				
Bill	School IT	18 years				
Wilma	Elementary Principal	Teacher for 11 years, principal for 13 years				

Table 1 continued

Public Library Staff

	Role	Years of Experience
Wanda	Staff	12 years
Jane	Staff	29 years

Documents

- Internet Provider Documents (Coverage map, Fiber map, incentives)
- Grant Documents related to student access to internet during pandemic (provided by Blaine County Superintendent via Email)
- Montana State Library Hot Spot Information sheet (Montana State Library, n.d.)

Note. Pseudonyms were used to protect confidentiality. *Only family members who participated in interviews were included in the table

Through the Coronavirus Aid, Relief, and Economic Security Act (CARES Act; U.S. Congress, 2020), the libraries were able to get Laptops and iPads that could be checked out to patrons. The librarians (Wanda and Jane) indicated that during the pandemic, the libraries provided expanded internet access opportunities for individuals and family, while continuing to be a resource for information— "aside from offering free Wi-Fi, hot spots, and all of that kind of thing, we were just kind of a place for people would call or try to connect for information" (Wanda).

Schools. Within Blaine County there are 20 schools (i.e., eight elementary, eight middle, and four high schools). In Spring 2020, there were a total of 1, 295 students enrolled in a public school within Blaine County (i.e., n = 722 elementary, n = 215 middle school, and n = 358 high school). The local schools played an instrumental part in getting families access to internet services and devices to connect to the internet that were needed during the pandemic. In terms of internet connected device access, a local elementary school (total enrollment < 200) was able to provide all students in kindergarten through third grade with iPads and grades four through 12 with Chromebooks. These devices were to be used for homework purposes. The school started purchasing these devices before the pandemic so when the COVID-19 pandemic started, they were able to service almost everybody right away. The school was to complete the technology initiative once COVID-19 began and the school received funds from the local and state government. A second school district (total public-school enrollment < 600) in the county provided Chromebooks to all kids in third grade and higher that did not have a laptop already at home. In addition to creating access to devices, schools also had to consider how to create more access to Wi-Fi for the families they served. For example, in one city (total population < 800) upgraded their Wi-Fi using Elementary and Secondary School Emergency Relief Fund funds so that it was accessible in all parking areas around both the high school and elementary school. This Wi-Fi was available 24 hours per day, every day of the week to anyone that wanted to use it. Schools were also able to provide families in a district (total public-school enrollment < 600) that did not have internet service with in-home internet service. While providing internet access to families was seen as positive, the actual process did come with its own set of challenges. A school technology specialist (Bill) elaborated, "one of the biggest challenges was to make sure that I could have content filtering on that [internet] service prior to them

getting access to those services." The families that used this internet service could only use it for schoolwork. The content filter blocked everything else.

3.2 Internet-Based Learning and Teaching

The COVID-19 pandemic limited in-person interactions, which resulted in increased opportunities for internet-based learning and teaching. Teachers and families alike were forced to learn new schedules and use new and different forms of technology. This theme is discussed in two subthemes: (a) technology learning curve, and (b) quality of learning.

Technology learning curve. In Blaine County, there was not an immediate switch to internet-based learning as many students did not have internet connected devices. Instead, at the onset of the pandemic, the schools in the county switched from in-person schooling to teachers preparing paper packets of worksheets that students would complete at home and turn them all in at the end of the week. The paper learning lasted until devices such as Chromebooks and iPads were distributed to the students. Once the schools were able to get the devices to the families, the homework, class meetings and help sessions were facilitated online. Teachers mainly used Google Classroom to conduct their classes. As the pandemic progressed, new teaching models were introduced. For instance, a school in Blaine County switched to a hybrid model in the fall of 2020. The hybrid model split each class into two groups. Group one met two days a week and then group two met two days a week. Fridays were set aside for teacher preparations and study hall sessions. While this hybrid education model was in place, families could choose if they wanted online learning or in person learning. This was challenging for the teachers. A teacher (Joan) said, "it was almost like we were teaching two classes because we had to be in charge of our class that was in the classroom and then in charge of our class that was on Google meets."

Throughout the COVID-19 pandemic teachers and students were required to adapt to new learning technology. There were many challenges that stood out to students during this time. It was very difficult for students to attend class meetings on Zoom as everyone in the families had different schedules and other family members may be in class during that time. Many of the students did not know how to use or have training on the new programs such as Zoom, Google classroom and Gmail, which created a learning barrier. Discussing this challenge, a mother (Anderson family) stated, “I actually think, [my younger daughter], having the paperwork, I think she thrived more through the pandemic than [my older daughter] did, who had all the online assignments. Because it was an unfamiliar format, she didn't understand it." Teachers and adults faced similar challenges supporting students. For example, teachers and families could not accurately see if assignments were submitted into Google classroom which caused some kids to have to redo assignments.

Like the students, the teachers also had to learn some new programs to facilitate online learning.

> [Many teachers] didn't know how to use all the Google apps so that was a challenge. So, the veteran teachers had to learn from the younger teachers on how to do that stuff. We just all had to learn on the fly how to use the internet. (Wilma, School Administrator)

> So just the technology end [of teaching online was challenging], just having to learn quickly how to do that. A lot of work with, you know, 'how do I record this and upload these things and get that all set and ready?' (Stevie, teacher)

The teachers also had to learn to use multiple devices at once to aid in the online teaching process. A teacher (Joan) reported:

> I had my teacher desktop computer on to a Google meet then if I wanted to use like my swivel and my iPad I had to make sure that the swivel was charged, and I had to make sure that my iPad was charged and then I had to make sure that they weren't going to feedback on each other.

While some teachers explained that after navigating the technology learning process that their course content was transferable in an online classroom, teachers in physical education (PE), art, music and similar were not able to conduct their classes in typical ways. A school administrator (Wilma) explained:

> I know my husband did not like [transitioning his class to an online classroom] because different classrooms like for him as a PE teacher, I mean you couldn't use PE, so the dynamics of his classroom changed from like PE stuff more to health.

Although the transition to online learning was a challenge, there were some successes from online learning. Students were well versed in how to properly send and receive emails, and how to type faster. Students who put in the effort to learn the devices were thought to be set up for success for the next year of school. Students also learned how to take care of the devices that they were assigned and to use them correctly. A school IT specialist (Bill) reported:

> The [students] took care of the devices at home and made sure that they had that item charged up enough to get online, made sure that they could get into the classroom to do the classroom with the with the teachers as it impacted their grades.

Quality of learning. Although the schools and teachers were doing everything they could, some families mentioned a noticeable learning decrease in their students throughout the COVID-19 pandemic. A mother (Smith family) explained:

> The whole rest of the year from mid-March until the end of May the kids didn't write a sentence or a paragraph, they didn't do any of that so they, I think, in some ways really fell behind. No science. No science experiments. No social studies. There were some real gaps, I feel. If it came to it again then it was an extended online homeschooling, I would homeschool the kids

> myself. The learning just wasn't there, and the interaction wasn't there. They missed a lot of things that you can't do online.

A child (Anderson family) mentioned, “my mom had to teach me how to do fractions. And fractions have been a little hard since then. I've never been very good at them." Teachers noticed a lower standard of teaching that was taking place. A teacher (Stevie) disclosed, “I do know my job was a lot more difficult when I had to do it online. I didn't feel like I was doing a good job, it was so much work." Students’ availability and willingness to tackle online learning was also perceived to be related to a decrease in their learning. Highlighting the various levels of student engagement, a teacher (Jean) explained, “out of my 12 students at that time, I had two students that took their work very seriously. I had probably four to six that I very rarely got work back from, and two for certain that never turned anything in." Student attention was also a challenge, and this varied by age with younger student (Kindergarten through third grades) not “always able to sit in front of a computer and listen,” but older students (fourth through sixth grades) “were able to kind of sit in front of a computer screen and listen” (Wilma, teacher). The schools made great efforts to ensure students had internet and device access so they could be engaged, but “of course, there's still some students who were just completely offline and unengaged and that was a choice that was made by parents and students" (Bill, IT specialist).

Through the technology learning model many interactions were noted, and some created an unsafe learning environment. A few students found online learning was an easy way to bully other kids. This required some teachers to meet with students and their parents to discuss cyberbullying. Teachers acknowledged the importance of parents in the learning process, especially during the transition to at-home learning. While there were a few successes in connecting with parents, parent engagement in student learning was a common challenge. Some teachers tried to contact student’s homes, but the families were unavailable because they were “busy” or “doing other things” When teachers were able to contact homes, there was a lot of chaos in the background in most of the homes. There were several that were even on the road [traveling]. In general, internet-based learning was perceived to have some challenges related to engagement and achieving typical learning outcomes.

3.3 Rural Home Internet Use

The participants explained that Blaine County was a tight rural community, “[in] rural areas, there's a different kind of bond there” (Jean [teacher]). During the pandemic everyone came together. The rural nature of Blaine County did precipitate some challenges during the pandemic. When “you live in a rural area, but you just didn't realize how much you depend on stuff (supplies, internet, etc.)" (Wilma, teacher) until it became less available during a global crisis. At the start of the COVID-19 pandemic, there was only one internet provider in Blaine County. The internet provider provided services to all the county, including extremely remote areas. Although the internet was available, the pandemic highlighted “what a gap there is between the have and the have-nots" (Wanda, librarian) in terms of internet and technology access. For some teachers it was hard to know if their students had internet access. A teacher (Stevie) relayed:

> I guess I honestly didn't really know [my students’] internet access was like at home. I just made an assumption that a lot of them didn't have access just

> in case there were students that didn't. I didn't want to embarrass them or make the assignments hard so they couldn't do them at home. So, I didn't really assign a lot.

Efforts were made by districts to get internet access to families with school-aged children and an Internet Technology specialist (Bill) in a district explained that there were "out of all of our students we maybe had five or six households that needed actual internet service provided to them." Still, there were challenges in the quality of internet for families because hotspots did not provide consistent quality service. A teacher (Jean) noted:

> Not all of my students had internet access, there were some that just never were able to get it and then we had some that the internet access was sporadic because they were trying to go through hot spots, which was not very effective.

Challenges related to the internet quality were also related to the families navigating daily responsibilities while completing remote schooling. Ranching and farming did not stop during the pandemic and a teacher (Stevie) explained, "we had Zoom calls from tractors and some kids were in trucks and they were going down the road or they were out with their animals."

Participants perceived that a greater part of the families in Blaine County (including themselves) did have what they described as good and reliable internet access prior to the pandemic. As the pandemic progressed multiple devices were concurrently used in the home which resulted in declines in internet quality. Elucidating this experience, participants said things like:

> I think just greater bandwidth was a problem for everyone to some extent because with the two kids, I think that was also a factor sometimes and why we had problems connecting. There was also a learning curve, they had to be on opposite ends of the house if they were in the same room. There's a lot of feedback on their microphones. (mother, Smith family)

> When you had the amount of people that had to be using it at that time, maybe the bandwidth or whatever was not strong enough to support us. I had two high school students at the time....The biggest problem was if I had to do a Zoom call and they did, oftentimes I would just come to the school to do those just because I knew the internet was better. I wasn't going to get kicked out. (Stevie, teacher)

As the urgency of the COVID-19 pandemic waned, families noted that they have continued to have more internet and device usage than they did before and are using more devices. Most participants reported that they were happy with their internet service and made no changes, but some upgraded their plans with the same provider to accommodate higher usage. During the pandemic, an internet provider competitor entered Blaine County, and one of the participants switched internet providers

during the COVID-19 pandemic. While internet challenges were reported to be managed, the increased usage of internet and devices during the pandemic has left lasting consequences. A father (Anderson) reported, "I think everyone is now addicted to an electronic device because that's all we did. There's no personal interaction anymore anywhere."

4.0 Discussion

During the COVID-19 pandemic, Hambly et al. (2022) provided a "wide-angle look at broadband [use in rural Canada and concluded that more] granular analysis of household level" (p. 241) especially with school-age children was an important next step. The General Ecological Model indicates that households with school age children are influenced by other environmental factors such as teachers and community resources (libraries; Bronfenbrenner, 1979). The current case study was designed to understand the internet experiences among rural families with school age children in Blaine County, Montana and those who provided internet-based services to families during the COVID-19 pandemic—school staff, librarians. In Blaine County, previously identified rural values (exosystem), such as strong community ties (National Public Radio et al., 2018), were evident as participants reported that the community worked together to get through the COVID-19 pandemic. Participants shared their experiences with internet accessibility and connectivity, internet-based learning, and the COVID-19 pandemic. Results are discussed in relation to existing research and the General Ecological Model (Bronfenbrenner, 1979).

4.1 Internet Access and Quality

At a microsystem level (Bronfenbrenner, 1979), participants noted that before the pandemic they had good reliable home internet services. Prime et al. (2020) reasoned that the pandemic significantly disrupted family life, and this was supported as participants described a transition of typical routines to virtual school and work at home. While internet services were deemed reliable prior to the pandemic, as more family members were concurrently using the home internet, participants indicated that the internet started to lag and was unable to support all family members at the same time. This supports Dobis et al. (2021) proposition that rural families experienced challenges completing work and school because of lower internet speeds or no access to the internet, especially as other sources (e.g., schools, libraries) of internet were not available (Dobis et al., 2021). The exosystem includes the indirect development influences on humans by the social environment, which includes "a community's geographic locale (e.g., rural, urban), density, demography, and economy" (Iurka et al., 2020, p. 16). If a rural community does have internet access, they may still experience higher prices and lower internet speeds because of limited internet providers at the exosystem level (Dobis et al., 2020). This was true in Blaine County, at the beginning of the pandemic there was only one internet provider serving the county. As the pandemic progressed, the county had another internet provider enter the local economy. Participants indicated updating their home internet service and one switched internet providers. A silver lining of the pandemic might have been increased internet options through added competition in the county. Examining the changes in the number of internet providers and quality of services in rural communities pre- and post-pandemic warrants future research attention.

Through inclusion of school staff and public librarians in the case study, it was identified that there were families in Blaine County that did not have home internet access. At a macrosystem level (government) there were policies that allocated funding to create family access to the internet and internet-based devices. Specific policies that supported internet and device access increase in Blaine County included the CARES Act (U.S. Congress, 2020), monies distributed through the CARES Act to the Institute of Museum and Library Services—these were distributed to state libraries who then distributed them to local libraries—(Federal Communications Commission, n.d.), and Elementary and Secondary School Emergency Relief funds (U.S. Department of Education, 2021). At an exosystem level, teachers in this study perceived that learning technology in their rural schools was not up to the level in schools in larger cities. Previous studies have indicated the rural residents often feel that they get less of their fair share of resources from the government (National Public Radio et al., 2018). In Blaine County, participants reported that local schools used Elementary and Secondary School Emergency Relief funds to provide students with devices such as Chromebooks and iPads to help the students with the switch to learning digitally. One school in the county was able to provide all students fourth through 12th grade with Chromebooks and iPads for kindergartners through third graders.

The current study highlighted that school staff in Blaine County did consider the families they served did not have home internet access. The Information Technology staff member specifically shared that he connected approximately five households with home-based internet. One of the challenges mentioned was putting the expected filters and restrictions for internet provided in student's homes. Schools also improved their Wi-Fi and reported students and families would use the Wi-Fi in the school parking lots. To inform future pandemic planning and preparedness, more research is needed concerning how schools identified and addressed internet-based needs during the pandemic across levels of rurality.

At a mesosystem level—parent-child microsystem interacting with parent-library microsystem—libraries increased their efforts to expand internet access for families. A survey of libraries in the United States early in the pandemic (March–April 2020) indicated that some libraries had provided hotspots or expanded Wi-Fi so it could be accessed outside the library. This study did not report experiences based on level of rurality, which made it unclear whether rural libraries engaged in similar efforts. In Blaine County, librarians reported that they did upgrade and extend their Wi-Fi so families could access it outside of the buildings. Libraries also provided Wi-Fi hotspot check-out to adults through funding from the state library. The library closest to the Fort Belknap Indian Reservation had the most demand for Wi-Fi hotspot checkouts. Prior to the pandemic, it was reported that there was limited internet access on tribal lands and that FCC reports overstate actual access (U.S. Government Accountability Office, 2018). This may explain the higher demand, but more pandemic focused research on tribal land internet access and quality is needed.

4.2 Internet-Based Learning

Leech et al. (2022) reported that technological challenges faced by teachers were a common issue in internet-based instruction during the pandemic. Within Blaine County, teachers did express personal internet and technology challenges that made instruction difficult. Part of this was because their schools had not adopted newer learning technologies prior to the pandemic, which made it challenging to learn new

technology, adapt classes, navigate multiple technology platforms at once, and engage students. Teachers also had to navigate new virtual classroom management challenges, including cyberbullying. With increases in socialization and access to technology during the school years, school age children are at risk of being cyberbullied (Evangelio et al., 2022). Cyberbullying prevalence decreased during the pandemic, but rural areas were identified as a risk factor for cyberbullying during the pandemic in a systematic review (Huang et al., 2024). To mitigate cyberbullying, teachers in this study had to meet with parents and students. It is important to acknowledge that teachers not only had to adapt their content for remote learning during the pandemic, but also had to navigate managing student behaviors in a digital environment.

Parents acknowledged at the beginning of the pandemic that it required adjustment to navigate their own work and their children's remote learning (Vaterlaus et al., 2021). Similarly, at a mesosystem level—parent–child microsystem and child–school microsystem—families reported having to adapt to internet-based instruction and learning. Some teachers and parents indicated that the students did not know how to use the learning technologies. Leech et al. (2022) reported that a common internet-based instruction challenge was that students did not have an adult available to help them online. While Leech et al.'s (2022) study examined grade-level differences, differences in rurality—exosystem—were not explored. Teachers in the present study felt that parental engagement was important for remote learning, but parents were often difficult to reach or challenging to communicate with because of background noise (e.g., chaos going on in the background, traveling).

Student attendance and engagement was a challenge during pandemic internet-based learning (Leech et al., 2022), but the reasons may vary by urbanicity level. Agriculture is central to Blaine County's economy, and teachers reported that students were virtually joining classes while engaging in farm or ranch related tasks. This led to lower internet quality and concerns regarding student learning. In the same vein, teachers, parents, and children felt like the unique sociohistorical conditions—chronosystem—of internet-based learning during the pandemic led to learning loss. There is some empirical evidence supporting this learning loss. Lewis and Kuhfeld (2022) reported a decline in math and reading scores during the COVID-19 pandemic, and although there were early signs of improvement by the start of the 2022–2023 school year, these scores remained below pre-pandemic levels (Lewis & Kuhfeld, 2022). Recovery has varied across age groups, with students who were in kindergarten at the onset of the pandemic experiencing the slowest progress, particularly showing the largest gap in reading achievement. Participant reports in the current study suggest that examining pandemic learning loss and recovery through the lens of rurality is warranted.

5.0 Limitations and Conclusions

There are limitations to this study. Interviews included retrospective information because they were conducted in 2022 and 2023, which could mean that some information was forgotten or framed differently after the onset of the pandemic. Within some families, not all family members elected to volunteer, missing some perspectives. Further, while efforts were made to recruit families from the Fort Belknap Indian Reservation, none volunteered to participate. Experiences may have been different for these county members and specific pandemic research related to internet access and quality on tribal lands is needed. The current case study appropriately focused on one rural county in the United States, and their experiences

may not be representative of other counties. A strength of the study was the inclusion of several types of case study evidence (i.e., families, school staff, libraries, and documents).

The current study answered the call to examine rural families'—with school age children—experiences more granularly with internet access and quality during the COVID-19 pandemic (Hambly et al., 2022). Challenges included initially only having one internet provider, bandwidth, and school staff reported that some of the families they served had no home-based internet access. Teachers and students had difficulty adapting to internet-based learning, and rural students joined virtual classes while working in agricultural contexts. Improving internet access involved federal policy—macrosystem—that allocated resources to organizations (schools, libraries) in the community. Most school staff and librarians had a strong understanding of family internet needs and demonstrated a commitment to meeting those needs. Future pandemic planning should consider the internet needs of rural families and recognize that solutions can be found through policy, schools, and public libraries.

Independent of the pandemic, the results of this study highlight that teachers and students in the rural community were not regularly using contemporary and free instructional technologies (e.g., Google Classroom). While ongoing professional development in instructional technology is essential for teachers, its effectiveness is contingent upon rural students having reliable access both in the classroom and at home. Pre-pandemic technology initiatives (e.g., providing Chromebooks to students) at some rural schools in Blaine County naturally prepared students for learning remotely during the pandemic. Prioritizing rural students' access to internet connected devices should remain a goal beyond pandemic contexts. Instructing students how to use the technology and emphasizing the importance of being good digital citizens are important. In Blaine County, school staff and librarians recognized that some homes with school-age children lacked Wi-Fi access. In response, schools and libraries took action to provide this connectivity. Now that the pandemic is over, it is crucial for policymakers and community leaders to sustain these initiatives and prioritize efforts that enhance broadband infrastructure and increase the number of internet service providers in rural communities. This will help ensure equity in learning opportunities for all students.

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