



CENTER *for* RURAL POLICY *and* DEVELOPMENT

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Broadband speeds in Minnesota's school districts

Introduction

A parent walking into a classroom in a Minnesota public school today will be presented with a different learning environment compared to that of 20 years ago. Gone are filmstrips and movie projectors and in their place are computer screens. Today's classroom is a heavy user of digital media, and much of that is accessed via the Internet. It is becoming apparent, however, that the means of accessing the Internet and other online services — the infrastructure carrying the signals — does not have the same level of availability for every school and every district in the state. Whether because of cost or physical infrastructure, schools have online access at different rates, which affects their capability of using online resources in the classroom and in the school office.

The purpose of this study is to gain a better understanding of what bandwidth schools have to access online services and what they are using these services for. This is a pilot study, but in this first look it has become apparent that this is a complex subject requiring a more in-depth examination. We can, however, present a group of key findings from this initial look:

- In the ten years or so that the Internet has been widely accessible to schools, they have become heavily dependent on the Internet and related online services. Primary uses of online access include student testing; daily reports to the state; maintaining information portals for parents to access their children's information, grades, etc.; and accessing online classes and educational content.
- Bandwidth varies considerably from district to district. The average bandwidth is 28.0 mbps, while the median figure is 10.0 mbps.
- The majority of districts responding rated their current bandwidth as adequate, but they anticipate needing more next year and the year after. The ever-increasing supply of online resources and their increasing use in the classroom are driving that need.

The Center for Rural Policy and Development, based in St. Peter, Minn., is a private, not-for-profit policy research organization dedicated to benefiting Minnesota by providing its policy makers with an unbiased evaluation of issues from a rural perspective.

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- Telecommunications access clusters, special consortia of school districts, libraries and other entities, report they are saving districts money by negotiating bandwidth prices and pooling administration, tech support and other services for groups of districts at a lower cost than the districts could access individually.

- The biggest barrier to getting more bandwidth is cost. Results indicated that districts with smaller enrollments appear to pay more per student for their broadband. Remoteness also appears to be a factor in higher costs and problems with accessing the necessary infrastructure.

Who we talked to

For this study, we contacted by phone technology coordinators for the 43 Minnesota school districts that are not currently participating in one of the 12 telecommunications access clusters around the state. Of those 43 districts, coordinators for 39 of those districts responded to a short survey that asked questions about the district’s bandwidth, activities that take up the most online capacity, how they would rate the adequacy of their bandwidth, how much they pay for their bandwidth, and any difficulties they might be facing with accessing their bandwidth. Coordinators of the 12 telecommunications access clusters were also contacted with the same survey, and all responded.

What we found

Today’s schools are online, both in the office and in the classroom

In the survey, the district technology coordinators were asked what activities, both administrative and instructional, used the most capacity on a day-to-day basis. The respondents listed the top five administrative and top five instructional activities, and while there was some overlap, a short list of activities came out clearly on top. Maintaining the district web site; state reporting; online research; financial business,

Table 1: Top activities using the most capacity on a day-to-day basis.

Activity	Percentage of respondents reporting this as the top activity
Testing	35%
Classroom use	27%
Media-rich content (includes ITV, video streaming, video conferencing)	23%
Growth of district/number of students	8%
Online classes/online learning	8%

which included payroll and human resources; and email were cited as the top administrative uses, while online research (by students and teachers); video (streaming or downloaded, used in the classroom); parent communications; and testing were listed as the top instructional uses. (Parent communications and information showed up frequently in both administrative and instructional categories.)

Responses from the technology cluster coordinators concerning activities were similar: finance; student records; state reporting; and data management were all given as important administrative activities, while student information/management (reporting attendance, grades); testing; video; and online classes were all cited.

When asked specifically, however, what overall takes the most capacity and/or time online, 35% of respondents answered “testing” or “state testing,” followed by classroom use and media-rich content (see Table 1). It was noted from the survey responses that a growing amount of the content being accessed online in classrooms is interactive: SMART Boards, reading and math programs, interactive learning games, interactive TV (ITV), online classes, and distance learning. Such things as video- and web conferencing were also included in these activities. Streaming video takes more bandwidth than reading a web site,

while interactive activities require even more bandwidth than passively watching videos.

Bandwidth varies from district to district

We were able to get a specific bandwidth number in 243 districts, ranging in speed from 1 Gbps (1,024 mbps) down to 1.5 mbps (see map, p. 7). The average speed for these districts is 28.0 mbps, but the median speed (the speed at the midpoint of the list) is only 10 mbps. This large difference between the average and the median indicates that a few districts with high speeds are raising the average; to be specific, 12%, or 28 districts in this group, have bandwidth speeds of 100 mbps or higher (these do not include districts that are in clusters using shared bandwidth: see below).

Of these 243 districts, 204 are members of telecommunications access clusters where each district has its own broadband access and speed. There are an additional 86 districts that also participate in telecommunications access clusters, but in these clusters the districts share bandwidth. Under these arrangements, one bandwidth is purchased for a group that includes school districts, special districts, libraries and other entities. The bandwidth is then distributed, like water through an irrigation system, to the sites with the flow adjusted to different locations according to need at the time. Like water, there is a finite amount of bandwidth being shared among these districts, so while the cluster may purchase an overall speed of, for example, 100 mbps, each building is receiving a fraction of that speed, not that full speed itself. Therefore, while the map on page 7 indicates that the telecom clusters in southwest and central Minnesota are purchasing one particular speed, the total bandwidth is being shared among the various districts in that group.

Cost

The amount districts pay is all over the board. Among the 39 independent districts surveyed (those not in telecommunications access clusters), amounts ranged from nearly \$10,000 a month

for St. Paul to \$100 a month for Blooming Prairie. Several factors affect how much districts pay each month for their broadband and other technology, including the number of buildings requiring infrastructure, the number of students, faculty and staff online at the same time, and the types of services besides broadband the district is using. Another significant factor in a district's technology bill is the federal e-Rate program, which covers a portion of broadband costs for schools and libraries. E-Rate can cover between 20% and 90% of a school's broadband bill, determined by factors such as the school's poverty rate and whether it is rural or urban. Only certain services are eligible for e-Rate, and therefore the type of services the district is purchasing will also have an impact on what districts ultimately pay for their technology.

The survey data showed that among the independent school districts, state and federal subsidies covered on average 43% of school districts' broadband bill, but rural districts did have more of their broadband bill covered by state

Table 2: The average percentage of the broadband bill covered by state and/or federal subsidies among the independent districts surveyed.

Metro districts	Rural districts
45%	63%

and federal subsidies on average than districts in the Twin Cities metro area (see Table 2).

A fundamental issue appears, however, when school districts' broadband bills are looked at on a per-student basis: the smaller the district, the higher the cost of broadband per student. As Figure 1 shows, among the independent districts, the cost per student decreases as the enrollment increases. (St. Paul was not included in this chart since its enrollment is so large, it skewed the graph.) Possible reasons factoring in are fixed

Figure 1: The cost of broadband per student by district enrollment size.

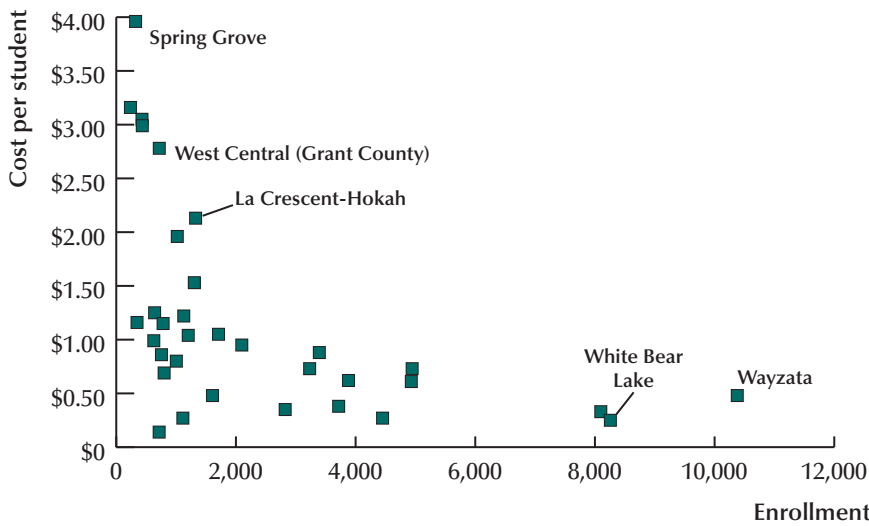
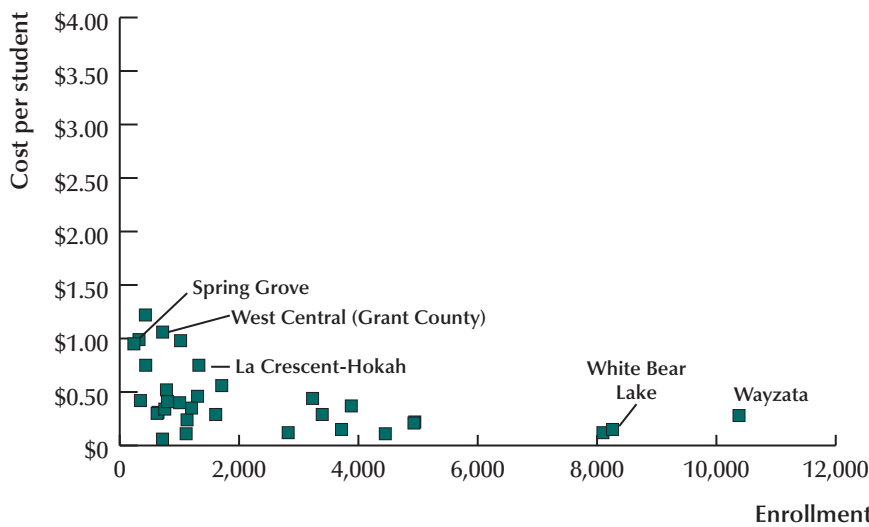


Figure 2: Broadband cost per student by district enrollment after e-Rate has been applied.



overhead costs present regardless of the number of students, the fact that smaller districts tend to be more remote, increasing infrastructure costs, lack of competition among local providers, and/or the local provider’s cost structure and needed return on investment. Regardless of the specific reasons, however, the fact remains that certain forces appear to be working against smaller districts.

E-Rate does help these districts, however. As Figure 2 shows, when the e-Rate reimbursement

is applied, the cost per student drops, particularly for the districts at the lower end of the enrollment scale. Smaller districts still tend to pay more, but some of the burden has been removed.

Several respondents mentioned Minnesota’s Telecommunications Access Equity Aid program as welcome, but they also expressed the wish that the funding would be stabilized. In the past few years the amount of funding for the program has varied widely depending on available dollars.

Telecom access clusters provide economy of scale

Most of the school districts in Minnesota have chosen to band together in telecommunications access clusters, which consist of associations of school districts, special districts and libraries. They act in many ways like purchasing pools and provide services that individual schools and libraries would either not be able to afford or would

have to supply at a higher cost on their own. The primary service most of the clusters provide is to act as the purchaser of broadband for all the districts and libraries in the group. Buying their bandwidth “in bulk” helps the cluster negotiate lower rates for the individual districts with the local providers. (In the case of the TIES group in the Twin Cities, the cluster is the broadband provider.)

Telecom access cluster coordinators report

they are also able to concentrate on services that individual districts, especially very small ones, would not have the staff or resources to do justice to on their own. Services include upgrading broadband technology for schools and libraries, providing technical support and training, and applying for e-Rate funding. The cluster coordinators we spoke to estimated they have saved their districts substantial funds annually by making it unnecessary for each district to provide these services themselves.

Despite the savings, cost was still reported most frequently by the coordinators as the roadblock to getting more bandwidth. Interestingly, the answers varied somewhat based on the districts' locations. Clusters with more remote and/or rural districts reported infrastructure issues: last-mile and end-of-the-road costs made service prohibitive. The southwest, northwest and east central clusters reported a lack of fiber network that prevented getting higher speeds regardless of cost. Other coordinators cited a lack of competition that kept costs "somewhat higher than they otherwise may be." Even in the Twin Cities, the more outlying districts faced difficulties with access to infrastructure.

Adequate speed

To gauge how coordinators for the school districts and telecom access clusters perceived the adequacy of their broadband access, survey respondents were asked to rate the adequacy of their district's or cluster's broadband speed on a scale of 1 to 5, where 1 was completely inadequate and 5 was completely adequate. The technology coordinators at the independent school districts (districts not in telecom access clusters) rated the adequacy of their bandwidth an average of 3.7, indicating that they found their districts' current bandwidth to be adequate (see Table 3). Only five, or 13%, of the independent districts responding rated their bandwidth as a 1 or 2, while 31% rated it as a middle-of-the-road 3. The other 56% rated it as an adequate 4 or 5. When

Table 3: Respondents' ratings of their district's bandwidth on a scale of 1 to 5, where 5 is completely adequate and 1 is completely inadequate.

Completely adequate 5	4	3	2	Completely inadequate 1
23%	33%	31%	10%	3%

those coordinators who rated their bandwidth as inadequate (1 or 2) were asked the cause of this inadequacy, four of the five districts said cost was the reason. Those coordinators who rated their bandwidth as adequate (3, 4 or 5) were asked if they believed their district would need more bandwidth in the next year and the next two years. Sixty-five percent of these coordinators said, yes, they would need more bandwidth in the next year and in the next two years. When asked what they thought was driving this need, 35% of those responding answered "testing," while 27% said increased classroom use, and 23% said the increased use of media-rich content, such as ITV and video conferencing.

Among coordinators of technology clusters, the majority of those responding also rated their bandwidth adequacy as 4 or 5. The coordinators in the two clusters who rated their bandwidth as inadequate, representing most of the districts in southwest and south central Minnesota, cited cost as the reason but also a lack of adequate infrastructure, including fiber. One coordinator stated that the high upfront cost of bringing fiber to schools was preventing them from installing this infrastructure, which would, if it were in place, actually lower the per-unit cost of bandwidth. Of those coordinators who rated their access as 3, 4 or 5, all stated they would need more bandwidth in the next one and two years. As one telecom access cluster coordinator put it, whatever bandwidth is given them, students, faculty and staff will find ways to fill it up.

Technology coordinators were also asked what the biggest difficulties or roadblocks were

to getting adequate bandwidth in their districts. In the independent districts, 59% responded “cost,” while 31% responded there were none. When asked what was working well with their broadband service, 69% of the district coordinators responded “reliability.” The remainder of the answers included responses such as “everything,” “tech support,” and “provider is fair with bandwidth offered.”

The technology cluster coordinators’ responses were similar in that cost was the top roadblock, but each coordinator had specific issues. In the southwest, the answer was “complete lack of fiber.” In central Minnesota, the coordinator stated that, although they appreciated e-Rate, it prevented them from entering into a cooperative deal with the city and county governments because e-Rate can only be used on services that are exclusively for education. Lack of competition among providers was also mentioned by some of the coordinators as keeping prices higher.

Thoughts for the future

As stated at the beginning, this study is a preliminary look at access to broadband for Minnesota’s schools. Discussions with these technology coordinators quickly revealed that the issue of broadband for schools is far more complicated than simply who has what speed. The following is a summary of the major findings and some possibilities for future research turned up by this initial study:

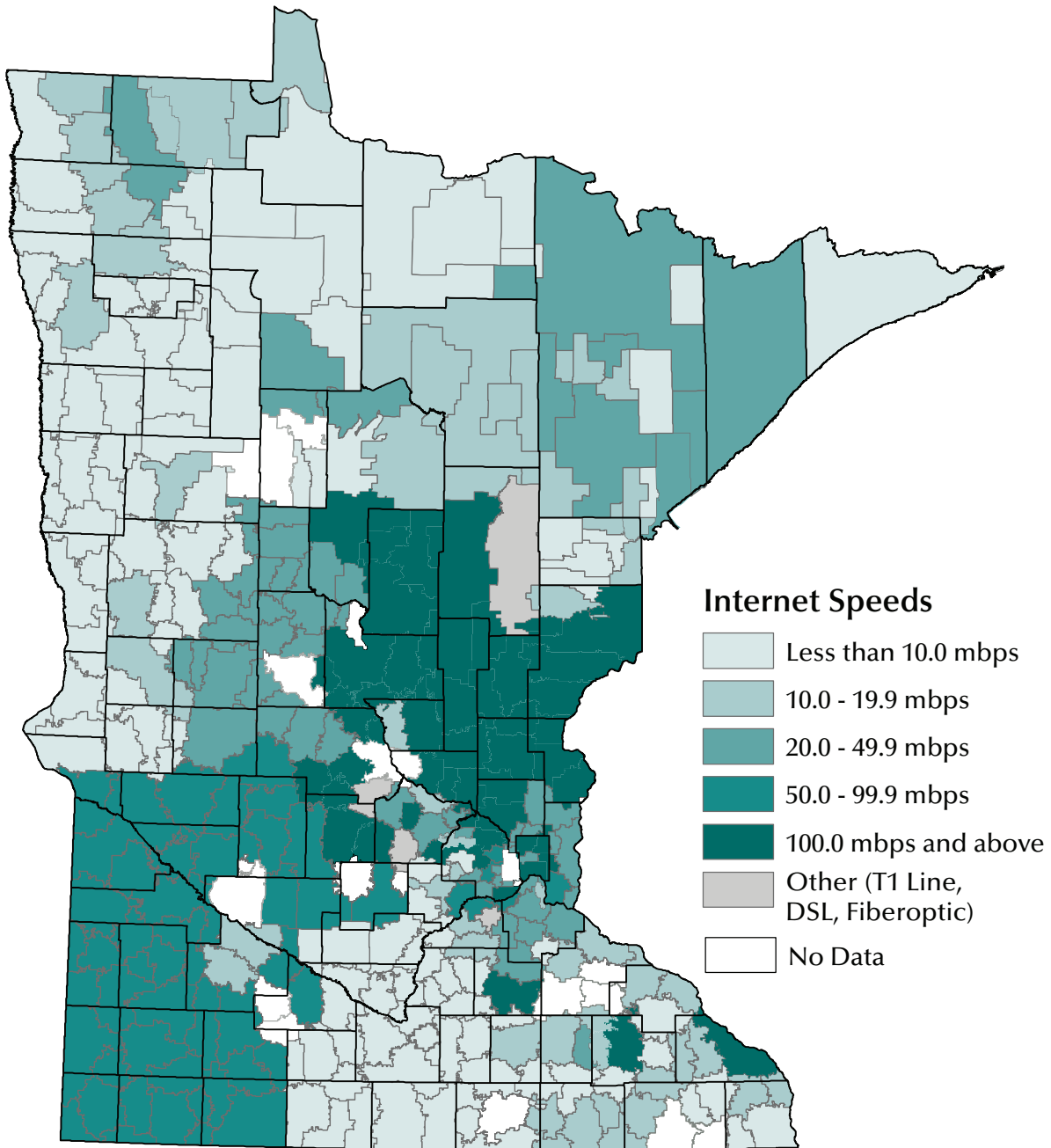
- The clear message from the survey respondents was that the trend is only toward more intensive use of online resources, and need for capacity will only continue to go up as

classrooms go increasingly online with video content, interactive online classes, and more means for students and parents to access the school and school work online. At the same time, administrative work continues to be largely managed online.

- One new service that some coordinators mentioned as something to look forward to is Internet 2: This new network running parallel to the current Internet and dedicated more exclusively to education use offers increased capacity and speeds, and therefore increased efficiency. Some districts are already connected, but helping others get online with Internet 2 may be a good opportunity for examining the current infrastructure of both local providers and the state’s system and how schools and libraries can be served the most efficiently and cost effectively.

- Anecdotally, telecommunications access clusters appear to be saving school districts and libraries a considerable amount of money and time. A closer look at whether they are helping and how much and why some districts choose not to participate could yield valuable information in the service-sharing field.

- Finally, the factors that go into acquiring broadband for districts are very local in nature. Much depends on the local providers, the local infrastructure and the local demographics. Technology coordinators and directors know their local issues and foibles very well, and if any broad solutions are going to be worked on at the state level, these individuals can be a source of valuable information.



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600 S. FIFTH ST., SUITE 211 • ST. PETER MN 56082

