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**Broadband:
Creating Educational
Opportunities across Michigan**

September 2012



Historically, the advent of every new technology from radio to television has heralded new opportunities to help students succeed. Yet no other technological advance has offered the potential of broadband. Broadband and e-Learning applications expand educators' instructional capabilities, boost students' research and interactive opportunities beyond the confines of the traditional classroom, and facilitate communication between educators and parents, promoting engaged and individualized decision-making based on student needs and abilities.

Nationwide, the use of broadband to enhance educational opportunities is soaring in popularity. More than 6.1 million students took at least one online class during the fall 2010 semester, and the number of high school students enrolled in online classes nearly doubled from 2008-2009.^{1,2}

Michigan is promoting numerous creative initiatives to promote online education. As of 2011, nearly 15,000 courses have been taken at the Michigan Virtual High School, while Michigan's Department of Education and Governor Rick Snyder have promoted initiatives that would expand online learning in Michigan schools.³ Michigan Virtual University is also partnering with the state's Education Achievement Authority (EAA) to provide online courses to 600 Detroit school districts starting in September, 2012.⁴ Similarly, students benefit from MI Learning on iTunes U, which is designed by the Michigan Association for Computer Users in Learning to allow students access to educational audio, video, and PDF files shared by the state organizations and educators for free on mobile devices.⁵ Broadband is also empowering Michigan educators, with the Shiawassee Regional Education Service District in Michigan applying technologies like Adobe Connect to make virtual training and e-Learning more easily available to teachers.⁶

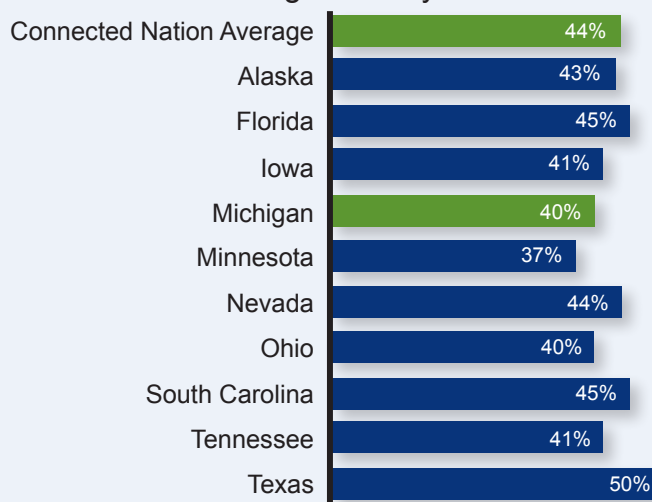
To examine the impact that broadband and online education (or "e-Learning") are having in Michigan, Connect Michigan explored broadband availability and usage across the state. In particular, this study looks at the correlation between broadband availability and school achievement and examines how Michiganders of all walks of life are accessing e-Learning opportunities.

E-Learning in Michigan

The Internet allows Michigan residents to access educational resources that may not have been available to them previously. Approximately 2.4 million adult Internet users are e-Learners, meaning that they take online classes or use the Internet to conduct research for schoolwork. This represents 40% of Michigan adults who use the Internet, which is below the Connected Nation average of 44% (Figure 1).

However, Michiganders recognize the value of broadband for education. When households with broadband were asked which factors contributed to their decision to subscribe, more than one in seven (15%, representing approximately 714,000 adult Michigan broadband subscribers) reported that the main reason for subscribing was that someone in their home needed broadband for school. In fact, two-thirds of Michigan households with children (67%) say their children use the Internet for schoolwork, demonstrating the increasing relevance and essential nature of broadband for education in Michigan.

Figure 1.
E-Learning Rates by State



1 <http://www.usnews.com/education/online-education/articles/2011/11/11/study-online-education-continues-growth>

2 Project Tomorrow, *Learning in the 21st Century: 2010 Trends Update* (2010), op.cit.

3 <http://www.edweek.org/dd/articles/2011/10/19/01bits-michigan.h05.html>

4 <http://www.mivu.org/News/tabid/297/newsid696/82/mid/696/Default.aspx>

5 <http://www.macul.org/milearning/>

6 <http://www.districtadministration.com/article/michigan-district-enhances-pd-through-virtual-training-and-e-learning>

Further, these data indicate that Michigan's twenty-first century e-Learning paradigm relies on dependable and affordable access to robust broadband infrastructure. Indeed, 85% of Michigan's e-Learners report subscribing to home broadband service (Figure 2). However, 4% of e-Learners (representing approximately 107,000 adults in Michigan) still use dial-up to access e-Learning resources, greatly limiting their ability. Furthermore, 8% of Michigan e-Learners rely on outside access to the Internet, such as at libraries, schools, or friends' homes.

To some extent, this gap is being filled by mobile technology. Among Michigan adults who subscribe to mobile broadband service on their cell phones, 14% (representing nearly 300,000 Michiganders) say they use their cell phone to access online classes or conduct research for schoolwork.

Demographics of E-Learning

Michigan Internet users pursue e-Learning opportunities at a rate that varies between different demographic groups. Michigan e-Learners tend to be young, employed, have at least some college education, and earn above-average household incomes (Table 1). In addition, e-Learning is attracting many African Americans in Michigan to continue their educations.

Employment Status

E-Learning helps employed Michiganders gain professional credentials and expand their career opportunities. Nearly one-half of employed Michiganders (47%) are e-Learners, compared to 31% of Michigan residents who are not employed.

Educational Attainment

Online education provides a great opportunity for Michiganders who want to continue their college educations. Internet users with a college education tend to use e-Learning more than their peers with no college education. Indeed, nearly one-half of adult Michigan Internet users who have taken some college courses (49%) pursue further education online, compared to 29% of Internet users with a high school diploma or less.

Figure 2.
Internet Adoption among E-Learners

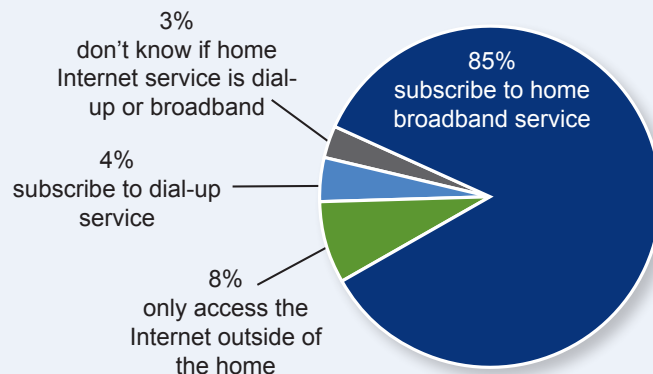


Table 1.
Percent of Internet Users in Each Demographic Group Who Use E-Learning Applications

Employment Status	
Employed	47%
Not employed	31%
Educational Attainment	
High school diploma or less	29%
Some college	49%
College graduate	44%
Advanced studies/degree	37%
Household Presence of Children	
Households whose children use the Internet for schoolwork	53%
Households whose children do not use the Internet for schoolwork	41%
No children at home	34%
Annual Household Income	
Less than \$25,000	35%
\$25,000 to less than \$50,000	39%
\$50,000 to less than \$75,000	40%
\$75,000 or more	51%
Age	
18 to 34	55%
35 to 54	41%
55 or older	21%
Race/Ethnicity	
Caucasian	39%
Black or African American	61%
Other minority	40%
Geography	
Rural	37%
Non-Rural	41%

Household Presence of Children

The presence of children and their learning habits have a positive correlation with the decision to use e-Learning applications. Over one-half of adult Internet users (53%) whose children go online for schoolwork also use e-Learning applications, compared to only 41% of those whose children do not use the Internet for their school. Both of these groups, though, are more likely to be e-Learners than Internet users with no children at home.

Annual Household Income

Michigan Internet users with higher annual household incomes are more likely to be e-Learners. More than one-half of Internet users (51%) with annual household incomes of \$75,000 or more are e-Learners, compared to just 35% in households with annual incomes below \$25,000.

Age

Use of e-Learning applications decreases with age. Over one-half of Michigan Internet users age 18-34 (55%) are e-Learners, compared to only 41% of Internet users age 35-54 and 21% of those age 55 or older. This age difference is evident in the fact that median age for Michigan e-Learners is 38, compared to 43 among Michigan adults who are not e-Learners.

Race and Ethnicity

African American Internet users are significantly more likely to access e-Learning applications than any other racial or ethnic group in Michigan. More than three in five African American Internet users (61%) are e-Learners, compared to only 39% of Caucasian Internet users. This suggests that broadband is expanding educational opportunities for African Americans across the state.

Geography

Rural Michigan residents often have limited access to educational opportunities. Utilizing broadband service, adults can pursue online and distance education programs, while children can take advanced courses that may not be available to them at local schools. Nearly two-fifths (37%) of rural Michigan Internet users go online for e-Learning applications. This translates into approximately 426,000 rural e-Learners statewide. In addition, 8% of rural adults who can access the Internet on their cell phones (approximately 27,000 rural Michigan adults) do so for e-Learning applications.

Why Broadband Matters to Education in Michigan

While online learning opportunities are available at every educational level, e-Learning is not an option available to all Michigan residents. According to Connect Michigan's 2011 Residential Technology Assessment, nearly two in five Michigan households (39%, representing more than 2.9 million adult Michiganders) do not subscribe to broadband service. While data show that the broadband availability gap is closing in Michigan, communities that do not have broadband available to them can face consequences that affect both adults and students.

Connect Michigan ranked and grouped Michigan school districts by the share of households that have access to broadband at advertised speeds of 3 Mbps or greater. This analysis revealed that as the district's average broadband availability increased, so do math and reading proficiency scores for students in grades 3 through 8. In addition, school districts with higher average broadband availability have a greater share of students who meet ACT college readiness benchmarks (Table 2). Even when other factors that could affect school performance were controlled for, such as economic differences and educational attainment levels in each school district, broadband availability at this speed tier still proved to be highly positively correlated with school performance benchmarks.⁷

⁷ See Appendix B for further information on cluster analyses, correlation results, and sample sizes.

Table 2.
School Performance and Broadband Availability

Average Broadband Availability at 3 Mbps or Greater Download Speeds	% of Students Meeting Math and Reading Proficiency Benchmarks for 3rd - 8th Grades	% of Students Meeting ACT College Readiness Benchmarks
99%	33%	16%
85%	30%	14%
64%	29%	13%
38%	26%	10%
13%	21%	6%

This suggests higher broadband penetration in portions of Michigan that are currently underserved or unserved may help improve academic performance for some students. However, this does not necessarily mean that simply increasing broadband availability will automatically help students achieve in school, and these correlations do not prove a direct cause and effect relationship between increased broadband availability and improved performance results. In addition, expanding broadband availability will not automatically result in universal broadband adoption and usage. For a community to truly benefit from the opportunities presented by broadband, many Michiganders will need to overcome barriers such as a perceived lack of relevance, cost, and a lack of digital literacy skills.

Conclusions

E-Learning powered by broadband technology gives Michiganders the opportunity to improve their lives as well as their educational attainment at a fraction of the cost of a “traditional” course.⁸ However, many Michigan residents are not taking advantage of this tool, particularly rural, low-income, and older Internet users. In addition, Internet users who have a high school diploma or less are also less likely to be taking advantage of the opportunities presented by e-Learning applications.

Making online courses available to all Michigan residents can help ensure that the workforce stays up-to-date and prepare to take on the challenges of tomorrow. Increasing broadband availability and designing specific training programs aimed at increasing broadband adoption may enable more Michiganders to realize the value of broadband, benefiting Michigan’s education and economy.



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⁸ <http://news.ufl.edu/2009/05/18/online-learning/>

Methodology and Definitions

Between June 27 and August 18, 2011, Connect Michigan conducted a random digit dial telephone survey of 1,200 adult heads of households across the state. This sample included 1,006 adults age 18 or older who were contacted via landline and 194 adults who were contacted via cell phone.

Of the 1,200 respondents surveyed in 2011, 929 respondents reported they use the Internet from home or outside of home, and 342 of those were identified as e-Learners. "E-Learners" are defined as respondents who go online to take online classes or conduct research for schoolwork. The results of this survey have been compared to similar surveys that Connected Nation conducted across ten states in 2011 (Alaska, Florida, Iowa, Michigan, Minnesota, Nevada, Ohio, South Carolina, Tennessee, and Texas). Altogether, Connected Nation surveyed 12,004 residents across these ten states in 2011 for this study, including 3,768 e-Learners.

Multiple attempts were made to each working telephone number on different days of the week and at different times of the day to increase the likelihood of contacting a potential respondent. To ensure a representative sample, quotas were set by age, gender, and county of residence (rural or non-rural), and the results were weighted to coincide with 2010 United States Census population figures. For the purpose of setting quotas and weighting, "rural" respondents are defined as living in a county that is not a part of a Metropolitan Statistical Area (MSA), as designated by the United States Office of Management and Budget. Weighting and design consultation were provided by Lucidity Research.

Surveys were conducted by Thoroughbred Research Group. On average, the survey took approximately 12 minutes to complete after the respondent agreed to participate. Based on the effective sample size, the margin of error = $\pm 3.09\%$ at a 95% level of confidence for the entire population and $\pm 3.51\%$ for the sample of Internet users. As with any survey, question wording and the practical challenges of data collection may introduce an element of error or bias that is not reflected in this margin of error. The survey results were subsequently reviewed by an expert in Statistics and Survey Design from Michigan State University.

These surveys were conducted as part of the State Broadband Initiative (SBI) grant program, funded by the National Telecommunications and Information Administration (NTIA). The SBI grant program was created by the Broadband Data Improvement Act (BDIA), unanimously passed by Congress in 2008 and funded by the American Recovery and Reinvestment Act (ARRA) in 2009. To learn more about Connect Michigan please visit www.connectmi.org or e-mail us at info@connectmi.org.

APPENDIX A:
Select questions and sample sizes

	<i>n</i> All Respondents	<i>n</i> Internet Users	<i>n</i> E-Learners
All Respondents	1200	929	342

Demographics	<i>n</i> Internet users
Employment Status	
Employed	563
Not employed	350
Educational Attainment	
High school graduate or less	241
Some college	285
College graduate	252
Advanced studies/degree	133
Household Presence of Children	
Households whose children use the Internet for schoolwork	265
Households whose children do not use the Internet for schoolwork	102
No children at home	537
Annual Household Income	
Less than \$25,000	137
\$25,000 to less than \$50,000	228
\$50,000 to less than \$75,000	171
\$75,000 or more	230
Age	
18 to 34	226
35 to 54	426
55 or older	277
Race/Ethnicity	
Caucasian	755
Black/African American	70
Other Minority	67
Geography	
Rural	300
Non-rural	629

APPENDIX B: Cluster analyses, correlation results, and school district sample sizes

This analysis utilized K-means clustering to group Michigan school districts by the mean share of households in each district that have access to home broadband service at advertised speeds of 3 Mbps or greater.⁹ The result is that school districts were grouped in a manner wherein groups are relatively homogeneous within each given group, while heterogeneous between groups. School districts are broken down as follows:

Grouping	Average % of households with broadband access at advertised speeds of at least 3 Mbps ¹⁰	Number of Michigan school districts in each group
Group 1	99%	343
Group 2	85%	30
Group 3	64%	12
Group 4	38%	109
Group 5	13%	56

The average scores for two school achievement benchmarks (the average percentage of children in grades 3-8 who had achieved both math and reading proficiency levels, and the average percentage of students who had met the ACT College Readiness Benchmarks) were then calculated for school districts in each of the five groups.¹¹

The Pearson correlation coefficient for the average broadband availability rate and the average percent of children in grades 3-8 who had met both math and reading proficiency rates is 0.981 with a p-value of 0.003; the Pearson correlation coefficient for the average broadband availability rate and the average percent of children who had achieved the ACT College Readiness Benchmarks is 0.986 with a p-value of 0.002.

To control for differences in economic and educational achievement (using poverty rates aggregated to the school district level and the percentage of adults age 25 and older who have achieved at least a college degree, respectively), this analysis also conducted partial correlations between broadband availability, the average percentage of children in grades 3-8 who had achieved both math and reading proficiency levels, and the average percentage of students who had met the ACT College Readiness Benchmarks.¹² The results are as follows:

Partial Correlation 1		
Control Variable: Percent of adults age 25+ with at least a bachelor's degree		
	% of children in grades 3-8 proficient in both math and reading	% of students meeting ACT College Readiness Benchmarks
Average broadband availability at advertised speeds of at least 3 Mbps	R = .977 2 - tailed significance (p) = .023	R = .988 2 - tailed significance (p) = .012

9 http://cn336-e6520:59693/help/index.jsp?topic=/com.ibm.spss.statistics.help/idh_quic.htm

10 Source: Connect Michigan interactive broadband map (<http://www.connectmi.org/interactive-map>)

11 ACT college benchmarks consist of minimum ACT test scores required for students to have a high probability of success in credit-bearing college courses—English Composition, social sciences courses, College Algebra, or Biology; more information available at <http://www.act.org/education/benchmarks.html>. Data was collected online from Michigan School Data (<https://www.mischooldata.org/Default.aspx>).

12 Source for demographic data, including the percentage of adults age 25 and older with at least a college degree and poverty rate: 2010 United States Census.

Partial Correlation 2

Control Variable: Poverty rate aggregated to the school district level

	% of children in grades 3-8 proficient in both math and reading	% of students meeting ACT College Readiness Benchmarks
Average broadband availability at advertised speeds of at least 3 Mbps	R = .978 2 - tailed significance (p) = .022	R = .985 v2 - tailed significance (p) = .015