

# Maine's Middle School Laptop Program: Creating Better Writers



Portland Press Herald staff photo by Doug Jones

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# **RESEARCH BRIEF**

## **Maine's Middle School Laptop Program: Creating Better Writers**

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## **EXECUTIVE SUMMARY**

### **Maine's Middle School Laptop Program: Creating Better Writers**

Beginning in Fall 2002 the State of Maine, through the Maine Learning Technology Initiative (MLTI), implemented a one-to-one middle school laptop program by providing all 7<sup>th</sup> and 8<sup>th</sup> grade students and their teachers with laptop computers, and providing schools and teachers with technical assistance and professional development for integrating laptop technology into their curriculum and instruction. This Brief describes the findings from an examination of the impacts of the laptop program on student writing achievement.

Eighth grade Maine Educational Assessment (MEA) writing scores were examined for two time periods; for 2000, a year prior to implementation of the statewide laptop program, and for 2005, five years after the initial implementation of the program. Results indicate that in 2005 the average writing scale score was 3.44 points higher than in 2000. This difference represents an Effect Size of .32, indicating improvement in writing performance of approximately 1/3 of a standard deviation. Thus, an average student in 2005 scored better than approximately two-thirds of all students in 2000.

A secondary analysis of the 2005 scale scores revealed that how the laptops are being used in the writing process influences writing performance. Students who reported not using their laptop in writing (No Use Group) had the lowest scale score, whereas students who reported using their laptops in all phases of the writing process (Best Use Group) had the highest scale score. The difference in Effect Size is .64, indicating that the average student in the Best Use Group scored better than approximately 75% of the No Use Group students.

Thus, the evidence indicates that implementation of Maine's one-to-one ubiquitous laptop program has had a positive impact on middle school students' writing. Five years after the initial implementation of the laptop program, students' writing scores on Maine's statewide test had significantly improved. Furthermore, students scored better the more extensively they used their laptops in developing and producing their writing. And finally, the evidence indicated that using their laptops in this fashion helped them to become better writers in general, not just better writers using laptops.

## **BRIEF**

### **Maine's Middle School Laptop Program: Creating Better Writers**

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#### **Introduction**

In 2002, Maine embarked on a bold new initiative, an initiative designed to:

*...transform Maine into the premiere state for utilizing technology in kindergarten to grade 12 education in order to prepare students for a future economy that will rely heavily on technology and innovation.*

(Task Force of Maine's Learning Technology Endowment, 2001, p. vi)

Beginning in Fall 2002 the State of Maine, through the Maine Learning Technology Initiative (MLTI), implemented a one-to-one middle school laptop program by providing all 7<sup>th</sup> and 8<sup>th</sup> grade students and their teachers with laptop computers, and providing schools and teachers with technical assistance and professional development for integrating laptop technology into their curriculum and instruction. Consequently, in the last five years nearly 100,000 Maine middle school students and their teachers have been learning in one-to-one ubiquitous laptop environments. As the laptop program enters its sixth year of implementation, policy makers and educators alike are asking if the program is achieving its goal. Is it helping to better prepare students for the future? Is it helping students learn better? To answer these questions, the Maine Education Policy Research Institute is conducting a series of research studies specifically targeted at examining the impacts of the laptop program on student achievement. This Brief reports the results of one study of the impact of the laptop program on student writing. As will be described below, the results from the study indicate the laptops have had a significant impact on improving student writing.

#### **Overview of MLTI Program**

Each year, all 7<sup>th</sup> and 8<sup>th</sup> grade students and their teachers are provided both hardware and software laptop technology. More specifically, each is provided an Apple iBook, Airport wireless networking and internet access. Software on the laptops includes AppleWorks (including word processing and

presentation), web browsers, email software, iMovie, iPhoto, NoteShare and a variety of other educational software. All Maine's middle schools are wireless so teachers and students may use their laptops throughout the school day and in a variety of settings and contexts. In addition, students may take their laptops home for use in the evenings, weekends, and on school vacations.

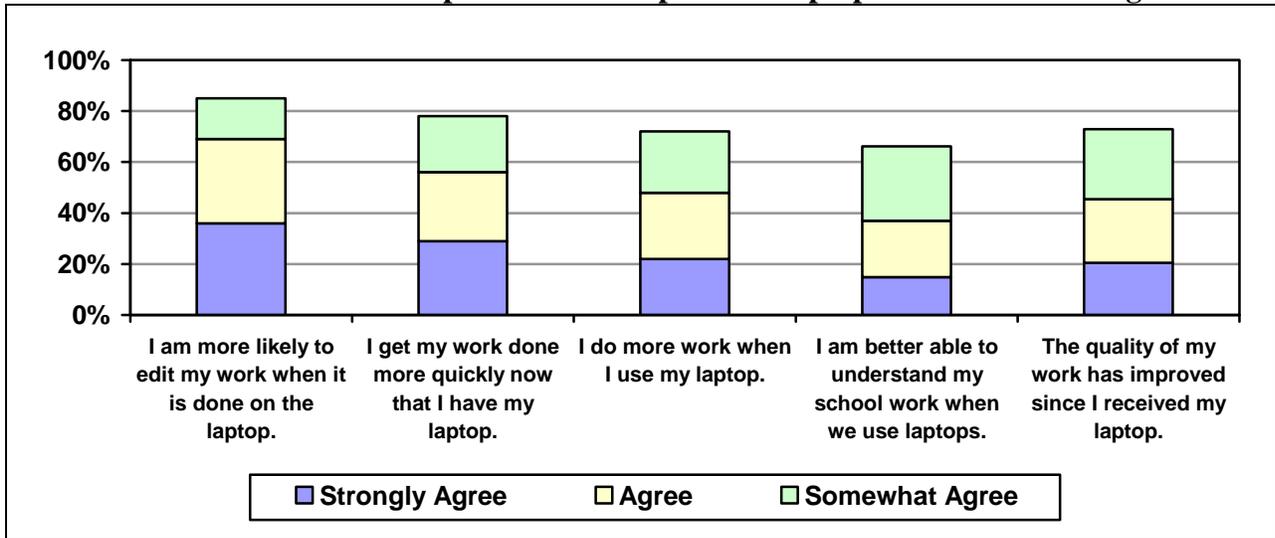
The MLTI initiative also has provided extensive technical assistance and targeted professional development programs to support the integration of the laptop program in all of Maine's 243 middle schools. School districts provide technical support to teachers and students, while a Teacher Leader at each middle school site helps teachers integrate the laptops into their curriculum and instruction. Many types of professional development opportunities are provided to teachers as well. These include initial training, regional teacher leader meetings and content specialists meetings, interactive websites, and other statewide and local professional development activities relevant to technology. In addition the Maine Department of Education provides staff development personnel to assist schools and teachers in implementation of the MLTI program.

### **Research Context**

As the laptop program enters its sixth year, it is timely to examine whether the program has achieved its goals. Is it helping students learn better, and, consequently, better preparing them for living and working in the 21<sup>st</sup> century? If one relies on self-reporting, and these self-reported perceptions are accurate, the answer is Yes.

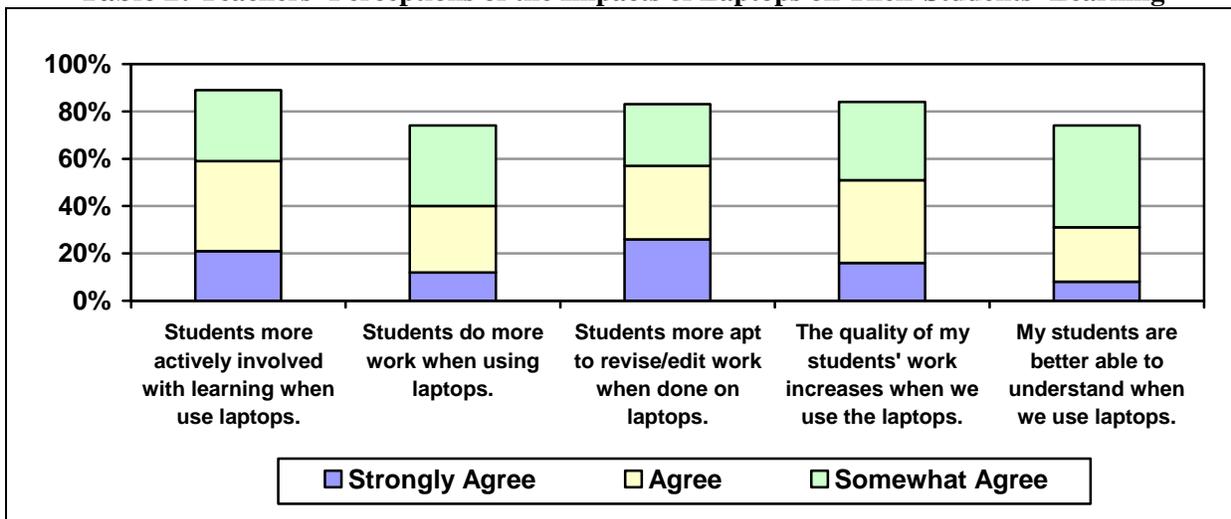
Table 1 reports students' perception of the impacts of the laptops on their learning in 2007. As shown in the table, 70% or more of the students think the laptops have facilitated their learning. Students report that they do more work, more quickly, and of improved quality. Over 80% report that the laptops increase their editing and self-correcting of their work.

**Table 1: Students' Perceptions of the Impacts of Laptops on Their Learning**



Teachers report having similar perceptions. In 2007 over 70% of the teachers believe that the laptops have had positive impacts on their students' learning. They see their students doing more work, and doing work that is of higher quality. They also report that their students are more engaged in their learning, more apt to revise and edit their work, and better able with the laptops to understand what they are learning.

**Table 2: Teachers' Perceptions of the Impacts of Laptops on Their Students' Learning**



So teachers and students believe the laptop program has improved learning. But what about documented improvements in learning? Have achievement test scores actually improved?

## **The Impact of Laptops on Standardized Test Scores**

Given this one of a kind statewide deployment of laptops to all 7<sup>th</sup> and 8<sup>th</sup> grade middle school age students and their teachers, many have expected to see significant improvements in student achievement, particularly in test scores on Maine's statewide assessments. However, overall performance on the 8<sup>th</sup> grade Maine Education Assessments (MEAs) has not changed appreciably since the inception of the laptop program.

Several factors may explain this apparent lack of improved student performance on the statewide achievement tests. First, it is well known that it takes time for reforms to produce appreciable results. Often it takes 5-8 years for an innovation to be implemented fully and for the impacts of the innovation to be discernible. Second, the method of implementation may impact results. In the case of the Maine laptop program, implementation of the program in each middle school was left in the hands of each school. So the timing and manner in which the laptops were introduced into the schools and curriculum varied widely.

Third, and possibly most importantly, most existing standardized tests are ill-equipped to measure the 21<sup>st</sup> century learning taking place in one-to-one ubiquitous laptop environments. Maine's statewide tests are no exception. A major goal of Maine's laptop program has been to help students acquire 21<sup>st</sup> Century skills using technology. However, the current MEA is designed to assess, at best, gateway skills and basic knowledge; skills and knowledge which may be necessary, but not sufficient for the demands of the 21<sup>st</sup> Century. As Rockman (2003) says,

*“Those administrators and board members who insist on a specific test score gain as the return on investment are, more likely than not, going to be disappointed. Authentic assessment may be a more realistic strategy for measuring the value that laptops bring to the classroom...”* (p.25).

## **The Impact of Maine's Laptop Program on Student Writing Scores**

The one area assessed by many existing standardized tests where the impacts of a laptop program on achievement may be discernible is in the area of writing; that is, if writing is assessed authentically by means of evaluating

student writing samples. In the case of Maine, the MEA measures, through the assessment of a writing sample, a student's skill of communicating ideas effectively in written form; a skill that will continue to be important in the 21<sup>st</sup> century. As Graham and Perin say in their 2007 report entitled, "Writing Next: Effective Strategies to Improve Writing of Adolescents in Middle and High Schools",

*"Writing well is not just an option for young people – it is a necessity. Along with reading comprehension, writing skill is a predictor of academic success and a basic requirement for participation in civic life and in the global economy."* (p.3).

Some researchers have found evidence suggesting a positive link between laptop use and student writing. For example, several studies report improved writing scores. Rockman et al. (2000) found that students who used laptops outperformed students who did not use them, Jeroski (2003) reported that giving students laptops increased the percentage of students who met performance standards by 22% over the course of one year, and Lowther et al. (2003) found significant improvements in writing and problem-solving performance for students given 24 hour access to laptops. Mann et al. (1999) reported higher performance on a state examination for students with laptops, and in one South Carolina middle school, students with laptops sustained their achievement gains over their middle school years, in contrast to students who did not have laptops (Stevenson, 1998). Thus, there is some evidence that writing may improve with the use of laptops.

Does the same hold true for Maine students? Has implementation of the laptop program resulted in improved writing skills? And do any improvements transcend the use of laptops? In other words, do students become better writers or just better writers on laptops? The purpose of the research reported here was to answer these questions.

### **Examining Writing Scores**

To answer the first research question; that is, has the statewide implementation of the laptop program improved students' writing achievement scores, 8<sup>th</sup> grade MEA writing scores were examined for two time periods; for

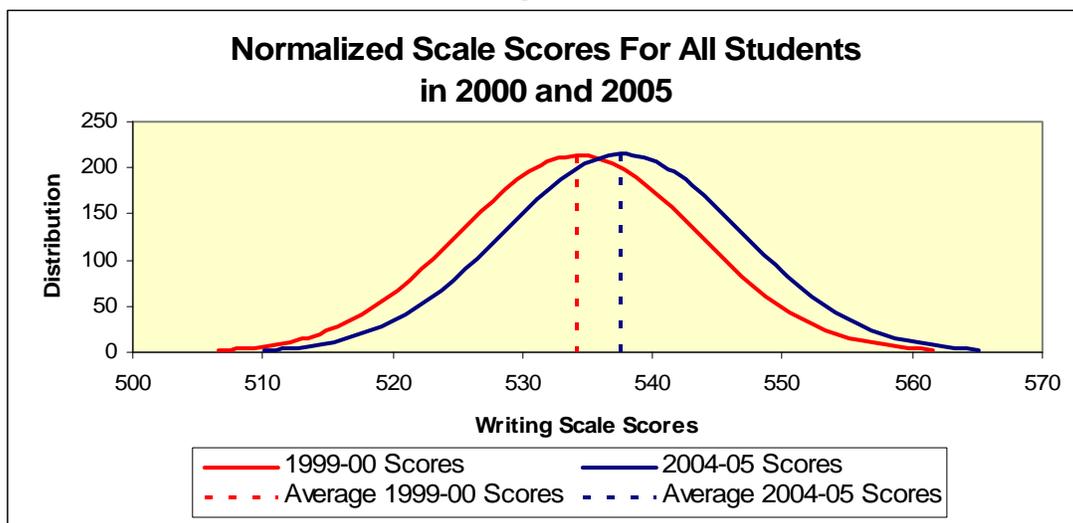
2000, a year prior to implementation of the statewide program, and for 2005, five years after the initial implementation of the program. The writing portion of the MEA consists of a writing prompt that is double scored. Scale scores may range from 500-580, and a scale score of 540 or above indicates a student has met or surpassed the State established proficiency level in writing. Table 3 reports the MEA Writing Scale Scores for 2000 and 2005. As may be seen in

**Table 3: MEA Writing Scale Scores 2000 and 2005**

Year	Number of Students	Average Scale Score	s.d.	Effect Size
2000	16,557	534.11	10.61	0.32
2005	16,251	537.55	9.17	

the table, in 2005 the average writing scale score was 3.44 points higher than in 2000, a period prior to implementation of the laptop program. Analysis of these average scale scores indicated that, in fact, there was a statistically significant improvement in writing scores after implementation of the laptop program ( $t= 31.51$ ;  $df = 32806$ ;  $p<.001$ ). Figure 1 depicts the same information, but in this case, as normalized scale scores for the two years. The red line represents the normal distribution of MEA Writing scale scores prior to implementation of the laptop program, and the blue line represents the normal distribution of Writing scale scores in 2005.

**Figure 1**



The Effect Size, a calculation designed to quantify the magnitude of differences between two groups, was .32 between the 2000 and 2005 average scale scores, indicating improvement of approximately 1/3 of a standard deviation. Put another way, an average student in 2005 scored better than approximately two-thirds of all students in 2000. Further analysis revealed there was a concomitant improvement in the number of students actually meeting the State writing proficiency standard. In 2000, 29.1% of the 8<sup>th</sup> graders met the writing proficiency standard on the MEA, and in 2005, this had increased to 41.4%.

Thus, the results indicated writing performance has improved. Undoubtedly other factors, beyond implementation of the laptop program, may have contributed to improved writing performance over the course of five years (implementing new writing programs in schools, more teacher professional development, etc.), but since these did not occur in all Maine middle schools, and the results are based on the total population of all 8<sup>th</sup> graders and all Maine middle schools, the results may be attributed, at least in part, to the laptop program.

A secondary analysis of the 2005 scale scores revealed an additional key finding. How the laptops are being used in the writing process influences writing performance. After completing the MEA students are asked a series of questions about their classrooms and learning. One survey question asks how students use the laptops in their writing. Table 4 reports the students' responses, and their average MEA writing scale scores. As shown in the table, writing scale scores are related to how, and how extensively students use their

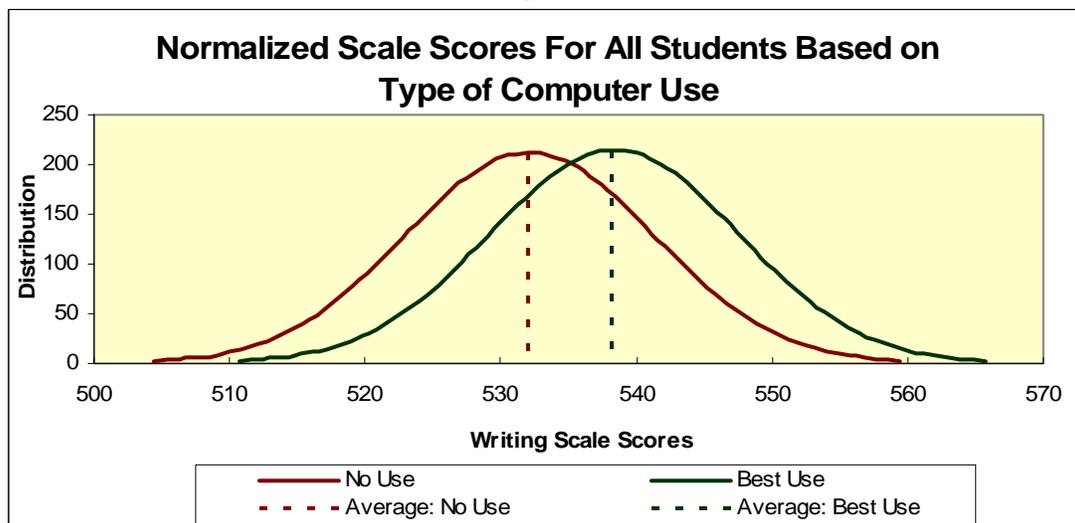
**Table 4: Type of Laptop Use in Writing**

Survey Question		Number of Students	Scale Score	
Stem	Responses		$\bar{x}$	s.d.
How do you use your laptop for writing?	Drafts and Final copy	11593	538.8	8.97
	Final copy only	3413	537.7	8.89
	Drafts only	233	533.0	9.74
	Not at all	642	532.0	9.63

laptop to produce writing. Students who reported not using their laptop in writing (No Use Group) had the lowest scale score, whereas students who reported using their laptops in all phases of the writing process (Best Use Group) had the highest scale score. Analysis of variance revealed a significant difference between the groups ( $F=123.67$ ;  $df=3, 15,877$ ;  $p<.001$ ), and post hoc analysis indicated significant differences between all four groups shown in the table. In essence the findings revealed that greater levels of use of the laptop in the writing process (e.g., drafts, edits, final copy) resulted in statistically significant increases in writing scores.

Figure 2 shows normalized scale scores for the No Use Group vs. Best Use Group (drafts, edits, final copy). As may be seen in the figure, the normal

**Figure 2**



distribution of scale scores for the Best Use Group is substantially better than for the No Use Group. The difference in Effect Size is .64, indicating that the average student in the Best Use Group scored better than approximately 75% of the No Use Group students. In terms of meeting proficiency, 21% of the students who did not use their laptops in writing met the State proficiency standards, as compared to 43.7% of the students in the Best Use group. In other words, the percentage of students who met Maine’s writing proficiency standard doubled. Thus, this additional analysis indicates that how students

use their laptops in writing makes a difference, and provides additional evidence of the impact of the laptop program on writing.

But do the laptops help students to become better writers in general or just better writers when using the laptops? To answer this second key research question, the way in which students produced their MEA writing sample was examined. In 2005, some Maine students completed the MEA writing assessment online, while many others produced their writing sample in longhand. Table 5 reports the average writing scale scores for students who produced their writing sample online and those who were developing their writing sample in the traditional paper and pencil fashion. As reported in the table, the scale scores are almost identical. In fact, analysis of these scores

**Table 5: MEA 2005 Writing Scale Scores by Mode of Writing (Assessment)**

Writing Sample	Number of Students	Average Scale Score	s.d.
Online	3,251	537.68	10.52
Longhand	13,000	537.52	8.80

using an independent sample t-test statistic indicated no statistically significant difference between the scale scores of the two groups ( $t = .810$ ;  $df = 16249$ ;  $p > .05$ ). In other words, writing improved regardless of the writing test medium.

### **Conclusion**

Thus, the evidence indicates that implementation of Maine's one-to-one ubiquitous laptop program has had a positive impact on middle school students' writing. Five years after the initial implementation of the laptop program, students' writing scores on Maine's statewide test had significantly improved. Furthermore, students scored better the more extensively they used their laptops in developing and producing their writing. And finally, the evidence indicated that using their laptops in this fashion helped them to become better writers in general, not just better writers using laptops. Taken together, the evidence suggests that policy makers and others should reasonably expect to see improvements in students' writing achievement over a

period of time with the implementation of laptop programs which provide teacher professional development in integrating the technology into their curriculum and practice, and teachers help students learn how to use the laptops as a writing development tool.

## References

- Department of Education, Task Force on the Maine Learning Technology Endowment, Augusta, Maine (2001). *Teaching and Learning for Tomorrow: A Learning Technology Plan for Maine's Future*.
- Graham, S. & Perin, D. (2007). *Writing Next: Effective Strategies to Improve Writing of Adolescents in Middle and High Schools*. New York: Carnegie Corporation.
- Jeroski, S. (2003). Wireless Writing Project Research Report: Phase II. Vancouver, B.C.: School District 60, Peace River North.
- Lowther, D.L., Ross, S.M., & Morrison, G.M. (2003). "The Influences on Teaching Strategies and Student Achievement of Using Laptops in the Classroom." Educational Technology Research and Development, 51, 3, 23-44.
- Mann, et al. (1999). West Virginia Story: Achievement Gains from a Statewide Comprehensive Instructional Technology Program. West Virginia.
- Portland Press Herald staff photo by Doug Jones (2007). Front Cover Photograph of McKenzie Loeser and Fred Randall, eighth-graders at Saco Middle School, used in "Loving the Laptops" article by Beth Quimby in the Portland Press Herald on 5/21/07 (used with permission).
- Rockman, et al. (2000). A more Complex Picture: Laptops Use and Impact in the Context of Changing Home and School Access. San Francisco, CA: Rockman et al.
- Rockman, S. (2003). Learning from Laptops. Threshold, Fall (2003) 25.
- Stevenson, K.R. (1998). Education Report – Year 2: Schoolbook Laptop Project. Beaufort, S.C.: Beaufort County School District.

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Figure 1: Normalized Writing Scale Scores for All Students in 2000 and 2005.

Figure 2: Normalized Writing Scale Scores for All Students Based on Type of Computer Use.

## **Additional MLTI Evaluation Reports**

The Impact of the Maine Learning Technology Initiative on Teachers, Students and Learning – Presentation. D.L. Silvernail, April 2007.

The Impact of the Maine Learning Technology Initiative: Maine’s Middle School 1-to-1 Laptop Program – Presentation. D.L. Silvernail, May 2006.

Belief Drives Action: How Teaching Philosophy Affects Technology Use in the Classroom. A. Gritter, April 2005.

Research Report #1: The Impact of Maine’s One-to-One Laptop Program on Middle School Teachers and Students. D.L. Silvernail & D.M. Lane, February 2004.

Research Report #2: Laptop Use By Seventh Grade Students with Disabilities: Perceptions of Special Education Teachers. W.J. Harris & L. Smith, February 2004.

Research Report #3: Trading Roles: Teachers and Students Learn with Technology. J. Fairman, May 2004.

Research Report #4: Use of Laptop Computers and Classroom Assessment: Are Teachers Making the Connections. J.S. Beaudry, February 2004.

Research Report #5: Two Teachers Implement One-to-One Computing: A Case Study. A. Garthwait & H. Weller, July 2004.

The Maine Learning Technology Initiative: Impact on Students and Learning. D.M. Lane, April 2003.

The Maine Learning Technology Initiative: Impact on the Digital Divide. P. Gravelle, April 2003.

The Maine Learning Technology Initiative: What is the Impact on Teacher Beliefs and Instructional Practices? K. Sargent, April 2003.

The Maine Learning Technology Initiative: Teacher, Student, and School Perspectives – Mid-Year Evaluation Report. D.L. Silvernail, et al., March 2003.

## **Authors' Biographic Sketches**

### **Dr. David L. Silvernail**

Dr. David L. Silvernail is director of the Center for Education Policy, Applied Research and Evaluation, and professor of research and evaluation in the College of Education and Human Development at the University of Southern Maine. Dr. Silvernail has over 25 years of research and education policy experience in the fields of school reform and school finance. He served as lead research analyst for the Maine State Board of Education and the Maine State Legislature in the development of a new adequacy basis school funding formula for Maine. Currently Dr. Silvernail is conducting several research studies including ones related to high performing schools, district efficiency, and technology in schools.

### **Aaron K. Gritter**

Aaron K. Gritter is a research analyst at the Center for Education Policy, Applied Research and Evaluation, and a student in the Psy.D. in School Psychology Program in the College of Education and Human Development at the University of Southern Maine. Aaron is a former middle school science teacher from Grand Rapids, Michigan where he received his Bachelor of Science in Biology and a secondary education certification. His work with the Maine Education Policy Research Institute at CEPARE has primarily been focused on the new essential programs and services school funding model components, higher performing schools identification, and technology integration research.



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