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# Memo

**Date:** XXXX, XX, 2023

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**From:** Eben Witherspoon, Jonathan Margolin, and Abena Acheampong, American Institutes for Research® (AIR®)

**Re:** **Evaluation of Digital Divide in Maine, 2022–2023**

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This memo is an addendum to the Year 2 Evaluation Report for the Maine Learning Technology Initiative (MLTI). The purpose of this memo is to summarize the current state of the digital divide in Maine. For this analysis, we examined the relationship of nine school characteristics, such as region and per pupil expenditure, to eight measures of digital learning, such as hours of professional development related to technology and the use of technology for instruction. Overall, we observed relatively few instances of a digital divide. Region and locale each had a relationship to digital learning, with two main findings:

- Schools in the Mid-Coast region required significantly more time than other regions to finish distributing devices to students.
- Schools located in towns reported significantly more time—a greater number of months—to finish distributing educator devices than schools in other locales.

## Overview of Methods

To evaluate the digital divide, AIR analyzed the extent to which school characteristics were related to differences in four aspects of digital learning: access to technology, access to professional development focused on technology, technology infrastructure, and use of technology for student-centered learning. AIR composed eight outcome measures aligned with these four aspects of digital learning (Exhibit 1).

**Exhibit 1. Measures of four aspects of digital learning and their data sources.**

| Measures of digital learning                                           | Data source              |
|------------------------------------------------------------------------|--------------------------|
| <b><i>Access to educational technology</i></b>                         |                          |
| 1. Devices received per student                                        | Device Deployment Survey |
| 2. Devices received per educator                                       |                          |
| 3. Months to finish distributing student devices                       |                          |
| 4. Months to finish distributing educator devices                      |                          |
| <b><i>Access to professional development focused on technology</i></b> |                          |
| 5. Hours spent in technology-focused professional development          | Teacher survey           |
| <b><i>Technology infrastructure</i></b>                                |                          |
| 6. Helpfulness of support personnel                                    | Teacher survey           |
| <b><i>Use of technology for student-centered learning</i></b>          |                          |
| 7. Frequent use of technology for instruction                          | Teacher survey           |
| 8. Frequent use of technology for student-centered learning            |                          |

The school characteristics we hypothesized to be related to each digital learning outcome fall into four categories: socioeconomic characteristics, geographic characteristics, student characteristics, and school resources. For example, if schools from different locales had a significantly different number of hours spent on professional development, that would indicate the presence of a digital divide in access to professional development based on locale. We identified the categories in consultation with the MLTI team and from a literature scan of characteristics related to the digital divide (see Scheerder et al., 2017 for a review). The AIR team collected nine variables aligned with each of these categories of school characteristics (see Exhibit 2).

**Exhibit 2. Overview of the initial set of school characteristics.**

| School characteristics                                                    | Data sources (Year)                                                             |
|---------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| <b><i>Socioeconomic variables</i></b>                                     |                                                                                 |
| 1. Percentage of students eligible for free or reduced-price lunch (FRPL) | National Center for Education Statistics (NCES) Common Core of Data (2021–2022) |
| 2. Per pupil expenditures (PPE)                                           | Maine Department of Education (2020–2021)                                       |
| <b><i>Geographic variables</i></b>                                        |                                                                                 |
| 3. School geographic locale (locale)                                      | NCES Common Core of Data (2021–2022)                                            |
| 4. School superintendent region (region)                                  | Maine School Superintendents Association (2023)                                 |

| School characteristics                                   | Data sources (Year)                                                        |
|----------------------------------------------------------|----------------------------------------------------------------------------|
| <b><i>Student characteristics</i></b>                    |                                                                            |
| 5. Total student enrollment (enrollment)                 | NCES Common Core of Data (2021–2022)                                       |
| 6. Percentage of students with disabilities (SWD)        | U.S. Department of Education (ED) Civil Rights Data Collection (2017–2018) |
| 7. Percentage of students who are English learners (EL)  | ED Civil Rights Data Collection (2017–2018)                                |
| <b><i>School resources</i></b>                           |                                                                            |
| 8. Ratio of full-time equivalent (FTE) staff to students | NCES Common Core of Data (2021–2022)                                       |
| 9. Ratio of instructional coaches (IC) to schools        | Maine Department of Education records (2023)                               |

We used regression analysis to determine which combinations of school characteristics explained the most variation in each of the eight measures of digital learning. We used a three-stage approach to conduct these analyses:

1. In the first stage, we determined which school characteristics to include in the regression model, excluding characteristics that did not explain any additional variation in the measure of digital learning. However, the percentage of students eligible for FRPL and school locale were included in all models.
2. In the second stage, the AIR team used the regression model to determine which of the included school characteristics were significantly associated with each measure of digital learning.
3. In the third stage, the AIR team tested for significant differences between specific levels of each of those characteristics (e.g., between each locale).

See Appendix A for additional information on the analytic approach, including variable definitions and data sources for school characteristics.

## Findings

The following sections describe the findings for each of the eight measures of digital learning. Exhibit 3 summarizes the findings, including the school characteristic variables included in each regression model, whether those characteristics were significantly associated with differences in the measures of digital learning, and if there were any significant differences between

specific levels of each school characteristic.<sup>1</sup> Appendix B summarizes the results of each regression analysis reported, and Appendix C provides descriptive statistics on differences by school characteristics.

**Exhibit 3. Overview of the significance, effect sizes, and variance explained by the final subset of school characteristic variables for each measure of the digital divide.**

| Measure of the digital divide                   | Model adj $R^2$ | School characteristics |        |        |        |     |      |     |    |     |
|-------------------------------------------------|-----------------|------------------------|--------|--------|--------|-----|------|-----|----|-----|
|                                                 |                 | % FRPL                 | Locale | Region | Enroll | FTE | % EL | PPE | IC | SWD |
| Devices received per student                    | 0.072           | ns                     | ns     | *      | --     | ns  | --   | --  | -- | --  |
| Devices received per educator                   | 0.090           | *                      | ns     | ns     | --     | *   | --   | *   | -- | --  |
| Months to finish distributing student devices   | 0.152           | ns                     | ns     | ●      | --     | --  | --   | --  | *  | --  |
| Months to finish distributing educator devices  | 0.143           | ns                     | ●      | *      | --     | --  | ns   | --  | -- | --  |
| PD hours                                        | 0.252           | ns                     | ns     | ns     | ns     | --  | --   | *   | -- | --  |
| Helpfulness of technology support               | 0.106           | ns                     | ns     | ns     | --     | --  | ns   | --  | -- | --  |
| Use of technology for instruction               | 0.558           | ns                     | ns     | *      | *      | --  | --   | --  | -- | --  |
| Use of technology for student-centered learning | 0.483           | ns                     | ns     | *      | --     | --  | --   | *   | -- | --  |

*Note.* % FRPL and locale were included in each model. % FRPL is percentage of students with free or reduced-price lunch. FTE is the ratio of full-time equivalent staff to students. % EL is percentage of English learners. PPE is per pupil expenditures. IC is the ratio of instructional coaches to schools. SWD is percentage of students with disabilities in a school. PD is professional development.

“—” Indicates variable was not included in the model.

ns Indicates variable had no significant main effect.

\*

Indicates variable had a significant main effect.

● Indicates variable had at least one significant post hoc test with a large effect size.

<sup>1</sup> In reported findings, subgroup differences with adjusted  $p$  values of less than .05 are considered statistically significant. Effect sizes, measured in terms of Hedges’s  $g$ , in the range of 0.8 or greater are considered large, in the range of 0.2 to 0.5 are considered medium, and less than 0.2 are considered small (see Bakker et al., 2019).

## **Comparable Access to Educational Technology**

Using data from the Department's Device Deployment Survey, we assessed the degree to which access to educational technology was comparable using four measures: the number of devices received per student and educator, and the number of months it took to finish distributing devices to students and educators.

### ***Devices Received per Student***

We tested for differences in the ratio of devices received per student by four school characteristics: percentage of FRPL-eligible students, locale, region, and teacher-to-student ratio. We detected an overall difference among regions in the ratio of devices received per student. However, post hoc tests revealed no significant differences between specific regions (Appendix C, Exhibit C1). The remaining school characteristics were not significantly related to devices received per student.

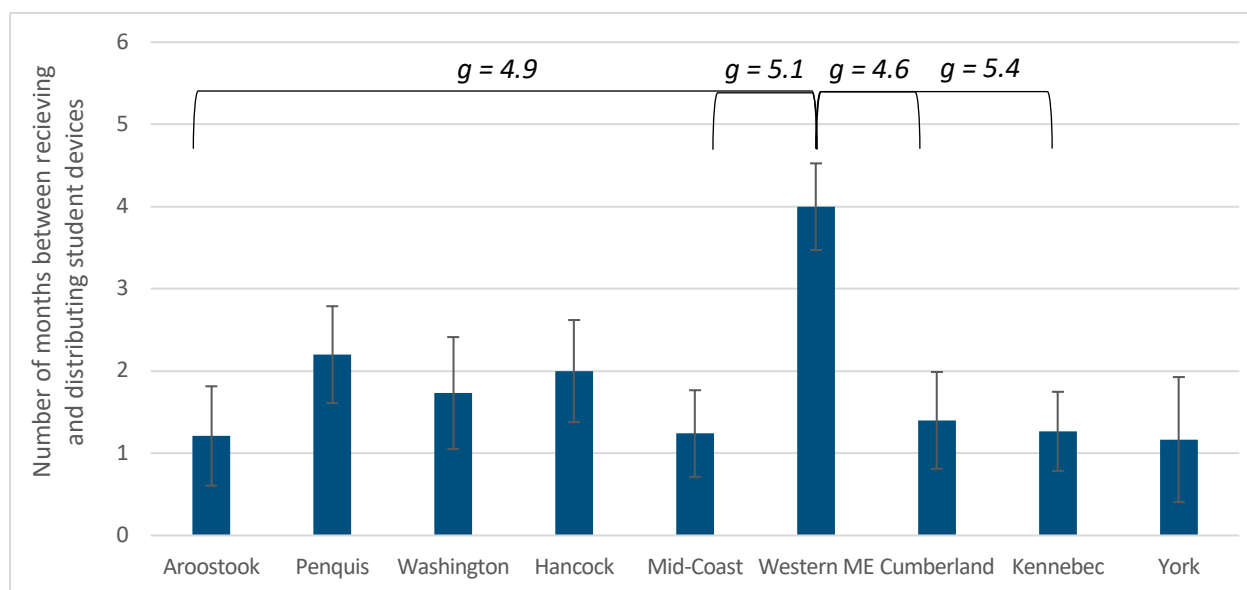
### ***Devices Received per Educator***

We tested for differences in the ratio of devices received per educator by five school characteristics: percentage of FRPL-eligible students, locale, region, teacher-to-student ratio, and per pupil expenditure. We detected a positive overall relationship between the ratio of devices per educator and both the teacher-student ratio and the school's per pupil expenditure. We detected a negative relationship between the ratio of devices per educator and the percentage of FRPL-eligible students in a school. However, there were no significant differences between schools at low, medium, or high levels of any of these variables (see Appendix C, Exhibit C2). Locale and region were not significantly related to devices received per educator.

### ***Months to Finish Distributing Devices to Students***

We tested for differences in the number of months it took schools to distribute devices to students by four school characteristics: percentage of FRPL-eligible students, locale, region, and the ratio of instructional coaches to schools. We detected an overall difference among regions in the time to distribute student devices, with schools from the western Maine region taking significantly longer to distribute devices to students (i.e., an average of 4 months) than schools in the Aroostook, Mid-Coast, Cumberland, or Kennebec regions (all of which had average distribution times between 1.2 and 1.7 months; see Exhibit 4). The ratio of instructional coaches to schools was also positively related to the months to distribute devices to students, but there were no significant differences in the mean number of months to distribute students' devices between schools with low, medium, or high ratios of instructional coach to school (see Appendix C, Exhibit C3). The percentage of FRPL-eligible students and locale were not significantly related to the number of months it took schools to distribute devices to students.

**Exhibit 4. Average months to finish distributing devices to students, by region.**



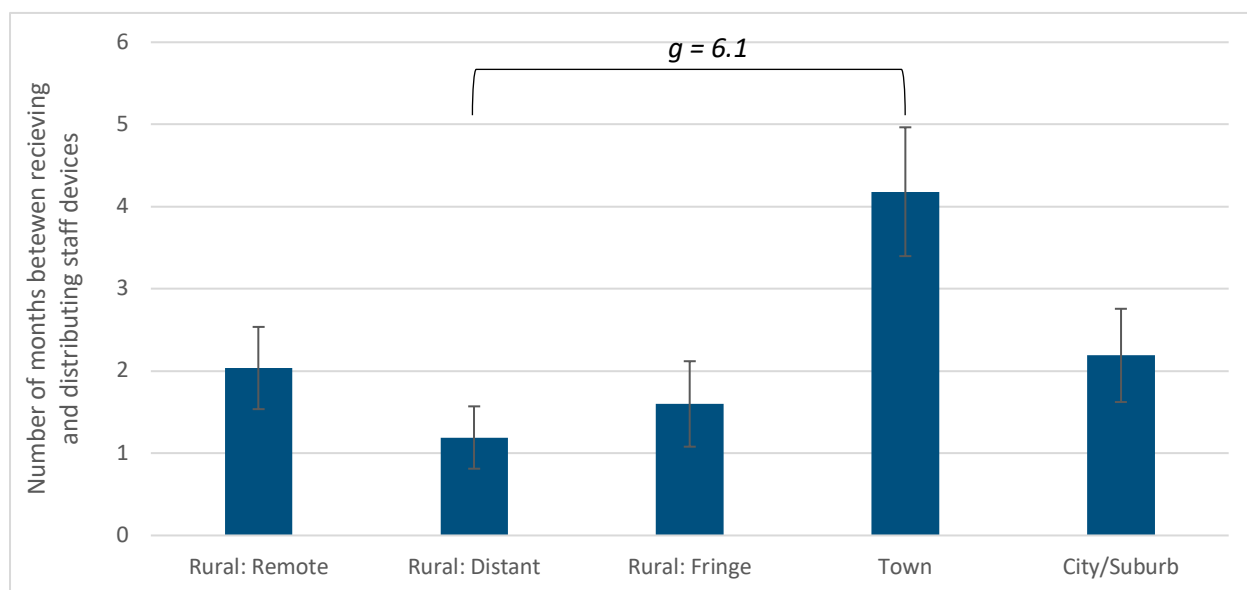
*Note.* The sample is limited to schools that responded to the Device Deployment Survey. Schools that did not finish distributing devices to educators are excluded from the sample.

Braces in figures indicate subgroup pairs that significantly differ at the .05 level;  $g$  is Hedge's  $g$ .

### ***Months to Finish Distributing Devices to Educators***

We tested for differences in the number of months it took schools to distribute devices to educators by four school characteristics: percentage of FRPL-eligible students, locale, region, and percentage of EL students. We detected an overall difference in the time to distribute educator devices among locales, with schools located in a Town (using National Center for Education Statistics definitions for locale from Geverdt [2019]; see note in Appendix A, Exhibit A1) taking significantly longer to finish distributing educator devices (i.e., an average of 3 months longer) than those in Rural: Distant locales (see Exhibit 5). We also detected an overall difference in the time to distribute educator devices among regions; however, there were no significant differences by specific region (see Appendix C, Exhibit C4). The percentage of FRPL-eligible students and percentage of EL students in a school were not significantly related to the number of months it took schools to distribute devices to educators.

**Exhibit 5. Average months to finish distributing devices to educators, by locale.**



*Note.* The sample is limited to schools that responded to the Device Deployment Survey. Schools that did not finish distributing devices to educators are excluded from the sample.

Braces in figures indicate subgroup pairs that significantly differ at the .05 level;  $g$  is Hedge's  $g$ .

## Comparable Access to Professional Development Focused on Technology

Access to professional development was measured using a sum across three items on the teacher survey that asked how many hours a teacher spent in various kinds of professional development (PD) in the last year (e.g., whole group, one on one, or self-paced; see Appendix A for all items).

We tested for differences in access to PD focused on technology by five school characteristics: percentage of FRPL-eligible students, locale, region, school enrollment, and per pupil expenditure. We detected an overall negative relationship between the number of PD hours and per pupil expenditure; however, post hoc tests showed no significant differences in PD hours between schools with low, medium or high levels of per pupil expenditure (see Appendix C, Exhibit C5). Percentage of FRPL-eligible students, locale, region, and school enrollment were not significantly related to the number hours of PD focused on technology.

## Comparable Technology Infrastructure

Technology infrastructure was measured using the Rasch scale score (Wright & Masters, 1982) of five items on the teacher survey that asked teachers to rate their schools' support for technology use in the classroom (see Appendix A for all items).

We tested for differences in support for technology use in the classroom by four school characteristics: percentage of FRPL-eligible students, locale, region, school enrollment, and percentage of EL students. There were no significant relationships between the ratings of school support for technology use and any of these characteristics.

## **Comparable Use of Technology for Student-Centered Learning**

The use of technology for student-centered learning was measured using the Rasch scale scores from two sets of items on the teacher survey: 10 items asking about teachers' use of technology for instruction, and 19 items asking about their use of technology for student-centered learning (see Appendix A for items).

### ***The Use of Technology for Instruction***

We tested for differences in the frequency of teachers' use of technology for their instruction by four school characteristics: percentage of FRPL-eligible students, locale, region, school enrollment. We detected an overall difference in teachers' use of technology for instruction among regions; however, there were no significant differences by specific region (see Appendix C, Exhibit C6). We detected an overall positive relationship between teachers' use of technology for instruction and school enrollment; however, post hoc tests showed no significant differences in PD hours between small, medium, and large schools (see Appendix C, Exhibit C6). Percentage of FRPL-eligible students and locale were not significantly related to teachers' use of technology for instruction.

### ***The Use of Technology for Student-Centered Learning***

We tested for differences in the use of technology for student-centered learning by four school characteristics: percentage of FRPL-eligible students, locale, region, and per pupil expenditure. We detected an overall difference in the use of technology for student-centered instruction among regions; however, there were no significant differences by specific region (see Appendix C, Exhibit C7). We detected an overall negative relationship between the use of technology for student-centered instruction and per pupil expenditure; however, post hoc tests showed no significant differences between schools with low, medium, and high per pupil expenditure (see Appendix C, Exhibit C7). Percentage of FRPL-eligible students and locale were not significantly related to the use of technology for student-centered instruction.

## **Summary**

We examined the digital divide with respect to access to technology, access to professional development focused on technology, technology infrastructure, and use of technology for student-centered learning.

Overall, access to technology was comparable across most school characteristics. Schools generally reported receiving at least one device per student and per educator. There were some significant differences in the time to distribute devices by geographic school characteristics:

- Schools in the Mid-Coast region took significantly more time to distribute student devices than in four other regions.
- Schools in Rural: Distant locales took significantly less time to finish distributing educator devices than schools in Town locales.

There were no other significant differences in the amount of time to distribute devices between specific subgroups.

***Recommendation 1:*** Consider working closely with school district administrators in the Mid-Coast region to determine possible causes for delays for the distribution of student devices in that region, and administrators in representative schools from locales that show longer distribution times for educator devices to identify possible sources for these differences.

Access to professional development focused on technology was also comparable across most school characteristics, with participating schools reporting an average of about 26 hours of professional development across all categories.

Technology infrastructure was comparable across all school characteristics, with most teachers (86%) reporting high levels of school support.

The use of technology for student-centered learning was comparable across most school characteristics. Most teachers (88%) reported frequently using technology for instruction, and a third of teachers (32%) frequently used technology for various types of student-centered learning.

In conclusion, this analysis detected few significant differences across the measures of digital learning related to school characteristics. The few differences found were associated with geographic characteristics, specifically with slower timing of device deployment shown in the Mid-Coast region and Town locales. Most importantly, there was not a consistent pattern that would suggest a pervasive digital divide in MLTI schools.

***Recommendation 2:*** Continue to monitor for emergence of any digital divides between MLTI schools, particularly with respect to differences in access to technology by school geographic characteristics (i.e., locale and region).

# Appendix A. Data Sources, Composition of Measures, and Analytic Approach

This appendix contains further details on the analyses, including data sources, creation of survey scale scores, and the best subsets regression approach to selecting a reduced set of predictors in the regression models.

## School Characteristics Data Sources and Variable Composition

We obtained data on school characteristics from the most recent publicly available and administrative data sources (see Exhibit A1).

**Exhibit A1. Data sources for school characteristics and variables retrieved.**

| Data source                                                                                                                                                                                                                                     | Variables retrieved                                                                                                                                                                                                            |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| U.S. Department of Education, National Center for Education Statistics, Common Core of Data (CCD), “Public Elementary/Secondary School Universe Survey,” 2020-21 v.1a.                                                                          | School-level data for the 2021–22 school year on:<br>1. Percentage of students eligible for free or reduced-price lunch<br>2. Locale <sup>a</sup><br>3. Ratio of full-time equivalent staff to students<br>4. Total enrollment |
| Maine Department of Education, ESSA Dashboard. (2021). <i>2020-2021 per pupil spending</i> .<br><a href="https://www.maine.gov/doe/dashboard">https://www.maine.gov/doe/dashboard</a>                                                           | 5. Per pupil expenditures by school in 2020–21                                                                                                                                                                                 |
| U.S. Department of Education, Office of Civil Rights (2020). <i>2018–19 Civil Rights Data Collection (CRDC)</i> .<br><a href="https://ocrdata.ed.gov/resources/downloaddatafile">https://ocrdata.ed.gov/resources/downloaddatafile</a>          | School-level data from the 2018–19 school year on:<br>6. Percentage of students with disabilities (under the Individuals with Disabilities Education Act or Section 504)<br>7. Percentage of students who are English learners |
| Maine School Superintendents Association. (2023). <i>Index of school districts by region</i> .<br><a href="https://www.msmaweb.com/o/mssa/page/superintendent-regions-list">https://www.msmaweb.com/o/mssa/page/superintendent-regions-list</a> | 8. List of school districts located in each superintendent region                                                                                                                                                              |
| Maine Department of Education administrative records                                                                                                                                                                                            | Staffing information for 2021–22 on:<br>9. Ratio of instructional coaches to schools in the district                                                                                                                           |

<sup>a</sup> Locale is designated using NCES definitions (see [https://nces.ed.gov/programs/edge/docs/EDGE\\_NCES\\_LOCALE.pdf](https://nces.ed.gov/programs/edge/docs/EDGE_NCES_LOCALE.pdf)). Because of the small numbers of schools in some subcategories, we collapsed the three Town subcategories into a single category (“Town”), combined the three City and three Suburban subcategories into a single category (“City/Suburb”), and left the three Rural subcategories (“Rural: Fringe”; “Rural: Distant”; and “Rural: Remote”).

## Composition of Survey Measures

The teacher survey included the following topics that addressed measures of digital learning that we used for the analysis of the digital divide:

- Frequency with which teachers use technology for instruction (10 items; adapted from the Clarity Technology and Learning Survey), including:
  - Use of technology for instruction (4 items)
  - Use of technology for productivity (6 items)
- Frequency with which teachers ask students to use technology in student-centered activities related to the following (19 items; adapted from Margolin et al., 2019):
  - Collaboration (4 items)
  - Critical thinking (4 items)
  - Creativity (5 items)
  - Communication (6 items)
- Time spent in professional development focused on technology (3 items)
  - Formal, whole-group professional development (e.g., in-service days, professional development workshops, book study)
  - Formal, individualized, or one-on-one professional development (e.g., mentoring, coaching, self-paced online courses)
  - Informal, self-organized professional development (e.g., podcasts, tutorial videos, communities of practice, blogs, social media)
- Helpfulness of technology support (5 items; adapted from Margolin et al., 2019)
  - Access to high-speed internet
  - Consistent access to Wi-Fi
  - Prompt assistance with technology problems that disrupt instruction
  - Support for computer device operation (e.g., desktops, laptops, or tablets)
  - Access to instructional software and tools

The study team used a Rasch rating scale model (RSM) to determine whether individual survey items are closely related and measure a single topic (Wright & Masters, 1982). Specifically, the study team calculated the reliability for items, both as Cronbach's  $\alpha$  and expected a posteriori, (EAP) reliability, on the topic of frequency of use of technology for instruction (Cronbach's  $\alpha$  =

.82, EAP reliability = .59), frequency of use of technology for student-centered learning activities (Cronbach's  $\alpha$  = .82, EAP reliability = .59), and items on the topic of helpfulness of technology support (Cronbach's  $\alpha$  = .91, EAP = .75), which were adequate to warrant calculating scale scores for these topics. Using the RSM (appropriate for Likert-scale items), the study team calculated the person ability estimate ( $q$ ) on each set of ordinal items, producing a continuous scale score for each teacher. These scale scores were then translated from the logit scale back onto the original Likert scale categories for ease of interpretation, and these scores were used to perform the between-group difference tests for each topic.

## Analytic Approach

For each of the eight outcome measures, we used regression analysis to determine which school characteristics were associated with a digital divide on combinations of the nine school characteristics. We used a three-stage approach to conduct these analyses:

1. In the first stage, the American Institutes for Research (AIR) determined which of the nine school characteristics to include in the regression model using a *best subsets* approach. This approach fits models for all combinations of predictor variables and identifies the most parsimonious set of variables that explain the most variance for each measure of the digital divide, as indicated by the adjusted  $R$ -squared value. In other words, this approach excluded school characteristics that did not explain much additional variance in the measure of digital learning. For this reason, each of the regression models could include a different subset of school characteristic variables. We used this approach because limiting the number of school characteristics in the regression model would allow a more efficient analysis and more concise summary of findings.

We included two variables in each predictive model, regardless of whether their inclusion explained much of the variance in the measure: the percentage of students eligible for free or reduced-priced lunch and school locale. We included these variables in every model because the Maine Learning Technology Initiative team hypothesized them to be key components of the digital divide in Maine.

2. In the second stage, the AIR team used the regression model selected by the best subsets approach to predict each measure of the digital divide, that is, to determine which of the included school characteristic predictor variables had significant main effects on those measures.
3. In the third stage, the AIR team performed post hoc tests for each school characteristic variable for which we observed a significant main effect. In other words, we tested for significant differences between specific levels of each of those characteristics (i.e., between each locale) and calculated an effect size of those significant differences.

## Appendix B. Summary of Tests for Main Effects

This appendix summarizes results of analyses testing for main effect in measures of the four areas of the digital divide, by school characteristics. Variables included in these tables are: 1) the percentage of students eligible for free and reduced-price lunch; 2) school locale, and; 3) any other school characteristic that explained additional variance in the measure of the digital divide (identified using adjusted r-squared from a best subsets regression, as described above and summarized in Exhibit 3).

### Exhibit B1. Results of overall tests for main effects on the ratio of devices received per student, by school characteristic.

| School characteristic                |           |           |          |                |
|--------------------------------------|-----------|-----------|----------|----------------|
|                                      | <i>df</i> | <i>SS</i> | <i>F</i> | <i>p value</i> |
| Percentage of FRPL-eligible students | 1         | 0.114     | 0.536    | 0.465          |
| Locale                               | 4         | 1.437     | 1.682    | 0.156          |
| Ratio of FTE staff to students       | 1         | 0.527     | 2.467    | 0.118          |
| Region: Penquis                      | 1         | 1.381     | 6.464    | 0.012 *        |
| Region: Washington                   | 1         | 1.200     | 5.620    | 0.019 *        |
| <i>Residuals</i>                     | 171       | 36.524    |          |                |

Source: Device Deployment Survey, Maine Department of Education.

Note: \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

### Exhibit B2. Results of overall tests for main effects on the ratio of devices received per educator, by school characteristic.

| School characteristic                |           |           |          |                |
|--------------------------------------|-----------|-----------|----------|----------------|
|                                      | <i>df</i> | <i>SS</i> | <i>F</i> | <i>p value</i> |
| Percentage of FRPL-eligible students | 1         | 2.392     | 6.423    | 0.012 *        |
| Locale                               | 4         | 0.548     | 0.368    | 0.831          |
| Ratio of FTE staff to students       | 1         | 1.567     | 4.208    | 0.042 *        |
| Region: Penquis                      | 1         | 0.844     | 2.266    | 0.135          |
| Per pupil expenditure                | 1         | 3.134     | 8.415    | 0.004 **       |
| <i>Residuals</i>                     | 133       | 49.541    |          |                |

Source: Device Deployment Survey, Maine Department of Education.

Note: \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

**Exhibit B3. Results of overall tests for main effects on the months to distribute devices for students, by school characteristic.**

| School characteristic                     |           |           |          |                |
|-------------------------------------------|-----------|-----------|----------|----------------|
|                                           | <i>df</i> | <i>SS</i> | <i>F</i> | <i>p value</i> |
| Percentage of FRPL-eligible students      | 1         | 0.27      | 0.043    | 0.836          |
| Locale                                    | 4         | 42.98     | 1.680    | 0.157          |
| Region: Penquis                           | 1         | 6.32      | 0.988    | 0.322          |
| Region: Western ME                        | 1         | 170.51    | 26.70    | 0.000 ***      |
| Ratio of instructional coaches to schools | 1         | 36.44     | 5.696    | 0.018 *        |
| <i>Residuals</i>                          | 171       | 1093.79   |          |                |

Source: Device Deployment Survey, Maine Department of Education.

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

**Exhibit B4. Results of overall tests for main effects on the months to distribute devices for staff, by school characteristic.**

| School characteristic                           |           |           |          |                |
|-------------------------------------------------|-----------|-----------|----------|----------------|
|                                                 | <i>df</i> | <i>SS</i> | <i>F</i> | <i>p value</i> |
| Percentage of FRPL-eligible students            | 1         | 4.53      | 0.727    | 0.395          |
| Locale                                          | 4         | 108.27    | 4.341    | 0.003 **       |
| Region: Mid-Coast                               | 1         | 21.33     | 3.421    | 0.067          |
| Region: Penquis                                 | 1         | 27.74     | 4.449    | 0.037 *        |
| Percentage of students who are English learners | 1         | 19.26     | 3.089    | 0.081          |
| <i>Residuals</i>                                | 118       | 735.71    |          |                |

Source: Device Deployment Survey, Maine Department of Education.

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

**Exhibit B5. Results of overall tests for main effects on teachers' responses of the number of hours for pd on technology, by school characteristic.**

| School characteristic                |           |           |          |                |
|--------------------------------------|-----------|-----------|----------|----------------|
|                                      | <i>df</i> | <i>SS</i> | <i>F</i> | <i>p value</i> |
| Percentage of FRPL-eligible students | 1         | 52.86     | 0.634    | 0.442          |
| Locale                               | 4         | 266.61    | 0.799    | 0.549          |
| Region: Cumberland                   | 1         | 233.77    | 2.802    | 0.12           |
| Enrollment                           | 1         | 34.94     | 0.419    | 0.530          |
| Per pupil expenditure                | 1         | 641.83    | 7.693    | 0.017 *        |
| <i>Residuals</i>                     | 12        | 1001.16   |          |                |

Source: Device Deployment Survey, Maine Department of Education.

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

**Exhibit B6. Results of overall tests for main effects on teachers' responses of the helpfulness of school support, by school characteristic.**

| School characteristic                           |           |           |          |                |
|-------------------------------------------------|-----------|-----------|----------|----------------|
|                                                 | <i>df</i> | <i>SS</i> | <i>F</i> | <i>p value</i> |
| Percentage of FRPL-eligible students            | 1         | 0.357     | 0.187    | 0.672          |
| Locale                                          | 4         | 7.968     | 1.046    | 0.421          |
| Region: Cumberland                              | 1         | 1.211     | 0.636    | 0.440          |
| Region: Kennebec                                | 1         | 5.9       | 3.097    | 0.102          |
| Percentage of students who are English learners | 1         | 4.527     | 2.377    | 0.147          |
| <i>Residuals</i>                                | 13        | 24.765    |          |                |

Source: Device Deployment Survey, Maine Department of Education.

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

**Exhibit B7. Results of overall tests for main effects on teachers' responses of the use of technology for instruction, by school characteristic.**

| School characteristic                |           |           |          |                |
|--------------------------------------|-----------|-----------|----------|----------------|
|                                      | <i>df</i> | <i>SS</i> | <i>F</i> | <i>p value</i> |
| Percentage of FRPL-eligible students | 1         | 0.089     | 0.250    | 0.625          |
| Locale                               | 4         | 0.889     | 0.626    | 0.652          |
| Region: Penquis                      | 1         | 5.893     | 16.617   | 0.001 **       |
| Region: Hancock                      | 1         | 1.361     | 3.838    | 0.072          |
| Enrollment                           | 1         | 4.008     | 11.302   | 0.005 **       |
| <i>Residuals</i>                     | 13        | 4.610     |          |                |

Source: Device Deployment Survey, Maine Department of Education.

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

**Exhibit B8. Results of overall tests for main effects on teachers' responses of the use of technology for student-centered learning, by school characteristic.**

| School characteristic                |           |           |          |                |
|--------------------------------------|-----------|-----------|----------|----------------|
|                                      | <i>df</i> | <i>SS</i> | <i>F</i> | <i>p value</i> |
| Percentage of FRPL-eligible students | 1         | 0.008     | 0.089    | 0.771          |
| Locale                               | 4         | 0.572     | 1.537    | 0.249          |
| Region: Washington                   | 1         | 0.879     | 9.457    | 0.009 **       |
| Region: Cumberland                   | 1         | 0.445     | 4.785    | 0.048 *        |
| Per pupil expenditure                | 1         | 0.666     | 7.159    | 0.019 *        |
| <i>Residuals</i>                     | 13        | 1.209     |          |                |

Source: Device Deployment Survey, Maine Department of Education.

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

# Appendix C. Descriptive Statistics by School Characteristic

This appendix presents descriptive statistics of measures of the digital divide for each school characteristic included in the regression analyses in Appendix B. Post-hoc tests (with a Bonferroni correction for multiple tests) were performed to test for significant differences and determine effect sizes between different levels of each school characteristic where a significant main effect was identified.

**Exhibit C1. Average ratio of devices received per student by school characteristics.**

| School Characteristic | N   | Mean ratio of devices received per student |       |
|-----------------------|-----|--------------------------------------------|-------|
|                       |     | M                                          | SE    |
| All schools           | 184 | 1.207                                      | 0.35  |
| Region                |     |                                            |       |
| Aroostook             | 19  | 1.163                                      | 0.107 |
| Penquis               | 20  | 1.428                                      | 0.104 |
| Washington            | 15  | 1.542                                      | 0.120 |
| Hancock               | 18  | 1.298                                      | 0.109 |
| Mid-Coast             | 25  | 1.111                                      | 0.093 |
| Western ME            | 25  | 1.063                                      | 0.093 |
| Cumberland            | 20  | 1.101                                      | 0.104 |
| Kennebec              | 30  | 1.164                                      | 0.085 |
| York                  | 12  | 1.130                                      | 0.134 |

Source: Device Deployment Survey, Maine Department of Education.

**Exhibit C2. Average devices received per educator by school characteristics.**

| School Characteristic                                                   | N   | Mean devices received per educator |       |
|-------------------------------------------------------------------------|-----|------------------------------------|-------|
|                                                                         |     | M                                  | SE    |
| All schools                                                             | 146 | 0.974                              | 0.052 |
| <b>Percentage of students eligible for free- or reduced-price lunch</b> |     |                                    |       |
| Less than 33%                                                           | 47  | 1.139                              | 0.093 |
| Between 33% and 50%                                                     | 54  | 0.917                              | 0.086 |
| Between 50% and 60%                                                     | 24  | 0.886                              | 0.130 |
| More than 60%                                                           | 18  | 0.823                              | 0.150 |
| <b>Ratio of FTE staff to students</b>                                   |     |                                    |       |
| Fewer than 8 students per FTE staff                                     | 19  | 0.821                              | 0.145 |
| Between 8 and 10 students per FTE staff                                 | 38  | 0.850                              | 0.103 |
| Between 10 and 12 students per FTE staff                                | 49  | 1.082                              | 0.090 |
| More than 12 students per FTE staff                                     | 39  | 1.034                              | 0.101 |
| <b>Per pupil expenditure</b>                                            |     |                                    |       |
| Less than \$15,000 per student                                          | 73  | 0.881                              | 0.074 |
| Between \$15,000 and \$20,000 per student                               | 53  | 1.084                              | 0.084 |
| More than \$20,000 per student                                          | 17  | 1.028                              | 0.154 |

*Source:* Device Deployment Survey, Maine Department of Education.

*Note:* N=3 schools did not have FRPL information available.

N=1 school did not have FTE information available.

N=3 schools did not have PPE information available.

**Exhibit C3. Average number of months between receiving and distributing devices for students, by school characteristics**

| School Characteristic                            | N   | Number of months for students |       |
|--------------------------------------------------|-----|-------------------------------|-------|
|                                                  |     | M                             | SE    |
| <b>All schools</b>                               | 184 | 1.848                         | 0.202 |
| <b>Region</b>                                    |     |                               |       |
| Aroostook                                        | 19  | 1.211 <sup>a†</sup>           | 0.604 |
| Penquis                                          | 20  | 2.200                         | 0.589 |
| Washington                                       | 15  | 1.733                         | 0.680 |
| Hancock                                          | 18  | 2.000                         | 0.621 |
| Mid-Coast                                        | 25  | 1.240 <sup>a†</sup>           | 0.527 |
| Western ME                                       | 25  | 4.000                         | 0.527 |
| Cumberland                                       | 20  | 1.400 <sup>a†</sup>           | 0.589 |
| Kennebec                                         | 30  | 1.267 <sup>a†</sup>           | 0.481 |
| York                                             | 12  | 1.167                         | 0.760 |
| <b>Ratio of instructional coaches to schools</b> |     |                               |       |
| 0 coaches                                        | 103 | 1.427                         | 0.267 |
| .01 to .99 coaches per school                    | 55  | 2.436                         | 0.365 |
| 1 coach per school or higher                     | 26  | 2.269                         | 0.531 |

*Source:* Device Deployment Survey, Maine Department of Education.

*Note:* <sup>a</sup> indicates group means are significantly different from Mid-Coast at the 5 percent level.

<sup>†</sup> indicates that the difference is large in effect size (Hedges's  $g \geq 0.8$ ).

**Exhibit C4. Average number of months between receiving and distributing devices for educators, by school characteristics**

| School Characteristic | N   | Number of months for educators |       |
|-----------------------|-----|--------------------------------|-------|
|                       |     | Educators                      |       |
|                       |     | M                              | SE    |
| All schools           | 132 | 1.856                          | 0.233 |
| <b>Locale</b>         |     |                                |       |
| Rural: Remote         | 27  | 2.037                          | 0.5   |
| Rural: Distant        | 47  | 1.191 <sup>a†</sup>            | 0.379 |
| Rural: Fringe         | 25  | 1.600                          | 0.520 |
| Town                  | 11  | 4.182                          | 0.784 |
| City/Suburb           | 21  | 2.190                          | 0.567 |
| <b>Region</b>         |     |                                |       |
| Aroostook             | 14  | 1.786                          | 0.719 |
| Penquis               | 15  | 2.000                          | 0.694 |
| Washington            | 7   | 1.857                          | 1.016 |
| Hancock               | 12  | 1.333                          | 0.776 |
| Mid-Coast             | 19  | 1.263                          | 0.617 |
| Western ME            | 17  | 1.059                          | 0.652 |
| Cumberland            | 15  | 2.133                          | 0.694 |
| Kennebec              | 22  | 2.909                          | 0.573 |
| York                  | 11  | 2.091                          | 0.811 |

*Source:* Device Deployment Survey, Maine Department of Education.

*Note:* N=1 school did not have Locale information available.

<sup>a</sup> indicates group means are significantly different from Town at the 5 percent level.

<sup>†</sup> indicates that the difference is large in effect size (Hedges's  $g \geq 0.8$ ).

**Exhibit C5. Teacher reports of the number of hours for PD on technology, by school characteristics**

| School Characteristic                     | N  | Number of hours spent on PD for technology |       |
|-------------------------------------------|----|--------------------------------------------|-------|
|                                           |    | M                                          | SE    |
| All schools                               | 21 | 26.323                                     | 2.305 |
| <b>Per pupil expenditure</b>              |    |                                            |       |
| Less than \$15,000 per student            | 8  | 27.278                                     | 3.556 |
| Between \$15,000 and \$20,000 per student | 10 | 28.769                                     | 3.181 |
| More than \$20,000 per student            | 3  | 15.628                                     | 5.807 |

Source: Device Deployment Survey, Maine Department of Education.

Note: N=1 school did not have any teachers respond to the survey item on PD hours.

**Exhibit C6. Teacher reports of use of technology for instruction, by school characteristics**

| School Characteristic        | N  | Scale scores for use of technology for instruction |       |
|------------------------------|----|----------------------------------------------------|-------|
|                              |    | M                                                  | SE    |
| All schools                  | 22 | -1.901                                             | 0.191 |
| <b>Region</b>                |    |                                                    |       |
| Aroostook                    | 1  | -2.078                                             | 0.821 |
| Penquis                      | 2  | -3.271                                             | 0.581 |
| Washington                   | 2  | -1.772                                             | 0.581 |
| Hancock                      | 4  | -1.766                                             | 0.411 |
| Mid-Coast                    | 3  | -1.093                                             | 0.474 |
| Western ME                   | 3  | -2.086                                             | 0.474 |
| Cumberland                   | 3  | -2.149                                             | 0.474 |
| Kennebec                     | 2  | -1.000                                             | 0.581 |
| York                         | 2  | -2.301                                             | 0.581 |
| <b>Enrollment</b>            |    |                                                    |       |
| Under 100 students           | 4  | -0.947                                             | 0.379 |
| Between 100 and 250 students | 5  | -2.659                                             | 0.339 |
| Between 250 and 500 students | 11 | -1.911                                             | 0.228 |
| Over 500 students            | 2  | -1.854                                             | 0.536 |

Source: Device Deployment Survey, Maine Department of Education.

**Exhibit C7. Teacher reports of use of technology for student-centered learning, by school characteristics**

| School Characteristic                     | N  | Scale scores for use of technology for student-centered learning |       |
|-------------------------------------------|----|------------------------------------------------------------------|-------|
|                                           |    | M                                                                | SE    |
| <b>All schools</b>                        | 22 | 0.542                                                            | 0.090 |
| <b>Region</b>                             |    |                                                                  |       |
| Aroostook                                 | 1  | 0.724                                                            | 0.409 |
| Penquis                                   | 2  | 0.602                                                            | 0.289 |
| Washington                                | 2  | 1.103                                                            | 0.289 |
| Hancock                                   | 4  | 0.601                                                            | 0.204 |
| Mid-Coast                                 | 3  | 0.438                                                            | 0.236 |
| Western ME                                | 3  | 0.739                                                            | 0.236 |
| Cumberland                                | 3  | 0.331                                                            | 0.236 |
| Kennebec                                  | 2  | -0.015                                                           | 0.289 |
| York                                      | 2  | 0.443                                                            | 0.289 |
| <b>Per pupil expenditure</b>              |    |                                                                  |       |
| Less than \$15,000 per student            | 8  | 0.762                                                            | 0.144 |
| Between \$15,000 and \$20,000 per student | 10 | 0.402                                                            | 0.129 |
| More than \$20,000 per student            | 4  | 0.449                                                            | 0.204 |

Source: Device Deployment Survey, Maine Department of Education.

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