A Study on the Use of Netbooks in the Texas Assessment Program

Background and Purpose

One of the newest popular trends in school-based mobile computing is the advent of netbooks, or "mini-laptops." These are smaller, and generally much cheaper, versions of laptops. Because of their price and mobility, they have generated significant interest from school districts, many of whom have already begun purchasing netbooks, especially in conjunction with one-to-one computing initiatives. Several districts have contacted Pearson to inquire about their suitability for online testing. As the presence of netbooks in schools continues to expand, the question about their suitability for online testing warrants further research, especially with respect to screen sizes roughly half that of traditional displays.

The purpose of the study is to evaluate whether the significant reduction in screen size for netbooks has an impact on student performance on the Texas End-of-Course (EOC) assessments. Specifically, the study is designed to determine whether student test performance differs when administered on 10.1-inch or 11.6-inch sized displays, versus the larger (14- to 21-inch) display sizes more commonly found on desktops and laptop computers used by most computer-based testers in the state.

Participants and Assessments

The study was conducted on a sample of middle- and high-school students from Austin Independent School District (AISD) and Leander Independent School District (LISD) during the spring 2010 administration of the EOC assessments. Students from across four campuses in the two school districts were provided with netbooks to take their EOC assessment. Students in the sample were randomly assigned to one of two netbook conditions: 10.1-inch netbooks with high definition widescreen display (1366 x 768 screen resolution) or 11.6-inch high definition WLED display (1366 x 768 screen resolution) for one of three EOC assessments—geometry, world geography and English I (writing and reading). Table 1 below summarizes the participating campuses and sample sizes analyzed for each EOC assessment in the study.

Table 1: Participation Summary for the Netbook Study

EOC Assessment	Participating Campuses	Sample Size Analyzed		
		10.1-inch	11.6-inch	Total
Geometry	Kealing Middle School (AISD) Rouse High School (LISD)	238	202	440
World Geography	Lanier High School (AISD) Rouse High School (LISD)	236	281	517
English I writing*	Austin High School (AISD)	109	98	207
English I reading*	Austin High School (AISD)	94	89	183

* The English EOC assessment was administered over two days. Not all students who took the writing component on the first day came back to take the reading component on the second day. As such, the writing and reading portions were analyzed separately.

Analysis Method

To make appropriate comparisons between students in each netbook condition and students who took the same EOC assessment on a larger screen size, a matched sample was formed by drawing from the statewide testing population that took each assessment in the online mode during the spring 2010 EOC administration. That is, for each EOC assessment in the study, a "large-screen" matched sample was created by matching to the characteristics of students in the 10.1-inch netbook condition and another "large-screen" matched sample was created by matching to the characteristics of students in the 11.6-inch netbook condition.

Each matched sample was created using the propensity score matching method. The propensity score matching method works best when the number of students for selecting the matched sample is substantially larger than the sample of students under study because the large sample offers many students for finding a close match to each student in the sample under study. Such was the scenario for this study, and a three-step process was used to generate each matched sample. First, a propensity score was calculated for each student in the netbook condition and for each student who took the test on a large screen using the following student characteristics: grade level, gender, ethnicity, economic disadvantage status, TAKS mathematics scale score and, for world geography and English I, TAKS reading/ELA scale score. Next, each student in the netbook condition was matched to a large-screen student using the propensity score. When multiple students matched a netbook student, the matched student included in the study was randomly selected. Finally, for students in the netbook condition that an exact propensity score match could not be found, a "nearest neighbor" was randomly chosen from the group of large-screen students with similar propensity scores.

For each EOC assessment in the study, two independent samples t-test were conducted on the pair of matched samples (i.e. 10.1-inch sample vs. its matched large-screen sample and 11.6-inch sample vs. its matched large-screen sample). A Bonferroni correction was applied to obtain an overall Type I error rate (α) of 0.05.

Results

For each EOC assessment in the study, the means, 95% confidence intervals, and results of each pair of independent t-tests are shown in Tables 2 to 5.

Table 2: Netbook Study Results – Geometry

10.1-inch vs. Large Screen	**Mean**	**95% Confidence Interval**
10.1-inch netbook	29.4	(28.2, 30.6)
Matched large-screen	27.3	(25.9, 28.7)
Difference (10.1-inch - Large)	*2.1*	*Not statistically significant*
11.6-inch vs. Large Screen	**Mean**	**95% Confidence Interval**
11.6-inch netbook	29.1	(27.7, 30.3)
Matched large-screen	27.6	(26.1, 29.0)
Difference (11.6-inch - Large)	*1.5*	*Not statistically significant*

Table 3: Netbook Study Results – World Geography

10.1-inch vs. Large Screen	**Mean**	**95% Confidence Interval**
10.1-inch netbook	32.5	(30.9, 34.1)
Matched large-screen	35.1	(33.3, 36.9)
Difference (10.1-inch - Large)	*-2.6*	*Not statistically significant*
11.6-inch vs. Large Screen	**Mean**	**95% Confidence Interval**
11.6-inch netbook	38.0	(36.4, 39.5)
Matched large-screen	39.2	(37.6, 40.8)
Difference (11.6-inch - Large)	*-1.2*	*Not statistically significant*

Table 4: Netbook Study Results – English I writing

10.1-inch vs. Large Screen	**Mean**	**95% Confidence Interval**
10.1-inch netbook	18.8	(18.0, 19.6)
Matched large-screen	18.6	(17.8, 19.4)
Difference (10.1-inch - Large)	*0.2*	*Not statistically significant*
11.6-inch vs. Large Screen	**Mean**	**95% Confidence Interval**
11.6-inch netbook	18.2	(17.4, 19.1)
Matched large-screen	19.3	(18.4, 20.1)
Difference (11.6-inch - Large)	*-1.0*	*Not statistically significant*

Table 5: Netbook Study Results – English I reading

10.1-inch vs. Large Screen	**Mean**	**95% Confidence Interval**
10.1-inch netbook	21.6	(20.3, 22.9)
Matched large-screen	22.6	(21.5, 23.6)
Difference (10.1-inch - Large)	*-0.9*	*Not statistically significant*
11.6-inch vs. Large Screen	**Mean**	**95% Confidence Interval**
11.6-inch netbook	21.6	(20.2, 22.9)
Matched large-screen	22.8	(21.4, 24.1)
Difference (11.6-inch - Large)	*-1.2*	*Not statistically significant*

Conclusion

The results in Tables 2 to 5 show that, for all EOC assessments examined in this study, no statistically significant differences were found between the netbook conditions (10.1-inch or 11.6-inch) and their respective matched large-screen conditions. Thus, there is no evidence to show that student test performance differs when the EOC assessments are administered on 10.1-inch or 11.6-inch netbooks versus the larger screen sizes on laptops and desktops.

Limitations

A few limitations should be noted about this study. First, even though random assignment was conducted at the campuses to form each netbook condition and a rigorous matching methodology was used to create the matched large-screen conditions, the study was still conducted on a convenience sample drawn from four campuses in the greater Austin area on three EOC assessments. The study was structured this way in order to minimize the impact on the volunteering

district and campuses during the EOC assessment testing window. However, because a convenience sample was used, caution should be taken in generalizing the study results to the entire statewide test-taking population as well as to other EOC subjects that are not in the study.

Secondly, the EOC assessments were not high stakes to students during the spring 2010 administration. Thus, student motivation was likely lower than it will be when the EOC assessments become high stakes, starting in spring 2012. This may have an impact on the generalizability of the study results to the high-stakes testing environment.

Lastly, spring 2010 was the initial stand-alone field test administration of the EOC English I assessment. Twelve stand-alone field test forms were spiraled at the student level during the administration and the set of items on each test form was different. Consequently, the raw scores used to compute the statistics in Tables 4 and 5 were not all based on the same set of items. As such, the results for English I need to be interpreted with particular caution. Furthermore, the English I raw scores used in the study were based on the multiple-choice items only and therefore did not take into account student test performance on the essay and open-ended items of the writing and reading components respectively.

Potential Future Research

Even with the limitations above, the findings of this study provide an initial evaluation of the impact of the smaller screen size found on netbooks on test performance. The study design and results can also serve as an example and guide for further research to help better inform online testing policies with respect to netbooks. Future research can include a larger and more representative sample in terms of region, district and campus size, student proficiency level, ethnic composition and other key characteristics. More elementary- and middle school-grade assessments could also be used to further determine whether an impact from using netbook-sized screens is more noticeable than at older grades. Greater control over the assignment of students to the netbook conditions and assessment subject areas would help the study's experimental design and improve the generalizability of the results. Finally, additional system configuration data (such as monitor size, screen resolution, operation system and platform etc) and student-level information (such as computer proficiency level, stakes of the assessment etc) could be captured to provide a more comprehensive examination of the suitability of netbooks for online testing.