

Introduction

In spring 2014, more than one million students in public schools across the country participated in the field testing of new computer-based assessments developed by the Partnership for Assessment of Readiness for College and Careers (PARCC).ⁱ These assessments are designed to measure students' knowledge of grade-level content in English language arts (ELA) and mathematics as defined by the Common Core State Standards.ⁱⁱ The field tests were conducted to ensure the assessments are valid and reliable, while providing an opportunity for state and local administrators to gain valuable insight into the effective management and use of new technologies to support computer-based testing. Approximately 81,000 students in 1,000 Massachusetts schools participated in the nationwide PARCC field tests.

Two Massachusetts school districts – Burlington Public Schools and Revere Public Schools – were among a small group of districts nationally that volunteered to administer PARCC ELA and Math field tests to all students in testing grades, or in selected schools. The willingness of Burlington and Revere to pilot PARCC testing district- or school-wide produced critical information on strategies employed in both districts to meet PARCC requirements, and address unforeseen difficulties. This technical resource guide examines decision-making in five key areas: *technology infrastructure, device use, scheduling, staffing, and student information management*. It provides below a series of key questions and potential actions for local education leaders to consider when planning for PARCC implementation at scale.¹

Technology Infrastructure

Burlington and Revere have both been working for many years to integrate technology into their classrooms. Each district possesses a robust information technology system, including fiber optic networks linking buildings, high-speed connectivity, and a substantial number of the latest generation devices to support student learning. As a result, both districts were comfortable expanding the number of students participating in computer-based testing during the field test, as well as utilizing different testing procedures to learn about practical implementation issues. Table 1 provides an overview of technology infrastructure features and related test administration plans.

Key Questions:

- How is network access set up in your district?
- Where are district/school servers located?
- Are buildings networked to each other? Each to a central server? Or does each building have its own server?
- What is the amount of bandwidth available? To the district? To each building?

Table 1. Technology Infrastructure*

	Revere	Burlington
Technology "track record"	District has been working toward enhancing technology infrastructure for the full tenure of the current superintendent (e.g., about 16 years). Superintendent hired current Director of Information Technology during his first years in the district.	District negotiated a combined package of services with town government, enhancing its ability to build IT infrastructure and maintain services. District now supports 1:1 iPad program for grades 3 - 10. Superintendent created Director of Information Technology position (shared by the school and town).
Hardware configuration	Central server with wired connectivity to each building	Central server with wired connectivity to each building
Connectivity	500 MB; increasing to 1 GB for 2014-15 school year	500 MB
Network configuration	Fiber optic network exists between buildings (includes all schools and town facilities)	Fiber optic network exists between buildings (includes all schools and town facilities)
Test administration approach	Proctor cache ²	Live Stream
Bandwidth used during test sessions	25-30% of total bandwidth	25-30% of total bandwidth
Bandwidth for test administration ³	154 kbps/student	140 kbps/student

¹ This technical resources guide has been produced as part of a larger case study—available in September 2014—that will provide district decision-makers with a detailed account of the experiences of district leadership, technology staff, principals, teachers, and students in planning for and participating in PARCC field tests. This research has been made possible through the generous support from the MA Teachers Association and the MA Association of School Superintendents, and with guidance from the MA Department of Elementary and Secondary Education.

² Proctor caching is a test administration approach where all test materials are downloaded to a local server, and students access test materials during a test session from the version saved to the server.

³ Please note that these statistics have been calculated based on the entire district enrollment, not per tested student. For Revere, this statistic is based on the 1 GB bandwidth currently available – 500 GB was available for the 2013-14 PARCC field test.

*PARCC requires a network data rate of 50 kbps per student testing (minimum) and recommends 100 kbps per student testing.ⁱⁱⁱ

Both districts reported relatively few concerns in successfully being able to download materials; the bandwidth used for test administration did not compromise internet use for other educational purposes (see Table 1). However, almost all test sessions were affected by test materials freezing or spooling for an extended period of time. These issues likely resulted from problems with the software application – Test Nav – that the PARCC tests used, and how PARCC-developed test materials interacted on Pearson technology applications, which may be accurately described as still in development at the time of the field test. For example, in Burlington, student test data was not being received due to a programming error affecting communication between Chromebooks and the Pearson server.

More significant challenges arose for Burlington due to the decision to live stream test materials, particularly with Chromebooks and iPads. District tech staff and test administrators were able to resolve most of these problems with a re-boot of test materials – and both districts had few issues of this type after the first few days of testing, which speaks to the relative strength of their infrastructure plans. Further, Pearson released many needed resources late, requiring many district tech staff in both districts to scramble to complete needed updates. These issues must be resolved for the first administration of PARCC in spring 2015.

Next year, both districts have chosen to administer PARCC and will proctor cache PARCC test materials. Pearson will be recommending that all districts use proctor caching. Revere has since purchased more wireless (internet) access points for buildings, as the district noted some classroom locations within testing buildings with lower levels of internet connectivity during PBA test sessions.

Device Use

Burlington and Revere used different devices as part of the spring 2014 PARCC trial. Revere conducted the trial largely on PC desktops and laptops; Burlington purposefully chose to use a variety of devices to learn about their functionality with test content. Burlington’s IT staff developed a testing schedule to facilitate the use of multiple devices (i.e., laptops, desktops, iPad, Chromebooks) to determine how each worked under test administration conditions with students of different ages/abilities. The Director of Information Technology led a team of 5 other IT professionals to prepare all devices for testing. This included installing a mobile device management (MDM) application on both Chromebooks and iPads to ensure that students’ devices would run programs needed to display test materials (i.e., Test Nav) and students would not be able to navigate away from test materials.

Key Questions

- How many existing devices are available for test administration?
- What type of devices do these include?
- Where are these devices located? And for what are they typically used?
- Are software/hardware features on these devices compatible with (PARCC) test specifications?

District technology staff in Revere had a similar preparation process with the laptops and desktops they used, but it was centrally managed by “pushing” updates out to most computers. There was not a need to individually program mobile devices. While Burlington found that it had a sufficient number of devices for their district-wide pilot, Revere needed to use computers from another building to complete the pilot in selected schools. See Table 2 for a detailed comparison of device use in the two districts.

Table 2. Device Use*

	Revere	Burlington
Types of devices used for test administration	<ul style="list-style-type: none"> ▪ Laptops (PCs) ▪ Desktops (PCs) 	<ul style="list-style-type: none"> ▪ iPads ▪ Chromebooks ▪ Desktops (PCs and Macs)
Time invested by technology staff to prepare	100% of 4 full-time FTEs for a period of 3 weeks	100% of Director for Technology Integration for 3 weeks prior to trial, with additional 500 staff hours across 5 staff members on district tech team to configure/manage mobile devices
District-wide device count	Approximately 6000 (3500 PCs and laptops; approximately 2500 iPad)	Approximately 4200 (800 PCs and laptops; approximately 3400 iPad/Chromebooks)
Proportion of devices used for test administration	100% of devices across testing schools plus two additional labs of computers (from another building)	100% of computer labs in testing schools; 100% of Chromebooks, and 25% of iPad, across the district
District equipment	3-4 year old laptops in most classrooms and labs, some machines dating 6 to 7 years old	Three-year rotation on all devices

*PARCC recommends a device for every 1 to 2 students in the largest grade.^{iv}

District-level tech staff in Burlington and Revere agreed that PC desktops performed best in terms of loading and running test materials; desktops required the least time investment for preparation, given that most software could be loaded onto desktops with batch updates, and produced the fewest technical problems and other interruptions during test sessions. Chromebooks and iPads experienced more interruptions in loading test materials. However, neither district is seriously considering the purchasing additional desktop computers solely to support test administration. All planned technology purchases will be geared toward enhancing classroom instruction. In spring 2015, Burlington is likely to use mobile devices (i.e., the district’s inventory is largely comprised of iPads); Revere is considering the purchase of Chromebooks to ensure a sufficient number of testing devices.

Scheduling

While MCAS (or any paper-based test) administration is largely done across a few days depending on grades tested, devising a testing schedule for a computer-based test is almost entirely dependent on the number of existing devices that can be used to test students at any one given time. A major challenge in both districts was determining a school-level test administration schedule that maximized the number of available devices, yet minimized school disruptions. To test the approximately 2,200 students that participated in the pilot, Burlington used almost all 15 days of the test administration window established by PARCC/Pearson for the PBA. In testing far fewer students, Revere used about the same number of testing days given the more constrained number of devices available across the three testing schools. In both districts, computer labs in testing schools were periodically taken off-line during the three week testing window for both the PBA and EOY. See Table 3 for details on test administration and scheduling.

Key Questions

- How many devices can be made available for test administration?
- Where are these devices located?
- What classrooms/spaces will be used for testing?
- Given the number of devices and space, how many classes/grades can be tested concurrently?
- How many test sessions can be conducted each day?

Table 3. Scheduling

	Revere	Burlington
Total schools tested	3	6
Total students tested	950	About 2200
Maximum number of students testing at one time	175 students, during the first days of PBA testing	600 students, during the first days of PBA testing
District enrollment	Approximately 6830	Approximately 3580

In 2014-2015, Burlington is likely to use their full inventory of mobile devices plus laptops/desktops, totaling about 4000+ devices, to test students in grades 3-8 in as few days as possible. Revere is weighing several scheduling scenarios – including scheduling two testing sessions per student per day (e.g., a student would take both a math and ELA session in a given day) and the purchase of additional Chromebooks to move students more rapidly through testing sessions, and ensure they complete testing in the test administration window.

Staffing

Both districts have depth of expertise in technology-related issues; this was a significant asset in planning for school- and district-wide test administration, and trouble-shooting challenges as they emerged. In Revere, planning for PARCC test administration was a collaborative endeavor between lead district IT staff, school-level IT staff, and school principals. District- and school-level IT staff worked with principals to determine the number of available devices that could be utilized for PARCC tests. With this information, principals created the test administration schedule and district IT staff created workplans for updating devices to meet PARCC specs. District and school staff in Burlington pursued a very similar multi-step process; however, it was managed by the district-level IT team, with feedback on scheduling from principals.

Key Questions

- Who will make decisions on scheduling test sessions?
- Who will take lead responsibility for managing devices, including needed updates?
- Who will staff test sessions (e.g., as test administrators)?
- What kinds of training will test administrators receive?

In addition, districts pursued different approaches to staffing test sessions. In Revere, teachers and other instructional staff served as test administrators and were responsible for initiating computer-based test sessions. In Burlington, school-level IT staff and library/media specialists initiated and closed test sessions. Burlington classroom teachers’ roles were more varied than in Revere; in elementary grades, classroom teachers served as test administrators or

proctors. At the middle school and high school, classroom teachers did not have these test administration roles. At all Burlington schools, school-level IT staff and library/media specialists became adept at re-starting test sessions; district-level IT staff were typically trouble-shooting more significant issues. See Table 4 for an overview of district staffing plans.

Table 4. Staffing

	Revere	Burlington
Test administration: Staff in the classroom	Teachers served as test administrators, and were responsible for initiating test sessions	Technology staff served as test administrators, and were responsible for initiating test administration sessions
Test administration: Staff at the school	2-3 technology staff leads on site at each building during test sessions (a mix of school-level tech leads and at least one district-level tech lead)	At least 2 technology staff on-site at each building during test sessions (one district-level tech lead and a school-level library and media specialist)
Number of technology staff district-wide	9 staff: combination of district-level and school-level staff	18 staff: district team of 6 (including district/town Director of IT position), plus two school-level position per building
Qualifications of lead district information technology staff	<ul style="list-style-type: none"> 16 year tenure with Revere Public Schools Prior to Revere Public Schools, worked in private sector IT role 	<ul style="list-style-type: none"> 7 year tenure with Burlington Public Schools Prior to Burlington Public Schools, worked in private sector IT role

Both districts are considering how to staff test sessions next year. During EOY test administrations, Burlington pulled back the number of district-level IT staff on-site to experiment with how many staff are needed during a given test session. Next year, the district is likely to operate with district-level IT staff on-call, but not on-site. In Revere, district-level IT staff are considering how to train a select number of teachers to be tech trouble-shooters during test sessions. Revere hopes to have 2-3 tech-trained staff per building while ensuring that district-level IT staff would be free to support multiple buildings during test administration.

Student Information Management

Across both districts, managing student information data to support test administration took substantial time and resources, perhaps more than was expected. Whether done by the district (e.g., Burlington) or school staff (e.g., Revere), creating test sessions was challenging in the Pearson ACCESS system which responded slowly to data changes and updates. The Massachusetts Department of Elementary and Secondary Education (ESE) prepared formatted files for districts to use in uploading student data into Pearson ACCESS – the online student information/database management system for PARCC tests. Districts then needed to create test sessions from grade-level files and adjust test sessions for any students requiring accommodations or make-ups.

Key Questions:

- How will student information be managed? At the district-level? At the school-level?
- Who will take the lead on managing student information?

In Burlington, district staff assigned students to test sessions; principals reviewed these assignments and identified needed adjustments. In Revere, principals were responsible for student information management, including the creation of test sessions. Both districts performed quality control tests for any student information errors. Some of these were simple “counts” of students in each session; others were more sophisticated and acted as a check on the correct assignment of students with accommodations and make-ups to sessions throughout the test administration window. See Table 5 for information on the processes districts created to manage these student information needs, and staff involved.

Table 5. Student Information Management

	Revere	Burlington
Student Information Management processes	Handled at the building-level, largely by principals or assistant principals	Handled by the district, largely by the Director of Student Information and team (a total of 2.5 district-level staff)
Time invested in Student Information Management processes	20-30 hours per week (of Principal’s or Assistant Principal’s time) for 3 weeks prior to test administration	100% of Director of Student Information for 2 weeks prior to trial, plus 100% of administrative staff for 1 week prior to test administration

In 2014-15, ESE expects to perform student data uploads in grades 3-8 for all districts. Both districts believe greater support in managing student information will be helpful, but still plan to commit additional staff time to this area. For example, Burlington will add another staff member to its Student Information Management team to support data processing and reporting, including test administration.

Additional Resources

This technical resource guide is drawn from a larger case study of PARCC field tests in the Burlington and Revere school districts. It should be noted that districts' decisions reflected their interest in better understanding potential approaches to planning for and carrying out a computer-based testing program school- or district-wide. Districts' decisions should not be viewed as representative of any future PARCC implementation plans. Further, the resources and support structures available to both districts, as well as challenges faced, are evolving and likely to be different with each test administration.

It is advisable that Massachusetts districts should seek out the latest information on PARCC test administration before moving forward with implementation. Resources are available from the following sources:

- The two case study districts, Burlington Public Schools and Revere Public Schools, have documented their experiences as part of the PARCC trial: <http://massparcctrial.org>;
- MA Department of Elementary and Secondary Education: <http://www.doe.mass.edu/parcc/>
- PARCC Consortia, in regards to school technology capacity: http://www.parcconline.org/sites/parcc/files/PARCCCapacityPlanningTool_3-5-13_Printablev1.0.pdf

ⁱ Partnership for Assessment of Readiness for Colleges and Careers: <http://www.parcconline.org/about-parcc>.

ⁱⁱ Partnership for Assessment of Readiness for Colleges and Careers: <http://www.parcconline.org/about-parcc>

ⁱⁱⁱ Partnership for Assessment of Readiness for Colleges and Careers, Assessment Administration Guidance: <http://www.parcconline.org/assessment-administration-guidance>

^{iv} Partnership for Assessment of Readiness for Colleges and Careers, Assessment Administration Guidance: <http://www.parcconline.org/assessment-administration-guidance>