Supporting and Sustaining Innovation: The ExitTicket Case Study

A Case Study of Innovation at Leadership Public Schools
For the William and Flora Hewlett Foundation

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October 1, 2012
At the inception of the movement, charter schools were envisioned as laboratories for education innovation. Similarly, open education resources (OER) were seen as vehicles facilitating ongoing collaboration and low-cost experimentation linking schools across the nation. However, particularly when the innovations and resources involve technology, it is cost prohibitive for schools to either incubate initial development or scale dissemination. If a school does design a promising tool or resource, the most viable path for development and distribution is often acquisition by a for-profit company. But this is unlikely to sustain ongoing school-based R & D or the dissemination of free, low-cost, or open-source resources. New models of sustainability must be found if charter schools or OER are to reach the potential for catalyzing educational change through resource development. This paper uses Leadership Public Schools’ development of ExitTicket as a case study in the promise and the problems confronting school-based R & D.

The Innovation Context

Leadership Public Schools (LPS) is a network of four charter high schools in Richmond, Oakland, Hayward, and San Jose that serves over 1,500 students. The four LPS high schools range from 62% to 93% low income and 94% of students are African American or Latino. The average entering freshman enters significantly behind grade level with 10% to 50% of those students, depending on the school, starting 9th grade with skills at the 4th grade level or lower. All LPS students take college preparatory courses and 97% of the graduates have been accepted into college by graduation.

LPS has deliberately structured itself as an R & D Network built around two design principles: collaborative innovation and distributed incubation, both of which leverage technology (“Leveraging Open Education Resources to Increase Student Achievement and Teacher Professionalism” is the first LPS Case study in this series: http://67.225.177.144/images/content/1091/LPS%20Case%20Study%202012.10.11.pdf).

Collaborative Innovation. Collaborative innovation uses technology to build, share, and continually improve a common and comprehensive spine of curriculum, assessment, data, and access/remediation resources for core high school courses. Many of these resources are LPS evolutions of open education resources from CK-12 Foundation and others. Because they are open source, teacher-developed iterations that have shown strong results can be readily incorporated back into the common materials to upgrade the collective practice. These common-spine materials of internal OER are stored and shared on the web and implementation is supported by online collaboration and virtual professional development. By using the process of collaborative innovation LPS achieves buy-in and consistency across teachers and schools, providing a third path between top-down mandated curriculum and “do-your-own thing” entrepreneurialism.

Distributed Incubation. The second design principle, distributed incubation, recognizes that urban education is hard: the changes needed are multiple, difficult, and immediate. Many of the solutions are not yet known. No one school can take on all of the innovation required for sustained breakthrough results. For this reason LPS distributes the incubation of new practices and products across the four schools depending on need, interest, and talent. It then relies on teacher excitement, or “demand-pull,” of results to accelerate change and distribute practice throughout the network.
ExitTicket – Innovation in Progress. LPS has utilized collaborative innovation and distributed incubation in the development of a range of Common Spine instructional resources. One of these, ExitTicket, a just-in-time data software application, has also helped iterate the design process itself. In addition, it has accentuated issues related to the sustainability and dissemination of school-based R & D which have implications for both the larger charter and Open Education Resource movements.

Design Process

Over the past two years LPS has developed a more robust multi-stage design process built off of the twin LPS design principles: collaborative innovation and distributed incubation (see model illustration on back cover). This process is initiated when a need or promising idea progresses through the following phases:

• **Design and Prototype Phase**
  ◦ Initial Design Team – a diverse group of users conceptualize the purpose, functionalities, and features of the product (software, curriculum, instructional structure or process).
  ◦ Early Rough Prototype – for a focus group of end users (students and/or teachers).
  ◦ Pioneer classroom – with a teacher champion highly invested in the concept, willing to participate in intense development, and able to handle the pain and disruption of early development.
  ◦ **Impact Gate** – products do not leave the Pioneer Classroom until basic functionality is reliable, basic instructional and classroom integration processes have been developed, and student outcomes are promising.

• **Alpha Phase**
  ◦ Second classroom – to further refine and test both product and implementation.
  ◦ Multiple classrooms – for refinement in a variety of contexts over an extended time.
  ◦ **Impact Gate** – teacher and student interviews and analysis of student data to determine whether to move forward to a more robust system-wide and external implementation.

• **Beta Phase**
  ◦ Major reworking of product based on input and results from alpha phases.
  ◦ Integration with systems-level structures.
  ◦ Design of professional development and processes for more systemic feedback across implementing classrooms.
  ◦ Continued refinement and iteration across all four LPS schools and potentially schools outside of LPS.

• **Dissemination**
  ◦ Development of structures or partnerships for support within LPS and dissemination beyond the network.
ExitTicket
An LPS Design Case Study
Drawing from the formative evaluation of Dr. Patrick Lee

Initial Conceptual Framework

- **Expansion of “clickers”:** Having used “clicker” (audience response) systems in the classroom, the LPS Richmond and LPS Hayward teachers wanted a tool that would maintain the basic functionality of the clickers, but would ideally use them to facilitate classroom assessment activities.

- **Immediate feedback and ongoing tracking:** The central feature of the tool was to center around real-time feedback. The teachers wanted an application that would provide immediate results from brief in-class assessments. Although clicker systems also provide such data, they typically do not preserve data over time. The design undergirding ExitTicket, then, was to build a tool where data could be accumulated and maintained over time in a manner that would motivate students and provide teachers with instructionally valuable information.

- **Effort and intelligence:** The notion of malleable intelligence underscored the early concept development phase. The teachers emphasize growth mindsets with the students and wanted a tool that would reinforce the importance of progress. ExitTicket was intended to be a tool that visually showed students the improvements they made on a day-to-day, week-to-week basis. This was particularly important for students entering high school significantly below grade level.
Design and Development Process

Design Phase: In the fall of 2009-2010 an LPS Richmond teacher, Taylor Garland, began using a donated set of clickers in his Algebra classroom. Given the student enthusiasm and initial positive impact, other teachers across the LPS Network began similar experiments. Because of growing teacher interest, in the spring of 2010 the new LPS Chief Innovation Officer, Scot Refsland, pulled together a group of teachers from various subjects and campuses to envision a “clicker on steroids.” The idea was to provide teachers just-in-time data for immediate intervention and give students micro-successes to promote engagement and empowerment. Based on design team input, he built a rough prototype and pressure tested it with the LPS Young Innovators Club as well as the design-team teachers – leading to a more robust prototype for launch fall 2010-2011.

Prototype Pilot: Garland became the pioneer teacher and initial champion with CIO Refsland embedded in his class for approximately six weeks beginning in September. With this on-the-ground vantage point, Refsland was able to make small changes on the spot, relay more complex modifications for offshore programming overnight, and return with an updated version the subsequent day. The initial few weeks were painful with multiple software, hardware, and wireless issues. Once these were resolved, attention turned to classroom management, charging, security, and other real-world implementation concerns. In October, things began to click, with Taylor stating, “Kids are crazy invested here and it is awesome how well it is working right now.” ExitTicket had passed the first Implementation Gate.
**Alpha Phase:** ExitTicket was now ready to move to a second classroom at Richmond: Academic Numeracy with Sophia Thomas in a desktop lab setting. This brought new hardware issues, problems with school-level, as opposed to classroom-level wireless, and a new set of student and content needs. Both Garland and Thomas provided constant feedback to the CIO on what the tool should look like, how it should function, bugs, report features, and other interface recommendations throughout the Fall semester.

LPS Richmond students also played an integral role in the development of ExitTicket. Garland and Thomas said the students understood their role in piloting the application and consequently were diligent in identifying bugs, testing new features, and providing ongoing feedback. The students’ responses provided essential direct user feedback.

Once ExitTicket was functioning well and achieving student impact at LPS Richmond, the pilot was extended to LPS Hayward with three math teachers, Laura Dagineau, Mike Fauteux and Rose Zapata across Algebra, Academic Numeracy and Geometry courses. A whole new set of wireless problems were uncovered, as well as issues of speed and data analysis, when the system was faced with a load of over 500 students with multiple data artifacts a day. In addition, while the LPS Richmond instructional culture led to the development of functionalities supporting a gaming and competitive orientation, this orientation did not resonate with the LPS Hayward culture. Those same features were seen as distracting or even counter-productive. In addition, with multiple teachers from a single class using ExitTicket, the demand for simple procedures for sharing, cloning, and editing assessment items became a core design discussion. And the need to develop more systematized processes for those kinds of discussions themselves became clear.

The benefits of having multiple alpha classrooms became increasingly apparent as the year continued. Garland experimented with a variety of uses moving from primarily using ExitTicket as the envisioned daily exit assessment, to using it for embedded practice sessions, 30 item pre-tests to identify and group students for review, and as a survey tool looking at student attitudes. He also began integrating its use with an emerging Mastery Grading system at the school. Most of the teachers used ExitTicket during launch at the beginning of the period for diagnostic or review purposes as well as at the end of the period. However, Dagineau found it more effective about 15 minutes before the end of class to determine concepts needing reinforcement before students’ independent work began at home. Fauteux and Zapata worked as intense collaborative partners and sought stronger data analytics and reporting as well as greater ease of sharing “tickets” they created.

Zapata and Fauteux also incorporated a range of open-ended math and discursive assessments and used other tools such as Edmodo, leading to new visions for extensions and use. Interestingly, the increasingly sophisticated use of ExitTicket resulted in a new pain point. Many of the desired features were beyond the capacity of ET 1.0 and, while they were incorporated in the beginning build of v2.0 in the spring, they were not available for classroom use. The pace of development created a tension: classroom needs and concerns demanded that teachers recognize and have patience with development reality. At the same time, it was incumbent on developers to recognize classroom urgency and the need for a certain level of immediate iteration.
β Beta Phase v2.0: ExitTicket v1.0 died at the end of the 2011-12 academic year. V2.0 was launched in the alpha classrooms plus an additional chemistry class at the beginning of September, 2012. The ExitTicket product rolled out in September was completely rebuilt with an infrastructure that could expand to 1,000,000 simultaneous users, an api to connect with other platforms and applications, and an extremely light structure to maximize speed. It specifically addressed the pain points of speed, ease of teacher ticket creation, ease of integration with the student information system, ease of administration and support, and the intuitiveness of use by students and teachers. After debugging with the initial users, implementation expanded to other LPS campuses and a wider range of courses. While the back-end work was done for the enhanced analytics, reporting, and more open-ended use, these were not part of the September rollout in order to first pressure test basic functionality with as wide a range of teachers as possible.

β Beta Phase v2.1: In October 2012, work began on integrating the more advanced features of the Beta version of ExitTicket. These include the ability of the tool to use rubric-based assessments, to provide real-time grading options for short-answer questions, to report against Mastery Grading learning targets, as well as other high priority new features identified during the pilot year. A particular focus is being placed on features designed to support critical thinking. This need was surfaced by teachers who felt the v1.0 pilot had too much of a “right answer” orientation and did not support exploring multiple approaches or unpacking wrong answers.

In addition, the utility of ExitTicket is being expanded in two directions. Excited by the potential for ExitTicket, LPS schools began envisioning uses in the advisory program as a way for students to track their progress not only on ExitTicket assessments but on multiple measures of progress. Similarly, a growing interested in Carol Dweck’s work on Academic Mindset has led to a discussion with Stanford University on using ExitTicket to deliver mindset assessments and track this kind of affective change over time. The new functionalities, pilots in humanities classes, and potential piloting outside of LPS are the work of developing v2.1. The final v2.1 refinement is due out early in 2013.
From the vantage point of ExitTicket v2.0 or v2.1, the Alpha v1.0 version looks clunky and slow. However, even in this early phase there was significant power in its use and the potential was clear.

- **Real time feedback and check for understanding:** ExitTicket v1.0 provided teachers with immediate feedback on individual student responses to questions as well as whole class performance patterns. The application overcame the time hurdle teachers have in hand scoring and tabulating individual students’ responses.

- **Immediate interventions:** The results generated from ExitTicket v1.0 could be used by teachers to immediately support students who incorrectly responded to a problem. Some teachers noted that they have tried implementing ExitTicket 15 minutes before class ends in order to be able to address mistakes within the class period.

- **Preview/review options:** When teachers were unable to provide follow-up support during the same class period, the ExitTicket results were used to inform areas for review or preview in the next day’s lesson or in lunchtime or afterschool tutoring sessions.

- **Polling:** ExitTicket v1.0 allowed teachers to implement limited polls, whether they involved survey questions, pulse check polls, or checks for understanding.

- **Competition:** ExitTicket v1.0’s reporting feature identified students with streaks of right answers, growth, and overall performance, which was key for some teachers to create gaming like structures in their classroom.

- **Student ownership:** ExitTicket v1.0 provided students as well as teachers with real time data on their performance, enabling them to monitor their own progress and correct errors in real time.

- **Error analysis:** ExitTicket v1.0 was able to provide error analysis, enabling teachers to identify common patterns of confusion among their students and to address them with the entire class or individual students, as needed.
ExitTicket v1.0 Results

The use of ExitTicket in our classrooms has revolutionized teaching and learning like no other intervention or strategy I have seen before. This tool quickly gives teachers and students essential feedback on their learning and the ability to intervene or adjust on the spot. This maximizes learning when every moment matters. This maximizes outcomes for a school that is results-oriented and wants to track and improve student learning.

— Shawn Benjamin, Principal, LPS Richmond

The ExitTicket pilot was fully implemented all year in LPS Richmond in 9th grade Algebra and the companion Academic Numeracy course. Results from the NWEA Measures of Academic Progress (MAP) growth assessment showed the average LPS Richmond Algebra student grew 2.5 years in one year. Because of a three-year research project on the development of a blended-learning approach to Algebra at LPS Richmond, we were able to isolate the probable impact of ExitTicket above and beyond the other literacy, data and online courseware elements of the program, assessing ExitTicket impact as approximately .9 years additional growth.

At LPS Hayward the overall average gain for students was 2.6 years but a lack of comparable three-year data does not allow the determination of how much of this growth was directly attributable to ExitTicket. However, disaggregating the 2012 data for both schools by entering skill level, some interesting similarities can be seen: greater gains for students 1-5 years below grade level than for the small number at or above grade level or entering at the 3rd grade level or below. Because there are so few students at the first starting level, particularly at LPS Hayward, and because their special education representation is so high, our next step will be to examine individual student learning/disability profiles to gain a better understanding of how both our Algebra/Academic Numeracy program in general and the use of ExitTicket in particular can better serve our lowest-performing students. That having been said, the LPS goal of accelerated catch up for students entering below grade level is clearly being achieved with ExitTicket playing a significant role.

<table>
<thead>
<tr>
<th>Starting Level</th>
<th>Average Growth in Grade Levels (students using ExitTicket in both Algebra and Academic Numeracy with valid pre and post data)</th>
<th>LPS Hayward</th>
<th>LPS Richmond</th>
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<tbody>
<tr>
<td>1 - Grades 0-3</td>
<td>2.00</td>
<td>2.27</td>
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<tr>
<td>2 - Grades 4-6</td>
<td>2.58</td>
<td>2.49</td>
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<td>3 - Grades 7-8</td>
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<td>2.88</td>
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<td>4 - Grades 9-10</td>
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<td></td>
</tr>
<tr>
<td>All Combined</td>
<td>2.64</td>
<td>2.47</td>
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The Dilemma of Development and Dissemination

As ExitTicket began to receive attention and results, schools and organizations started approaching LPS for licensure or acquisition. In the process of these discussions, as well as reflections on pilot year implementation, it became clear that the process of developing ExitTicket through a school-based R & D process had yielded unique strengths:

- Bringing an experienced technology entrepreneur, Scot Refsland, into LPS as Chief Innovation Officer brought a different mindset as well as design and technical skills seldom found within a school setting. He was able to raise issues and create opportunities that would not have been possible had the design team simply been composed of educators. Similarly, his experience and skills ensured that the ExitTicket technical backbone was state-of-the-art and scalable.

- On the flip side, embedding a technologist within a school meant that from the beginning the design was driven by student and teacher needs. Dr. Refsland was continually and viscerally confronted with implementation realities and classroom imperatives. Bugs needed immediate fixes or lessons would be sabotaged. Reliability was critical or teachers would not use ExitTicket. And it had to address significant academic needs immediately because classroom time was too precious to waste simply on potential.

- Because the development of ExitTicket has been a system-wide imperative, and not simply a classroom-based or external project, the design team has included the Director of Data, Assessment and Intervention, Amy Epstein; and the Director of Technology, Ellen DiGiacomo; and input has been garnered from principals and network curriculum personnel as well as from teachers and students. Thus, from the beginning, ExitTicket has been designed as a systemic solution, able to be used at the classroom, school, and district/network levels. As such, it has been built to respond to systemic technology integration requirements, accountability mandates, and larger issues of data, assessment, and instruction.

- The process of ExitTicket development has further refined the R & D laboratory orientation of the LPS Network and promises ongoing iterations of the tool that will continue to increase its power at the classroom and systems level – and that will probably result in the development of spin-off products.

Exciting as all of these benefits of the ExitTicket design process have been, they have come at a cost. The risks and development expenses have been borne by LPS with limited after-the-fact grant support to offset those costs. And while the success of the product has led to widespread external interest, dissemination and continued support entail even greater expenditures—although revenue could become available to offset these costs. There appear to be three dissemination routes, each of which has advantages and disadvantages, and each of which highlights the dilemmas faced by schools committed to innovation, dissemination, and some degree of open-access/open-source availability.
1. **Continued development and dissemination by LPS.** Advantages: product control, retention of any revenue generated, and opportunity to distribute in multiple forms including open-access. Disadvantages: continued financial risk and deflection of energy from the core LPS mission, a problem that increases if interest continues to grow.

2. **Acquisition by an external for-profit organization.** Advantages: dissemination and support handled external to the organization, and immediate revenue. Disadvantages: loss of product control for LPS use or iteration; dissemination tied to overall marketing priorities of the company, with open-access versions unlikely; limited long-term revenue potential.

4. **Dissemination by a non-profit** either created by LPS or in partnership with it. Advantages: continued product control, greater long-term revenue potential, potential to support continued R & D and open-access/low-cost dissemination, segregation of risk and focus of R & D from core LPS mission. Disadvantages: continued need for immediate capital to offset LPS investment and to support dissemination until there is enough revenue to be self-sustaining, limited investor interest because of limited return on investment (ROI), and therefore longer reliance on philanthropic funding.

**Lessons Learned**

In developing ExitTicket, Leadership Public Schools has learned that collaboration between teachers, administrators and technologists and an embedded design process can produce impactful education resources. At the same time, LPS has struggled with how to sustain this process and how to make these tools available to the wider education community. We have learned that it is critical to have both the moment-to-moment design input of teachers and students as well as an embedded technologist to deal with the multiple pain points as they arise. With this combination and our careful step-by-step design process, it is possible to do high quality innovation while immediately and positively impacting student achievement. Without this tight and rapid iteration process, such R & D could well overwhelm the core mission.

However, this process is expensive and the need for revenue to support it is at odds with our goal of wide dissemination and open access. We are currently searching for a sustainable model, beyond reliance on philanthropy, to enable us to do both. Should we succeed, creating a sustainable school-based R&D process could have potentially even greater significance than a product as promising as ExitTicket.
Leadership Public Schools (LPS) is a not-for-profit organization founded in 2002 to serve a diverse student body throughout the Bay Area. The LPS network of outstanding public charter high schools are located in Richmond, Oakland, Hayward, and San Jose and serve over 1,500 students. LPS is led by Dr. Louise Bay Waters and supported by a board of directors and advisory board of experienced educators, business people, and community leaders. Our schools serve ethnically and economically diverse student bodies and are located in or near low-income urban neighborhoods.

This report was supported by a grant from the William and Flora Hewlett Foundation. © 2012

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