CONNECTING ED & TECH:

Partnering to drive student outcomes

BY THOMAS ARNETT

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EXECUTIVE SUMMARY

All too often, the connection between teachers and technology falls flat. Pioneering schools and educators search for technology to support new instructional models, only to find that existing options do not align with their evolving classroom practices. This case study describes how Leadership Public Schools (LPS), a charter school management organization that operates high schools in the San Francisco Bay Area, and Gooru, a nonprofit edtech company, co-developed a technology to support LPS's personalized learning model and improve student outcomes.

Prior to the partnership, both organizations were trying to find better ways to expand the impact of their personalized learning efforts. LPS had developed a successful personalized learning model, but had found it difficult to scale the teacher-developed technology that supported the model beyond its original pilot classrooms. Meanwhile, Gooru had experienced slower-than-expected adoption of its platform because it was not adequately addressing teachers' use cases. Over the course of a year, the two organizations worked together to redesign Gooru's technology to align with LPS's instructional model. Four critical elements enabled their successful partnership:

- **Teaching practices guided the technology.** LPS and Gooru made sure that teaching practices guided the development of the technology, rather than technology driving the instructional model. Consistent with this approach, they formed a clear vision up front of the core design principles for transforming teaching and learning.
- **Teams fostered intensive collaboration and a shared language.** In order to ensure that the redesigned technology accurately aligned with LPS's instructional practices, the teacher that developed LPS's personalized learning model became an embedded member of Gooru's design team. This level of collaboration proved critical for allowing the team to develop a shared language and understanding of their joint work.
- **LPS tested design assumptions in its classrooms.** As the members of the project team developed ideas for improving Gooru, they tested their design assumptions with LPS teachers by creating simple prototypes to pilot in classrooms. Working within the context of the classroom led to design decisions that were better aligned with teachers' needs and practices.
- **Both organizations had business models that prioritized the partnership.** LPS and Gooru's business models undergirded the success of their partnership. Because the project was funded with grants and because the two organizations had other sources of revenue to sustain their ongoing operations, they were able to focus on ensuring the project's effectiveness.

Gooru and LPS are now working to scale their technology and its associated personalized learning practices to other K–12 schools and teachers. It remains to be seen how the partnership will persist over time and how the system they developed will address the "build versus buy" dilemma facing the broader education sector. Moving forward, LPS and Gooru will need to prove that their business models can sustain their partnership long term, given the differences between their primary missions. In the meantime, their story provides important insights into how schools and edtech companies can collaborate to meet the instructional needs of teachers and improve student outcomes.

INTRODUCTION

In September 2013, Louise Waters, CEO of Leadership Public Schools (LPS), and Prasad Ram, CEO and founder of Gooru, began meeting regularly for breakfast. A mutual friend, who was aware of the challenges faced by each organization, had introduced Waters and Ram in hopes that their organizations' complementary strengths and similar missions might lead the two to work together.

Earlier that year, Waters and one of her math teachers, Mike Fauteux, had begun exploring options to develop a more sustainable and scalable version of an edtech tool, called Learning Lists, which Fauteux had prototyped in Google Sheets. The approach had produced strong and consistent student learning gains, and neighboring schools and districts were requesting access, but the spreadsheet-based format of the tool had become difficult to support beyond LPS's pilot classrooms. Waters and Fauteux had considered building the tool in-house, but ultimately decided that LPS had neither the engineering expertise nor a good investment and revenue model to build the technology itself. Alternatively, they had considered partnering with an edtech company, but past experience had taught them that few edtech companies would be interested in the type of in-depth collaboration needed to support LPS's evolving approach to personalized instruction.

Meanwhile, Ram and his co-founder, Amara Humphry, were looking for ways to make Gooru's edtech platform more useful to teachers and schools. The platform allowed teachers to curate and share collections of online educational resources aligned with specific lessons or topics. But feedback from teachers showed that they were struggling to figure out how to integrate these resources into their daily teaching practices, which, in turn, meant that the tools were showing little evidence of student impact. Ram and Humphry needed to find a school partner that would work closely with their design team to help align their platform with specific classroom use cases.

Initially, Waters and Ram's breakfast meetings focused on discussing their passion for education and their organizations' respective missions. Over the course of the following year, however, they came to recognize a high degree of alignment between their beliefs and values. Both organizations believed that scaling impact must precede scaling adoption, that teaching practices should drive technology development, that empowering teachers was the way to empower learners, and that high-quality learning experiences required more than interaction with digital-learning resources. Additionally, both organizations agreed that education is a human right.

With a shared sense of purpose, the two CEOs decided to embark on a collaborative project to align Gooru's platform with the non-traditional teaching practices that LPS had designed Learning Lists to support. As Waters explained, "The partnership represented an opportunity to test whether a collaborative project driven by our shared values and beliefs could actually deliver an elegant, impactful, and scalable product." In December 2014, they solidified their partnership by securing grants from the Charles and Helen Schwab Foundation and the William and Flora Hewlett Foundation to redesign Gooru's platform around LPS's personalized learning practices.

Many innovative school systems struggle with the decision of whether to build or buy technology to support their personalized learning models.

LEADERSHIP PUBLIC SCHOOLS AND THE HISTORY OF ACADEMIC NUMERACY

Founded in 2002, Leadership Public Schools (LPS) is a charter school management organization in the San Francisco Bay Area that operates high school campuses in Hayward, Oakland, and Richmond serving roughly 1,500 students from predominantly low-income backgrounds. In early 2008, LPS faced a math achievement challenge: roughly 80 percent of its incoming 9th graders were below grade level in math, and by the end of their freshman year only about 20 percent of them were passing the state's end-of-course Algebra 1 test. To solve this problem, LPS leaders approached two of their veteran math teachers, Michael Fauteux and Todd McPeak, about designing a companion math course for Algebra 1 that would focus on backfilling the gaps in incoming 9th graders' basic math skills.

During the 2008–09 school year, Fauteux and McPeak piloted the new math course, which they called Academic Numeracy, at the Hayward campus. All 9th graders who were below grade level in math were required to enroll concurrently in Academic Numeracy and their regular Algebra course. The course relied primarily on teacher-led instruction based on two textbooks that McPeak had developed as part of his graduate studies. Students also spent time practicing basic math skills using an online software program that McPeak had also developed.[1]

Early on, Academic Numeracy showed promising results. After just one year, the proportion of 9th graders at the Hayward campus scoring proficient or better on the state's end-of-course Algebra 1 test jumped from 23 percent to 56 percent. With this success, LPS expanded the Academic Numeracy course to its Richmond and Oakland campuses in 2009. In its second year implementing Academic Numeracy, the Richmond campus saw the number of students passing the state Algebra 1 assessment grow from 29 percent to 72 percent.[2] The student outcomes at the Oakland campus were not as noteworthy—and LPS attributed these uneven results to other school challenges unrelated to Academic Numeracy. Nonetheless, given the strong results at the Hayward and Richmond campuses, LPS continued offering the Academic Numeracy course at all its campuses with the hope that, over time, the course would lead to network-wide improvements in student outcomes.[3]

New approaches to address students' learning needs

Although Academic Numeracy seemed to improve students' scores on state tests, Fauteux worried that it was not challenging the most advanced students or helping the lowest performing students to improve. He noticed that these groups of students were struggling to stay engaged in class.

To increase student engagement and differentiate to his students' needs, from 2009 to 2012 Fauteux offered additional math instruction to small groups of students before and after school. In these small-group settings, he compiled paper-based lists of learning activities that included some computer-based activities, which he called "missions." He also created individual data-tracking worksheets, where students could monitor their progress as they worked through missions; constructed a data wall in the back of his classroom to celebrate students' learning progress; and added game-like elements by creating clubs that students could join based on the missions they had completed.

Although these early practices seemed to improve student engagement, they proved unsustainable. For one, holding extra sessions before and after school extended Fauteux's work hours from 7 a.m. to 6 p.m. with no lunch break. Additionally, Fauteux struggled to leverage student data in a paper-based system. As he explained:

> Students were doing amazing work, but the analog approach … meant I either had to collect the private [data] trackers or study the [data] walls frequently to get an idea of where the class, groups, and individuals were. My biggest wish was to sort out how to digitize everything so that both the students and I could see this data at all the levels we needed to in real-time.

While Fauteux was developing new instructional approaches to make his students' learning more personalized, he and other LPS leaders began grappling with another problem: many LPS graduates who had successfully entered college were dropping out. They concluded, based on conversations with alumni and recent findings from psychological research, that LPS was not doing enough to help students develop critical non-cognitive skills—such as goal setting, time management, organization, self-advocacy, and perseverance—needed to succeed in college.[4]

These alumni conversations were pivotal for Fauteux. In an effort to make his personalized learning practices more efficient and to address his students' needs for non-cognitive skill development, in early 2013 he began prototyping a new tool he called Learning Lists. His aim was to allow his students to see their learning data, make decisions, and take more responsibility for their own learning.

A self-described spreadsheet geek, Fauteux built the tool in Google Sheets, where he created lists of hyperlinks to online resources his students could use to learn and practice basic math skills at their own pace. The spreadsheets also gave students automatically populated dashboards that summarized their progress across all the units of the course. To add a game-like element, Fauteux created a corresponding dashboard that determined students' rank on a fictitious pirate ship crew based on their course progress. Learning Lists also provided teachers with dashboards that detailed each student's progress, and class-wide dashboards that could be displayed on computer screens at the back of the classroom to foster a class culture of academic achievement. (For screenshots of the Learning Lists spreadsheet prototype, see *Appendix A*.) He also redesigned his instructional approach to support student development of perseverance and collaboration and to teach skills such as time management, organization, and goal setting. Also, by shifting some of the instruction to online resources through Learning Lists, Fauteux could devote more time to teaching students skills like note taking, goal setting, and reflection.

LPS student profile: Yamiley

When Yamiley entered LPS Richmond in 9th grade, she had 5th-grade math skills and struggled with time management, organization, and setting goals for herself. Yamiley described how her learning experience in math changed while taking Academic Numeracy:

> *Academic Numeracy and the tools we used were really good. I had a better idea of what I needed to focus on and where I needed to improve. Plus, I just really liked math more. The class let me focus on what I needed to do—so I could watch videos and do exercises on my own until I understood better. I didn't feel as lost—and I pushed myself more than I ever had in middle school.*

By the end of the year, she had accelerated her math skills by more than two years and was doing well in Algebra 1.

After experimenting with early prototypes, Fauteux rolled out Learning Lists in October 2013 as the primary source of curriculum and learning resources for his Academic Numeracy classes. With Learning Lists, Fauteux shifted his class from a teacher-led instructional model, in which he was the primary source of content instruction, to a student-directed instructional model, wherein students received much of their content instruction online and guided their own learning. This freed students to move through the course content at an individual pace and to focus on topics, lessons, and activities that addressed their individual learning needs. It also freed Fauteux to focus on small-group and individual intervention and to encourage peer collaboration.

Initial success prompted the other campuses to do a partial implementation of Learning Lists in their Academic Numeracy classes, which laid the groundwork for full implementation across all of LPS's Academic Numeracy classes the following year. By the end of the 2013–14 school year, Fauteux had compelling evidence that the new instructional approaches enabled by Learning Lists were having a positive impact on his students. That year, his students' average math achievement gains, as measured by Northwest Evaluation Association's (NWEA) Measures of Academic Progress (MAP) assessments, increased from 2.14 to 2.38 times the national growth norm.[5] Additionally, the Academic Numeracy classes at other campuses that had only partially implemented Learning Lists saw students' learning growth increase from 1.81 to 2.43 times the national growth norm in math.

Even more impressive, the new course format seemed to increase students' enjoyment and confidence in math. According to surveys administered by Fauteux at the beginning and end of the course, the percentage of students who disliked or hated math dropped from 42 percent to five percent and the percentage of students who strongly agreed that everyone can learn math jumped from 27 percent to 61 percent. Additionally, students appeared to enjoy the new model: when Fauteux asked his students at the end of the school year whether they preferred Learning Lists or traditional teacher-led instruction, 84 percent chose Learning Lists.

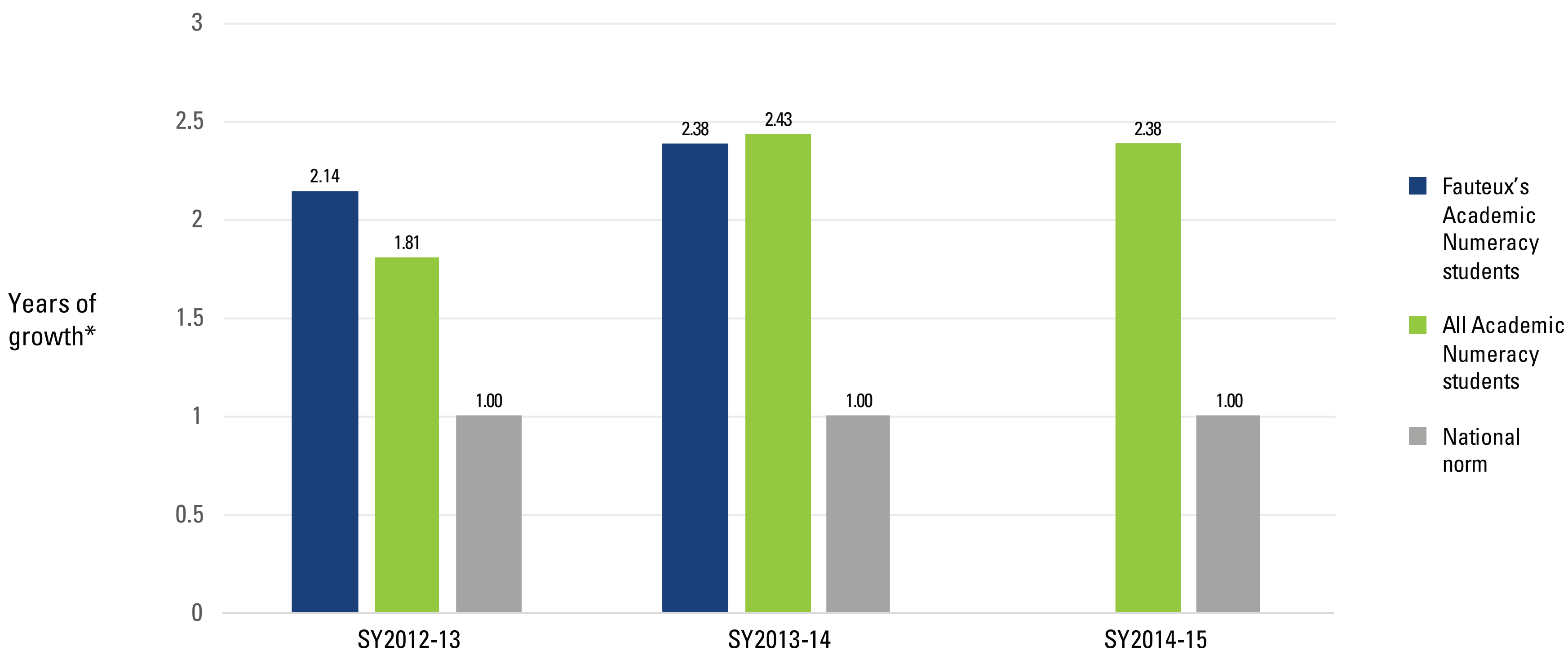
Based on these early results, during the 2014–15 school year LPS fully implemented Learning Lists to support Academic Numeracy courses at all three campuses, and Fauteux stepped out of the classroom to support the work. That year, average learning gains in math for Academic Numeracy students' who had used Learning Lists were 2.38 years times the national growth norm, as measured by NWEA MAP assessments. Although these results were slightly lower than those from the previous year, they still demonstrated strong student achievement growth. LPS leaders also noted that students maintained strong academic outcomes even as LPS shifted the instructional focus in its Academic Numeracy courses from pure academic content to include explicit non-cognitive skill development. The results also suggested that Learning Lists could potentially be a scalable solution, given that three different LPS teachers with varying levels of teaching experience had replicated Fauteux's results while using Learning Lists in their classrooms. *Figure 1* compares LPS students' results on NWEA MAP assessments before, during, and after the implementation of Learning Lists.

Some Academic Numeracy teachers were initially concerned about shifting away from traditional teaching methods to adopt Learning Lists. But as they saw Learning Lists in action, they realized that the new system allowed them to address their students' needs more effectively. According to Sophia Thomas, a veteran teacher who teaches Academic Numeracy at the LPS Richmond campus:

> When we first adopted Learning Lists, I was pretty hesitant about the idea of giving my students free reign to direct their own learning. I'm a control freak that wants things to go a certain way, and I was afraid that students wouldn't learn as much if I wasn't in control. But I'm also a risk-taker and I like trying new stuff, so I decided to give it a try even though it was scary. The kids rose and exceeded my expectations. It was really cool to see how engaged they were. Now I feel like I'm finally able to address their needs, and I can focus not just on filling skill gaps, but on teaching them how to learn.

"Now I feel like I'm finally able to address their needs, and I can focus not just on filling skill gaps, but on teaching them how to learn."

Figure 1. Academic Numeracy student results, SY2012–15



* NWEA MAP results represent Academic Numeracy students' academic growth in math during the school year compared to a nationally representative norm of similar students who took NWEA MAP assessments. One year of growth in math, as indicated by NWEA MAP results, represents the average growth of a nationally-representative comparison group of students over the course of a school year and does not represent mastery of all academic content for a given grade level or year-long course.

The challenge of scaling teacher-developed tools for personalized learning

Using Learning Lists, Fauteux could scale his model across the LPS network. But despite its positive reception, Learning Lists was still proving unsustainable for Fauteux in the long run. First, maintaining and updating the spreadsheets still required a significant amount of manual work. As Fauteux explained:

> In the first few versions of Learning Lists, if I made a mistake or wanted to add something, I had to open 350 student dashboards and update them individually. Even after I built a way to automatically update the content in all student dashboards, it didn't solve the problem of how to fix errors in the code, add a new feature, etc.

Second, given the complexity of the system, Fauteux had to devote significant time to training and providing technical support to teachers. "When multiple other teachers were using Learning Lists with a variety of experiences, capacities, and student contexts, the list of needs grew quickly. Meeting those needs took a lot of time," Fauteux said.

For Fauteux and Waters, it was clear that a more sophisticated web app could alleviate the burden of maintaining Learning Lists across the LPS network. One option they considered was building the app internally. LPS had taken a similar approach the previous year when it had developed ExitTicket, a free web app that helps teachers track student understanding through formative assessments. ExitTicket had proved effective in helping to improve LPS's student learning outcomes and was subsequently adopted by tens of thousands of users around the world. But the experience building ExitTicket had led Waters to reach two important conclusions: first, LPS's strength was in operating schools, not in building technology; second, it was difficult to find a viable business model to support the internal development of edtech tools. When LPS tried spinning off ExitTicket as an independent company, Waters had found that venture capitalists' focus on rapidly growing a user base did not align with LPS's priority of ensuring that ExitTicket met teacher and student needs and demonstrated strong student achievement outcomes.

In light of this experience, Waters concluded that LPS's best option for building a scalable and robust version of Learning Lists might be to partner with an existing edtech company—but finding a partner that shared LPS's priorities and vision seemed like an impossible feat. Waters met with a number of edtech companies, but these companies generally approached the idea of a partnership by trying to show how their existing technologies could meet LPS's needs. In contrast, LPS wanted a partner that would be genuinely interested in doing in-depth collaborative design to create a technology aligned specifically with the instructional strategies Fauteux had developed in Learning Lists for teaching Academic Numeracy.

LPS needed a partner to help develop edtech tools, but most potential partners were not interested in doing in-depth collaboration.

GOORU AND THE EVOLUTION OF THE LEARNING NAVIGATOR

At the same time that LPS was developing Learning Lists, Gooru, a nonprofit edtech firm located across the bay in Redwood City, Calif., was working on its own solutions for improving education. In January 2011, Prasad Ram, the former head of R&D at Google India and chief technology officer at Yahoo! India, and Amara Humphry, a Stanford-trained engineer and designer, teamed up to pursue their shared vision of being "engineers for educators." Driven by a strong belief that education is a fundamental human right, they founded Gooru to leverage the latest techniques in data science in order to provide K–12 teachers with a free tool that would make it easier for them to find open educational resources aligned with their particular instructional needs.

Gooru's technology had two main elements. The core technology was Gooru's learning architecture, a system for tagging and organizing resources according to Gooru's learning taxonomy. It allowed Gooru to manage millions of open learning resources from across the internet—such as text, videos, interactive apps, and assessments—and make them easily searchable by grade level, topic, learning standard, resource type, and a host of other criteria. Gooru's web application, the second part of Gooru's technology, used the learning architecture to enable teachers to discover online educational resources aligned with their instructional needs. The web application then allowed teachers to organize these resources into collections that students could study at their own pace. Additionally, the web application allowed teachers to share their collections with other teachers and remix collections created by others.

After launching an alpha version in June 2011, Gooru's leaders were disappointed that their technology was not being adopted as quickly or as consistently as they had anticipated. They soon came to the conclusion that if they wanted to reach more users, they would need to refine the technology to meet teachers' instructional needs better.

Additionally, Ram and Humphry wanted their technology to have a positive impact on student learning outcomes. Scaling the adoption of the technology seemed critical for addressing this second issue. They believed that gathering large amounts of data from a broad user base would allow them to use data science to hone the technology's effectiveness in recommending learning resources to users—similar to how Netflix and Pandora use data to make better entertainment recommendations for their users—and thereby improve learner outcomes.

To address these problems, Gooru immediately began working with teachers to make improvements to the technology. Initially, the company gathered input from individual teachers who were enthusiastic early adopters. Then, in 2013, Gooru developed a partnership with the Riverside Unified School District in Southern California to run a collaborative project it called Innovation Labs. As part of this partnership, Gooru sent its designers to Riverside on a regular basis to meet with teachers, principals, administrators, staff developers, and curriculum developers to learn how they were using the platform and get feedback on its functionality. Using this feedback, Gooru released a 1.0 version of its technology in September 2014. That year, Gooru also formed partnerships with Santa Ana Unified School District in Orange County and Val Verde Unified School District in Moreno Valley, Calif., in order to test and refine its technology further.

The challenge of aligning technology with instruction

By soliciting feedback from its user base, Gooru identified a clear problem with its product: teachers were struggling to integrate the technology into their daily teaching practices. Because Gooru did not build its product with a particular teacher use case in mind, teachers had to do a lot of thinking and experimenting on their own to figure out how to adapt the technology to their specific needs.

Gooru came to realize that its approach to gathering feedback from partners was not leading to the kinds of design insights needed to make the technology more useful for teachers. “These partners … were definitely showing us their workarounds and the areas where we could improve the product,” Humphry said. “But the nature of the relationship was such that teachers were giving us input on products we had already conceived of, as opposed to playing an equal role in the development process.”

Ram and Humphry also recognized through their work with teachers and school systems that improving student outcomes would not happen by merely improving the technology’s ability to recommend learning content to students. They observed that student achievement was heavily influenced by factors outside of students’ interaction with the technology, such as teacher expectations, classroom culture, and students’ non-cognitive skills.

Gooru decided that it needed to find a partner that could do more than merely provide feedback on new platform features. It needed a partner with a strong record of student achievement results that would work closely with its design team to make sure classroom practices drove technology development.

Gooru needed a partner that would work closely with its design team to ensure that classroom practices drove technology development.

KEYS TO A SUCCESSFUL PARTNERSHIP

During Waters and Ram's breakfast meetings in late 2013 and 2014, they realized that their organizations were grappling with related issues. At LPS, Fauteux had developed an online system for facilitating instructional practices that was yielding results for students. But he needed a more robust technology to support his practices at scale. Gooru, on the other hand, needed a school partner with a proven model for improving students' academic outcomes that would help the company align its technology to specific classroom use cases.

In their respective ways, each organization was working toward the same goal. When Humphry first looked at Learning Lists, she was struck by how different the spreadsheet-based system looked compared to Gooru's platform, but soon realized that, in her words, "at the core it was what Gooru was built for." Once Waters and Ram recognized the potential value of collaborating, they jointly secured grants from the Schwab and Hewlett foundations in December 2014. *Figure 2* provides a timeline of key events in this partnership.

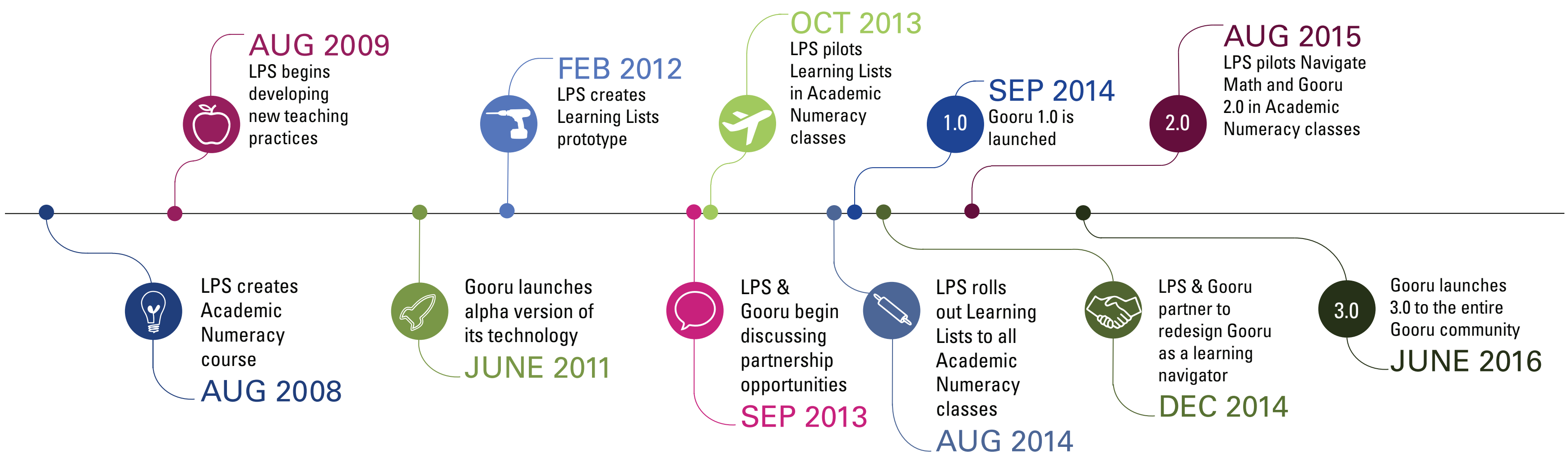
Starting in January 2015, the two organizations began working together to redesign Gooru. Up to that point, Gooru's technology had primarily functioned as a search engine for finding and organizing learning resources. But Gooru's leaders concluded that what students and teachers really needed was a "learning navigator" aligned with teachers' practices to empower students to drive their own learning. In conjunction with redesigning Gooru's technology as a learning navigator, LPS and Gooru worked on creating a set of course resources within Gooru, called Navigate Math, for LPS's Academic Numeracy classes.

As the two organizations worked together, four key elements emerged as critical enablers of the partnership's success. First, the two organizations developed a clear vision of core design principles to guide their efforts toward the student and teacher experiences they wanted the technology to support. Second, as the two organizations worked together, their respective teams developed close working relationships that allowed for intensive collaboration. Third, the partnership allowed Gooru's design team to test quickly and cheaply their design assumptions against the needs of LPS teachers and students. Lastly, the funding streams and incentives embedded in the two organizations' business models allowed them to prioritize the project.

Essential elements for effective collaboration:

- Complementary challenges and capabilities
- Agreement on core design principles
- Close collaboration between teachers and technology developers
- Testing design assumptions in classroom contexts
- Business models that value a tight-knit partnership

Figure 2. Timeline of key events in LPS and Gooru's partnership



Design principles for transforming learning

As LPS and Gooru embarked on their joint work, their leaders agreed on three core design principles for transforming students' learning experiences. First, they wanted the system to give students real-time data on their learning progress. Fauteux found with his ad hoc data trackers for his Academic Numeracy students that showing students real-time learning progress was a powerful way to motivate them.

Second, LPS and Gooru wanted students to have data and resources that empowered them to guide their own learning. Fauteux found with Learning Lists that giving students agency to choose learning activities from among a curated set of learning resources and then showing them data on their learning progress allowed students to see for themselves the correlation between their learning choices and academic growth.

Lastly, LPS and Gooru wanted the system to support students' development of non-cognitive skills in order to help prepare them for life beyond high school. Accordingly, they worked to ensure that the personalized learning approaches built into the learning navigator platform would provide students with experiences—such as goal setting, time management, and reflection—that would help them develop non-cognitive skills.

Design principles for transforming teaching

LPS and Gooru also honed three core design principles for helping teachers transform their teaching practices, which aimed to ensure that teaching practices guided the development of the technology, rather than designing the technology first and then expecting teachers to adapt their practices around it. First, they wanted the technology to serve as a bridge for helping teachers shift their practices from traditional teacher-centered instruction to a wider repertoire of practices including personalized instruction. For example, when LPS released Navigate Math for initial testing in the Academic Numeracy classes, Fauteux noted that some teachers who were less comfortable with personalized learning tended to use the resources in Navigate Math as lesson plan guides for whole-class, lecture-based instruction. But over time, as these teachers mastered the classroom-management and culture-building skills they needed to make students responsible for their learning, they increasingly directed students to access the resources in Gooru on their own. LPS

LPS teacher profile: Laurie Ellis

LPS math teacher Laurie Ellis, who taught Academic Numeracy for the first time during the 2015–16 school year, described her experience using the Gooru platform with her students:

> *Gooru and Academic Numeracy have provided the space for me to give content to students in a way that allows them to work at their own pace and become self-advocates for their learning. I have seen students grow in their math confidence because they are given the time to focus attention on the trouble spots in their understanding. And I feel like I have grown as a teacher in my ability to differentiate instruction and use data in a way that powerfully benefits my students.*

and Gooru wanted to ensure that the technology would similarly help non-LPS teachers transition from traditional direct instruction to more differentiated, student-centered and personalized instruction.

Second, LPS and Gooru wanted the technology to be flexible for teachers. In Gooru's words: "We are about personalized teaching as well as personalized learning." They recognized that for Gooru's learning navigator approach to gain broad adoption and buy-in among teachers, it would need to be useful across a wide variety of teaching styles and classroom contexts. As such, they designed the technology so that teachers could choose either to adopt or ignore particular features based on their needs and circumstances. Many of the new features in the learning navigator—such as those for organizing students into teams, administering real-time formative assessments, and having students grade each other's work—became optional extensions to the platform's core functionality.

Lastly, LPS and Gooru wanted the technology to provide teachers with instruct-ionally-focused data. Fauteux found that his real-time student learning trackers in Learning Lists helped him to intervene more effectively to address his students' learning needs by showing him which topics or concepts students found challenging and which particular students needed additional supports. As a result, he could shift his instructional planning and delivery so that his instruction was driven by his students' particular learning needs, rather than by a course's topic sequence or pacing guide. The new Gooru platform needed to include features similar to those found in Learning Lists that would provide teachers with real-time, instructionally-focused data on student learning growth.

Intensive collaboration and shared language

Even with the high degree of alignment between the two organizations' needs and capabilities and their agreement on core design principles, it still took time for LPS and Gooru to develop the common language and norms they would need to collaborate effectively. In early 2015, Fauteux kicked off the partnership by giving Humphry access to Learning Lists and sharing a document with her that explained his rationale for wanting to incorporate specific Learning Lists features into Gooru 2.0. After this initial information dump, Humphry had planned to touch base with Fauteux every few weeks to show him how Gooru's work was progressing and get his feedback. But after just a few of these conversations, they realized that this arm's-length collaboration was insufficient. They needed Fauteux to become an active collaborator in the design process. Before long, Fauteux was going to Gooru's offices at least twice a week to work closely with Gooru's design team and communicating informally with Humphry on an almost daily basis.

More frequent and informal communication was just the first step in learning how to work together effectively. They also needed a shared language to ensure that the two organizations had a common understanding of what they were building. During the first few months of the partnership, the two organizations had numerous conversations about definitions of terms—such as "platform" and "systems"—that might have different meanings to designers and educators.

Next, they had to learn how to rely on each organization's expertise as they made important design decisions. At times Gooru's design team had to help LPS leaders understand that some aspects of the technology they envisioned needed to be altered, given technical constraints and the needs of Gooru's broader user base. Similarly, Fauteux and Waters needed to help Gooru's design team understand how seemingly minor design decisions could have large pedagogical implications for teachers. For example, when building the assessment features in Gooru, Gooru's design team programmed the tool to give students immediate feedback on their responses—based on the assumption that immediate feedback would help students learn. But when LPS teachers reviewed the tool, they pointed out that immediate feedback could be problematic if students were working together on a question as part of a class activity because it would reveal the answer before all students had time to work through the problem. With input like this from LPS teachers, Gooru's design team could better align the learning navigator's features with teachers' actual instructional needs.

But after just a few of these conversations, they realized that this arm's-length collaboration was insufficient.

Testing design assumptions against a school context

LPS and Gooru's partnership also allowed Gooru's design team to test quickly and cheaply whether particular design assumptions actually had classroom impact as they were developing Gooru's learning navigator. Previously, many of the company's ideas for improvement could not be tested until there was a basic prototype. In describing this situation, Humphry said:

> When you design you make a lot of assumptions. Because we're not teachers, every single thing we draw into our designs is an assumption. After you make those assumptions, you can go validate them with a group of users. But it is a lot easier to just ask someone who has the answers.

Drawing on his extensive teaching experience and his close work with other teachers at LPS, Fauteux could quickly answer many of Gooru's questions about particular design concepts. When Fauteux and the other LPS teachers' experience could not provide clear answers to how particular feature ideas would work in a classroom context, Fauteux would often build a basic "duct-tape prototype" of the proposed features in Learning Lists and have his colleagues test them with their students. These practices provided Gooru with an efficient feedback loop for testing and validating design concepts.

Business models that prioritize close partnership

Undergirding LPS and Gooru's successful working relationship, both organizations had business models that aligned their organizations' values and priorities, thereby making closer collaboration possible. In her initial breakfast conversations with Ram, Waters approached the idea of partnership with a fair amount of skepticism given LPS's prior experience with ExitTicket. That experience had led her to believe that most edtech companies' profit and growth motives limited their ability to collaborate genuinely with schools. Waters was also concerned about the long-term sustainability of Gooru itself. She was unwilling to invest time, personnel resources, and the substantial political and professional development capital needed to change instructional practices at LPS unless Gooru would commit to the project for the long haul. What ultimately convinced Waters that a partnership with Gooru could work, however, was not Ram's promises of genuine collaboration, but his explanation of Gooru's business model.

Unlike most other edtech companies, Gooru was a nonprofit that had found a way to finance the development and support of its technology without the need for venture capital investment or sales to school systems. Gooru's revenue came primarily from two sources. First, to fund the development of new technologies and features, Gooru sought philanthropic grants from private foundations. Then, to fund the ongoing support of its software, Gooru licensed its core learning architecture for tagging and searching educational content to large organizations—such as Amplify, Pearson, and Teach For America—for use within their own proprietary learning systems. As a result, Gooru did not rely on revenue from school systems and could make its platform free for students and teachers. This revenue model also meant that Gooru could prioritize building a tight-knit partnership with LPS because Gooru's philanthropic investors cared more about proving impact than about quickly scaling adoption.

LPS's business model and revenue sources were also critical for supporting in-depth collaboration with Gooru. Although LPS's per-pupil funding from the state provided the financial resources it needed to operate its schools, that funding was not ample enough—given LPS's relatively small scale compared to large urban school districts—to fund capital-intensive innovative projects. Additionally, grant dollars and donors' expectations pushed LPS to stay focused on demonstrating that its innovative projects had potential for broader-scale impact on student outcomes across the education sector. Thus, LPS's opportunities to secure grant funding were critical for allowing it to take on projects, such as working closely with Gooru, and for keeping its projects focused on improving student achievement.

INITIAL RESULTS OF THE PARTNERSHIP

Over the course of seven months, Gooru's design team worked closely with Fauteux to build Navigate Math using Gooru's new learning navigator features. They released Gooru 2.0 in Fall 2015 and then rolled out the Navigate Math course materials to all of LPS's Academic Numeracy classes at the start of the 2015–16 school year. The most significant update in Gooru 2.0 was the ability for users to develop and organize collections of learning resources into a yearlong course. (Previously, the system was designed to organize collections of resources around particular topics.) It also included improved teacher and student dashboards that displayed students' progress in the course. (For screenshots of Gooru 2.0, see *Appendix A*.)

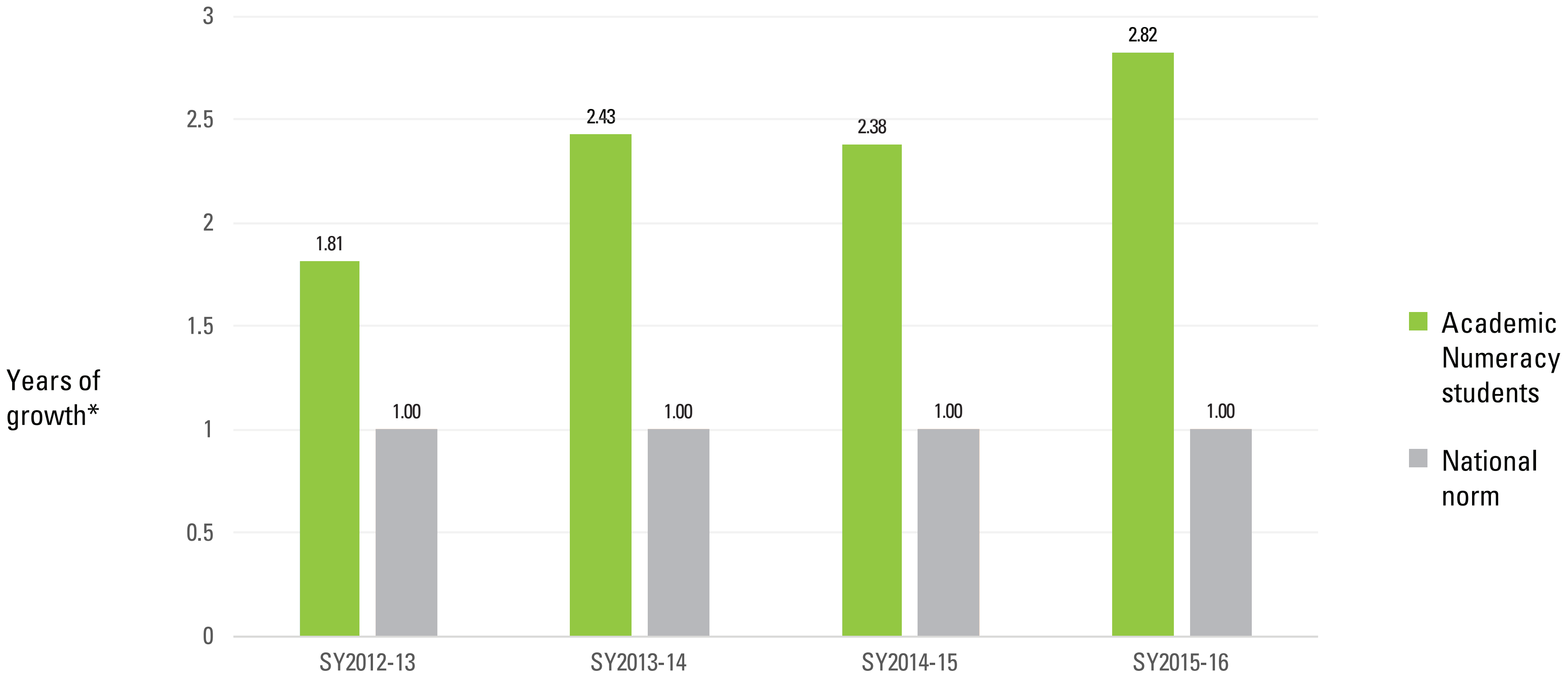
For Gooru's design team, rolling out Gooru 2.0 at LPS was an opportunity to inform their iterative design process and test the impact of the software on student learning. By the end of the school year, classrooms using the tool were showing positive learning results. Academic Numeracy students across all three LPS campuses demonstrated average learning gains in math of 2.82 times the national growth norm, as measured by NWEA MAP assessments. *Figure 3* compares LPS students' results on NWEA MAP assessments before, during, and after the implementation of Academic Numeracy, Learning Lists, and Gooru. Additionally, LPS continued to see positive changes in Academic Numeracy students' attitudes toward math. According to surveys administered at the beginning and end of the 2015–16 school year, the percentage of students who reported feeling comfortable with math jumped from 32 percent to 56 percent and the percentage of students who believed they were good at math because they worked hard at it increased from 32 percent to 50 percent.

> On average, Academic Numeracy students' learning growth in math was 2.82 times the national growth norm during the first year of the Gooru implementation.

After releasing Gooru 2.0 and Navigate Math to LPS's Academic Numeracy classes, Gooru's design team continued working with Fauteux to develop the learning navigator features for Gooru 3.0. These included assessments that measure students' performance by micro-standard; real-time student and class dashboards for displaying formative assessment data; a feature for organizing students into teams and tracking team progress while students learn at their own pace; and a new user interface that Gooru's design team hoped would make the tool more intuitive to use.

Gooru released Gooru 3.0 in June 2016, and the company is now watching closely to see how its users respond to the new user interface and implement the new features found in this major update. (For screenshots of Gooru 3.0, see *Appendix A*. For a more complete list of feature updates across the different versions of Gooru, see *Appendix B*.)

Figure 3. Academic Numeracy student results, SY2012–16



* NWEA MAP results represent Academic Numeracy students' academic growth in math during the school year compared to a nationally representative norm of similar students who took NWEA MAP assessments. One year of growth in math, as indicated by NWEA MAP results, represents the average growth of a nationally-representative comparison group of students over the course of a school year and does not represent mastery of all academic content for a given grade level or year-long course.

PLANS TO SCALE IMPACT

Moving forward, true to their shared mission, LPS and Gooru are experimenting with a number of efforts to scale the impact of the new Gooru 3.0 learning navigator platform beyond LPS. Gooru has worked with researchers at Johns Hopkins University and with Gooru Fellows—a group of teachers from across the country piloting Gooru in their classrooms—to create curriculum for over 35 courses featured on the new platform. Additionally, LPS recently began working with three California-based school systems—Oakland Unified School District, Val Verde Unified School District, and Aspire Public Schools—to pilot Navigate Math in their middle and high school math intervention classes.

Through these early attempts at scaling access to Navigate Math and Gooru 3.0, LPS and Gooru are eager to learn what it takes to help other school systems successfully replicate LPS's student outcomes. In the long run, LPS and Gooru hope that the learning navigator approach will be a key catalyst in driving the adoption of personalized teaching and learning models.

They recognize, however, that for other school systems to see student achievement results similar to LPS's, those school systems will not only need to adopt Gooru's learning navigator technology and its featured courses, but also transform their instructional models as LPS has done. LPS and Gooru suspect that a major challenge to replicating impact is that scaling access to the learning navigator software is much easier than scaling the adoption of new teaching practices. For this reason, they are investing significant resources to build teacher support features into the software, create an online companion teacher course for Navigate Math, recruit and train lead teachers to serve as Gooru ambassadors, and give schools the ability to opt into train-the-trainer activities. Their hope is that, like LPS's own math teams, as teachers use the tool, become familiar with its features, and access the additional supports, the flexibility of the technology will allow them to shift their teaching practices toward the more personalized approaches that the platform is optimized to support.

Gooru 3.0 and the Navigate Math resources are available for free at https://gooru.org

CONCLUSION

The challenges that brought LPS and Gooru together are not unique to the two organizations. Many pioneering school systems are struggling to find software that supports personalized learning without constraining their particular approaches to instruction. Alternatively, some schools have attempted to build software platforms and tools in-house to customize to their specific needs. But schools interested in this route often find that they lack the revenue sources or expertise to support a software development department.

LPS and Gooru's story presents an interesting variation on the theme of so-called "build versus buy" decisions facing innovative school systems. Their example suggests that when a school system finds building technology to be infeasible and buying off-the-shelf technology to be impractical, a viable third-way approach is to partner with a technology developer. Furthermore, their partnership lends a number of important insights regarding the circumstances required for a successful partnership.

Unlike many partnerships—in which two organizations work at arm's length to develop separate components of a shared system—LPS and Gooru's partnership demonstrates how two organizations could merge their teams in order to design a tool to support an evolving personalized learning model. Over the course of their partnership, LPS has come to view Gooru as the key avenue through which it will fulfill its own mission to impact the broader education sector. Similarly, Gooru now views LPS as not just a partner, but as an extension of its organization. LPS and Gooru's partnership is less like a reciprocally beneficial arrangement for exchanging resources and feedback and more like a tightly intertwined symbiosis.

Looking ahead, it remains to be seen how LPS and Gooru's efforts stand to impact the broader K–12 education sector. Scaling adoption of Gooru's software may prove easier than scaling LPS's instructional model and practices, which could hinder their broad-reaching impact on student learning outcomes. The two organizations hope that the new user interface, the flexibility of Gooru 3.0, and the additional supports they are now developing will inspire more teachers to adopt the technology, followed by a natural transition toward more personalized learning practices. But time will tell whether Gooru's redesigned technology will effectively attract more teachers and whether increased adoption will actually lead to more personalized instructional models and improved student learning outcomes.

It is also not clear whether LPS and Gooru's partnership will endure over the long run. Gooru's business model of licensing its core technology to provide recurring revenue may yet prove to be unsustainable. Additionally, LPS and Gooru's differing primary missions may at some point lead either of the organizations to make decisions that jeopardize their partnership.

Yet, as they move forward to face the challenges of an uncertain future, both organizations remain optimistic that their shared work will produce an effective on-ramp to personalized learning for schools and teachers trying to transform their practices. LPS and Gooru intend to continue to work together closely into perpetuity as long as their joint efforts continue to improve student outcomes. Meanwhile, the story of LPS and Gooru's partnership provides important insights for others in the field who are working to design edtech tools that successfully connect teaching and technology to consistently deliver improved student outcomes.

NOTES

1 The software Todd McPeak developed for helping students practice math skills is called Prime Numeracy and can be accessed for free at http://www.lpsmath.org/.

2 LPS's end-of-course test score data is available at http://star.cde.ca.gov/. Note: California suspended California Standards Tests (CSTs) at the end of the 2013–14 school year.

3 During this time, LPS also operated a high school in San Jose, Calif. The San Jose campus was the last of LPS's schools to implement Academic Numeracy, and this did not occur until after state testing for Algebra was suspended.

4 In developing its focus on and approaches to fostering students' non-cognitive skills, LPS drew on research on growth mindset by Carol Dweck from Stanford University; research on character strengths by Martin Seligman from the University of Pennsylvania; research on college readiness by David Conley from the University of Oregon; and research on the Universal Design for Learning framework by David Rose from Harvard University.

5 During the 2012–13 school year, LPS shifted from measuring student achievement based on California's end-of-course tests to measuring student achievement based on NWEA MAP scores, as California suspended year-end testing in 2014. For more on interpreting NWEA MAP results, see John Cronin, "How many students and schools actually make a year and a half of growth during a year?," Northwest Evaluation Association, June 16, 2016, https://www.nwea.org/blog/2016/how-many-students-and-schools-actually-make-a-year-and-a-half-of-growth-during-a-year/ (accessed July 12, 2016).

PHOTO NOTES

Cover: LPS teacher Sophia Thomas
Page 10: LPS teacher Mike Fauteux
Page 20: LPS 9th graders

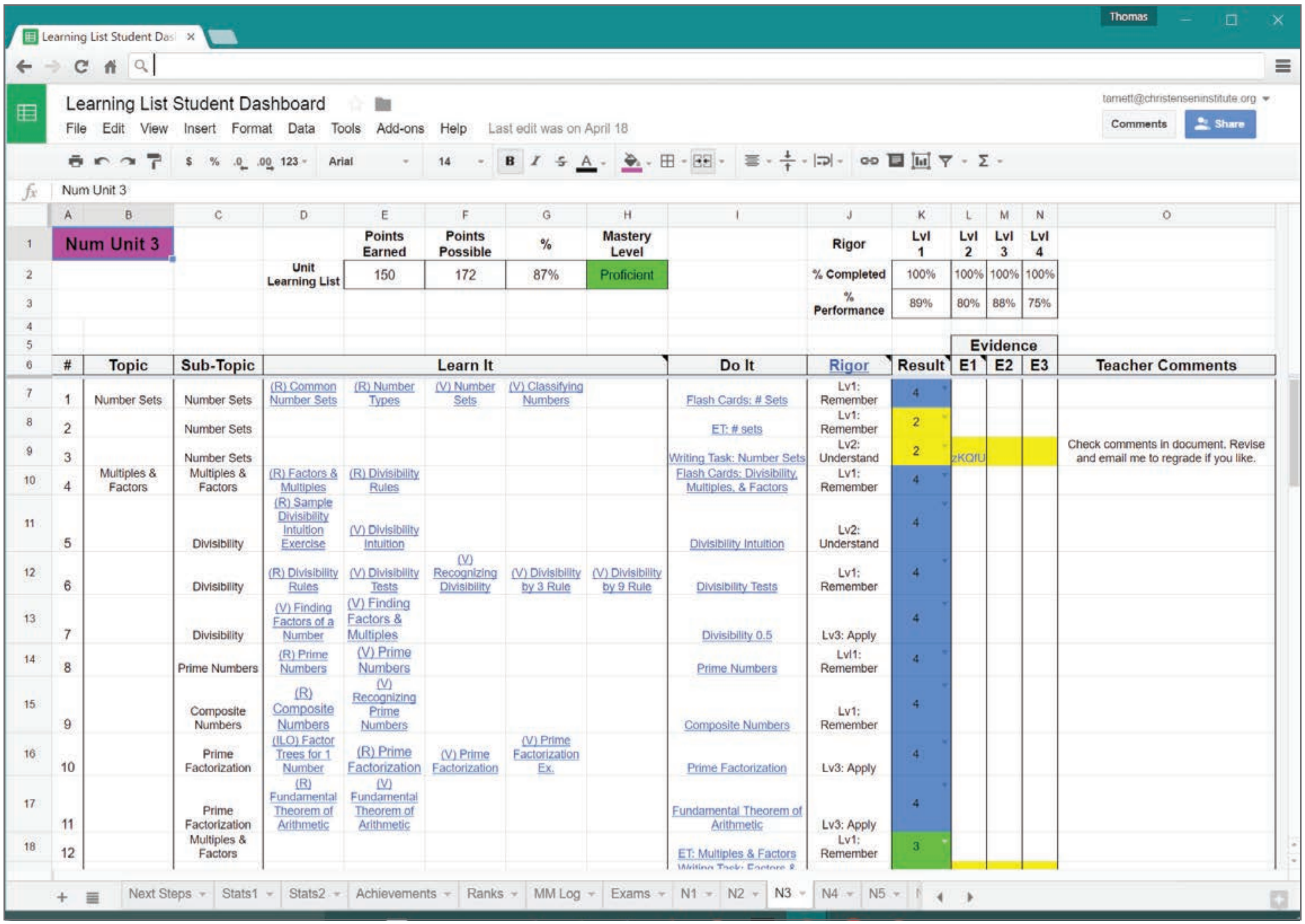
APPENDIX A. TECHNOLOGY COMPARISONS

The following screenshots show similar views in Learning Lists, Gooru 2.0, and Gooru 3.0.

Learning Lists unit overview

See the links below for a working example of Learning Lists:

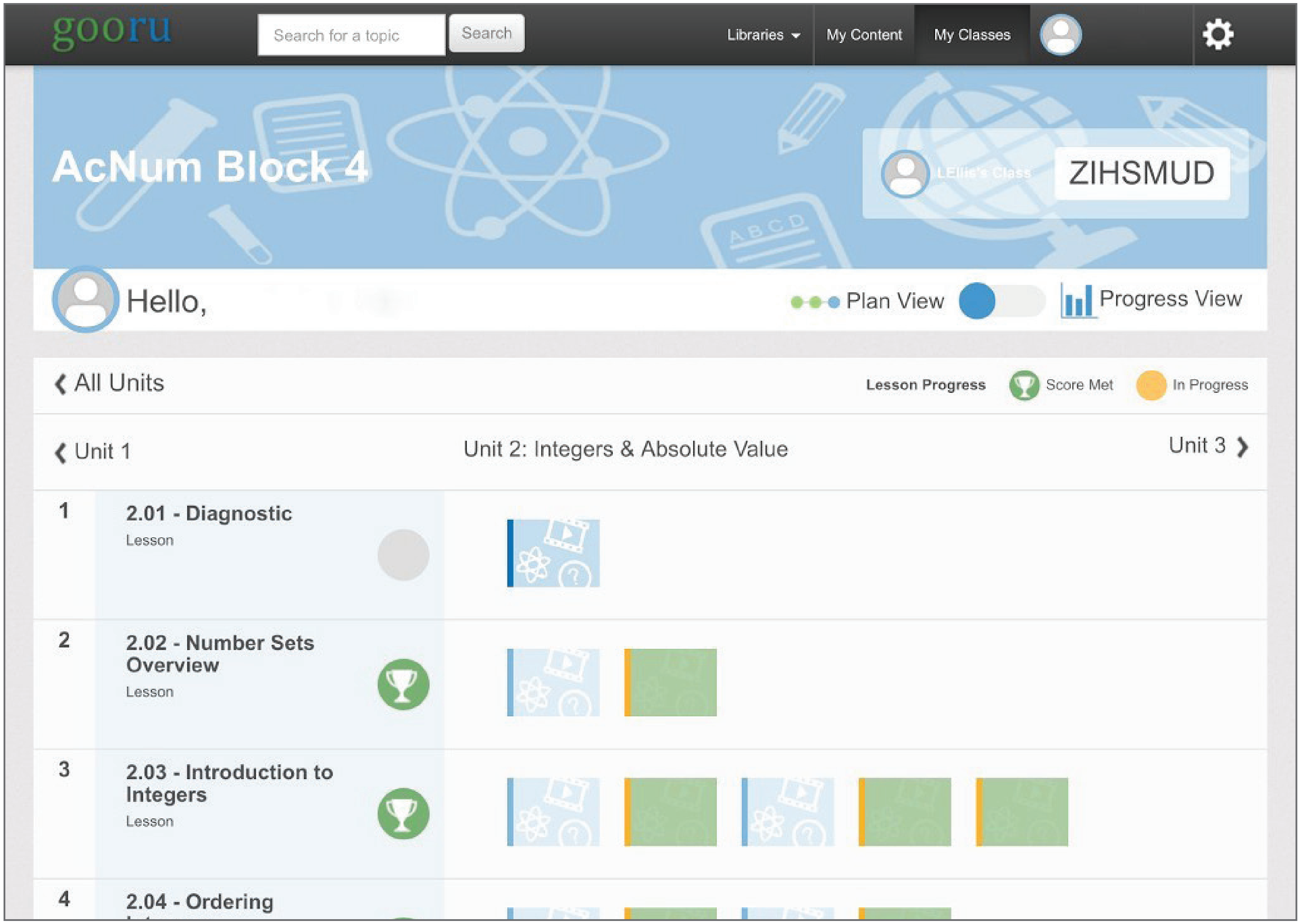
- Student view: https://goo.gl/sGaNq3
- Teacher view: https://goo.gl/EscC0i



Num Unit 3		Points Earned	Points Possible	%	Mastery Level	Rigor	Lvl 1	Lvl 2	Lvl 3	Lvl 4
	Unit Learning List	150	172	87%	Proficient	% Completed	100%	100%	100%	100%
						% Performance	89%	80%	88%	75%

#	Topic	Sub-Topic	Learn It					Do It	Rigor	Result	Evidence E1	E2	E3	Teacher Comments
1	Number Sets	Number Sets	(R) Common Number Sets	(R) Number Types	(V) Number Sets	(V) Classifying Numbers		Flash Cards: # Sets	Lv1: Remember	4				
2		Number Sets						ET: # sets	Lv1: Remember	2				
3		Number Sets						Writing Task: Number Sets	Lv2: Understand	2	zKQfU			Check comments in document. Revise and email me to regrade if you like.
4	Multiples & Factors	Multiples & Factors	(R) Factors & Multiples	(R) Divisibility Rules				Flash Cards: Divisibility, Multiples, & Factors	Lv1: Remember	4				
5		Divisibility	(R) Sample Divisibility Intuition Exercise	(V) Divisibility Intuition				Divisibility Intuition	Lv2: Understand	4				
6		Divisibility	(R) Divisibility Rules	(V) Divisibility Tests	(V) Recognizing Divisibility	(V) Divisibility by 3 Rule	(V) Divisibility by 9 Rule	Divisibility Tests	Lv1: Remember	4				
7		Divisibility	(V) Finding Factors of a Number	(V) Finding Factors & Multiples				Divisibility 0.5	Lv3: Apply	4				
8		Prime Numbers	(R) Prime Numbers	(V) Prime Numbers				Prime Numbers	Lvl1: Remember	4				
9		Composite Numbers	(R) Composite Numbers	(V) Recognizing Prime Numbers				Composite Numbers	Lv1: Remember	4				
10		Prime Factorization	(ILO) Factor Trees for 1 Number	(R) Prime Factorization	(V) Prime Factorization	(V) Prime Factorization Ex.		Prime Factorization	Lv3: Apply	4				
11		Prime Factorization	(R) Fundamental Theorem of Arithmetic	(V) Fundamental Theorem of Arithmetic				Fundamental Theorem of Arithmetic	Lv3: Apply	4				
12		Multiples & Factors						ET: Multiples & Factors	Lv1: Remember	3				

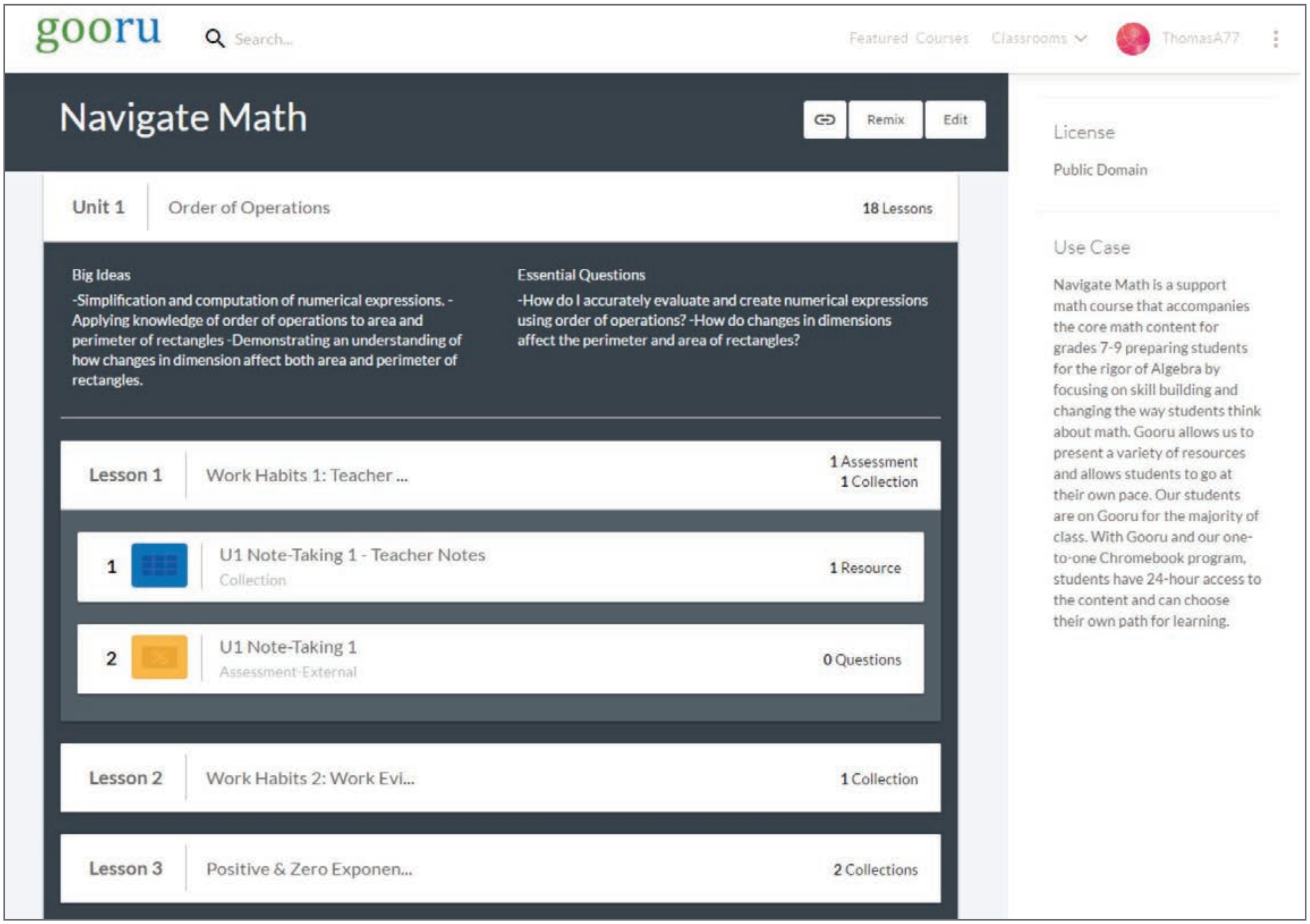
Gooru 2.0 unit overview



Gooru 3.0 unit overview

See the links below for more on Gooru 3.0:

- Video tour: https://goo.gl/mmGio1
- Featured courses: https://gooru.org



APPENDIX B. UPDATES TO GOORU

Gooru 1.0 (pre-partnership)	Search for learning resources Collection editor Remix collections
Gooru 2.0 (launched August 2015)	Course editor • Collection/assessment editor • Resource/question editor • Tags: standards, 21st-century skills, Depth of Knowledge Dashboards • Teacher dashboard showing student progress by unit, lesson, and assessment • Student dashboards showing learning plans and student progress
Gooru 3.0 (Gooru's learning navigator) (launched June 2016)	Class • Co-teachers, rostering integration • Course map showing current location and peer locations • "Go Live!" real-time class analytics • Improved teacher and student data dashboards • Student assessment summary and suggestions • Student teams (based on Johns Hopkins University's research on cooperative learning) Profiles • About user • Libraries (courses, collections, assessments, resource, questions) • Community (followers, following) New content editor • Course, collection, assessment, resource, question • Assessment improvements • Editing collaboration • Tags: micro-standards • Best practices, use cases Featured courses that have been reviewed and vetted Limiting search to only vetted items Ability to remix courses
Additional planned updates to learning navigator	Mastery dashboard based on micro-standards Free-response scoring per question Rubric grading • Teacher grades student • Student grades self • Students grade each other • Crowd-sourced grading Suggestions for content editing

CLAYTON CHRISTENSEN INSTITUTE
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About the Institute

The Clayton Christensen Institute for Disruptive Innovation is a nonprofit, nonpartisan think tank dedicated to improving the world through disruptive innovation. Founded on the theories of Harvard professor Clayton M. Christensen, the Institute offers a unique framework for understanding many of society's most pressing problems. Its mission is ambitious but clear: work to shape and elevate the conversation surrounding these issues through rigorous research and public outreach. With an initial focus on education and health care, the Institute is redefining the way policymakers, community leaders, and innovators address the problems of our day by distilling and promoting the transformational power of disruptive innovation.

About the author

Thomas Arnett is an education research fellow at the Clayton Christensen Institute, where his research focuses on the changing roles of teachers in blended-learning environments and other innovative educational models. Prior to joining the Institute, Thomas worked as an Education Pioneers Fellow with the Achievement First Public Charter Schools and as a Teach For America corps member in the Kansas City Missouri School District. Thomas received a BS in Economics from Brigham Young University and an MBA from the Tepper School of Business at Carnegie Mellon University, where he was a William G. McGowan Fellow.

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