Personalization in Practice: Observations from the Field

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Personalization in Practice: Observations from the Field

Rich Halverson, Al Barnicle, Sarah Hackett, Tanushree Rawat, Julia Rutledge, Julie Kallio, Curt Mould, and Janice Mertes

Personalized learning places the interests and abilities of learners at the center of their education experience. In personalized learning, educators develop environments in which students and teachers together build plans for learners to achieve both interest-based and standards-based goals. In 2014, a number of foundations gathered together to develop a working definition of personalized learning that included four components:

- *competency-based progression* that defines trajectories of content for learners and provide ongoing, formative assessment toward learning;
- *flexible learning environments* organized around the needs of students;
- *personal learning paths* that customize activities to learner motivations and goals; and
- *learner profiles* to capture the progress students make toward learning goals. (*Education Week*, 2014)

Educators have used ideas like these to develop personalized learning environments in public and private schools across the country. Personalized learning is the latest in a series of designs aimed at organizing schooling around learner interest. As is true with many similar ideas, the diversity of designs, models, and implementations means that personalized learning has come to mean different things to different communities. It is used, for example, to refer to computer-adaptive learning, virtual learning, blended learning, data-driven learning, differentiated learning, and 1:1 technology plans (e.g., American Institutes for Research, 2013; Gates Foundation, 2010; Grant & Basye, 2014; & Abbott et al., 2014). This variety of uses describes a fertile domain of innovation that has grabbed the attention of educators and policy makers around the world who are committed to improving teaching and learning for all students.

One common approach to studying an innovation mid-bloom is to engage in descriptive research about how the emerging practices are actually being performed in cutting-edge environments. This research strategy helps the field begin to map how the ideas are taken up by educators (e.g., District Reform Support Network, 2014). It also provides some contrast between the ambitious plans of reformers and actual practices of teachers and students in schools in order to help reformers refine their ideas and to open up new avenues for change. Finally, this approach begins to identify indicators of practice that can guide innovation on the ground and help educators and policy makers alike develop assessment tools that measure the degree to which strategies improve learning.

Our report summarizes the early findings of a study to document the practices of personalized learning across a dozen Midwestern K–12 public schools. Our approach is to talk to teachers, students, and parents in the schools, visit the learning environments, and observe practices of teaching and learning so that we can develop a sense of how the principles of personalized learning are lived day to day.

Researchers from the University of Wisconsin–Madison School of Education worked with leaders at the Institute for Personalized Learning (IPL)[1] to identify a number of K–12 schools with experience implementing principles of personalization. This research report presents the initial findings of a 6-month research project designed to document what personalized learning looks like in contemporary K–12 schools.

Site Selection

Our study focuses on the five schools (Table 1) that participated in a pilot version of the study conducted in Spring 2015 (all pseudonyms).

***Table 1*. Schools Observed**

Name	Type	Location	Students	Teachers	Free & Reduced-price Lunch
Anderson	HS	Urban	1000	35	60%
Balsam	HS	Suburban	150	10	20%
Carson	MS	Suburban	100	3	40%
Delaney	MS	Suburban	800	50	20%
Edison	ES	Urban	450	30	50%

Anderson High School is a large school in an urban community with a challenging academic program. Its personalized learning initiative is designed to support student success in the program, located in a lab that features computer-adaptive learning tools and regular consultation with faculty and peers. Approximately 50% of Anderson students participate in the personalized learning program.

Balsam High School is an arts-based charter school-within-a-school located in a suburban high school. Students work with teachers to design classes and develop proficiency-based learning programs in the school's learning management system. Balsam students are expected to develop senior projects that involve inquiry, social engagement and learning technology in a public performance space.

Carson Middle School is a small school-within-a-school set in a traditional suburban middle school. The three Carson faculty members work with students to develop personalized learning

[1] IPL provides workshops and guidance to schools about how to create personalized learning environments around a set of design principles organized in a honeycomb model. The model describes strategies for educators to build personalized learning around collaboratively designed learner profiles, learning paths, and proficiency-based progress measures. (http://www.cesa1.k12.wi.us/institute/designdevelop/personalized-learning.cfm)

plans that allow students flexibility in choosing the pace and pathway for learning. The Carson learning environment, adapted from a storage space in the middle school, has couches, desks, and open areas for students to design learning opportunities.

Delaney Middle School is a large science and technology based charter school in a suburban community. Delaney is organized around project-based learning in which students are expected to learn the content and skills necessary to complete long-term design-based projects. While there are a number of traditional classes, flexible teacher and classroom schedules allow students to learn what they need in order to complete the program.

Edison Elementary School is a medium-sized traditional urban elementary school. Educators at Edison help young learners develop the skills and practices necessary to organize their own learning processes. Edison integrates computer-adaptive learning, curriculum tools, and new media devices into designing learning activities in which students are expected to provide direction and critique.

Questions and Key Findings

This report is built around the three key domains of learners, teachers, and technology. We selected questions to explore several ideas represented in the IPL theory of action, as well as the defining themes of personalized learning as identified by prior research. These questions, of course, are not intended to either define or exhaust possibilities of personalized learning in practice. We hope they serve as an on-ramp to a broader account of the innovative practices engaged in by the IPL schools. The central questions and findings that guide this report are:

1. How do IPL schools encourage students to be *active participants* in their learning? Educators in the IPL schools attempt to create a **culture of agency** by designing opportunities for students (with educators) to collaboratively control the time, pace, space, place, content and goals of their learning.

2. How do IPL schools *shift the role of educators* to support personalization? IPL schools enable educators to engage in **regular, data-driven consultation** with students to construct learning pathways and set learning goals.

3. How are *learning technologies* used in IPL schools? IPL schools develop **socio-technical ecologies,** that is, environments where technologies are selected by educators to address the interests and needs of all learners. The ecologies have three dimensions:

    1. all schools provide **information technologies** that allow students to coordinate and document learning processes and outcomes;

    2. all schools provide **computer-adaptive assessment** and **curriculum programs** that individuate skill and content development learning in math and reading;

3. some schools create **digital media spaces** to foster creativity in activities such as gaming, coding, performance, production and making.

The following sections detail how we answered our research questions.[2] We found evidence of the four characteristics of personalized learning—progressions, flexible learning environments, pathways and profiles—described above. We found students and teachers co-constructing learning goals and pathways around student interests and learning standards; students engaged in independent and self-organized group learning; and educators engaged in conferences with students on the process of learning as well as discussing goals and improvement data. We saw how educators used technologies to organize assessment data and how students used technologies to chart and record learning paths.

Most importantly, we found a common pedagogical commitment to personalized learning across the IPL schools. This shared vision of teaching and learning framed the practices to provide students with agency over their learning, the interactions of teachers and students, and the selection and use of technologies. One teacher commented that, at Balsam, "personalization is setting a unique goal for every student and then setting competencies that align to that goal." A Anderson High teacher remarked that "the role of the learner … is to determine goals based on student needs, interests, learning styles and career goals, and to develop the individual paths to reaching them." The commitment to a core pedagogy of student ability to design, track and assess a learning program pervades the observations we made at the IPL schools. This is not to say that schools are places where anything goes for students. Perhaps the commitment to personalized learning as a structured learning environment is best described by a leader who described how Carson teachers are "really intentional about the fact that we give *freedom within fences*." The concept of freedom within fences describes how IPL schools create a culture in which students and educators are oriented toward learning outcomes while also open to student agency. Although what counts as a fence and what constitutes freedom varies across the schools, achieving the balance between freedom and fences is a defining characteristic of the IPL schools in the study.

Question 1: How Do IPL Schools Encourage Students to Be *Active Participants* in Their Learning?

A central challenge in enabling students to take control of their learning is to create a space where student choice is expected. In the context of everyday schooling, creating a culture of student ownership can be more involved than it first appears. Schools have a well-deserved reputation for overlooking student interest and building routines that require learners to comply with the program provided by the school. The ability of students to express their interests, much less the ability to act upon interests, evaporates in many school environments. Many schools lock down student choice into routines, fearing the chaos or disengagement that may ensue when students are left to make their own choices.

[2] For more detail on the research methods, nature of the data, and coding process, see the Appendix.

In the IPL schools, we observed a multi-dimensional effort by educators to encourage the engagement of interest in learning by increasing the range of *agency* students have over their work. The commitment to increase the range of student control over their learning stemmed from the pedagogical vision of the school. As a Balsam teacher explained:

> if you have a framework to move students through their competencies you have the ability to personalize for every student…. You have to get out of seat time to do that. So personalized learning … and competency based go hand and hand.

Agency reflects a learner's ability to control the pace, place, means and ends for learning. Learners with agency are motivated to succeed in their learning, can frame the next challenges in their path, and can persist when faced with difficulties. The educators in our IPL schools talked about scaffolding opportunities for students to embrace their agency and building on the emerging culture of student agency, with small steps, to begin to define new routines around which learning could occur.

Educators in the IPL schools took a number of steps to design what we call a *culture of agency* that invited students to take ownership of their learning process. In practice, this meant allowing students more control over the (a) *time and pace of their learning*, (b) *physical and social space in which learning could occur*, and (c) *content learned*. The next sections highlight the stepping off points at which educators built opportunities for students to take control.

A. Agency over the Time and Pace of Learning

The first challenge faced by many of the educators toward building a culture of student agency was to create learning environments that allowed students to take control of the time and pace of their learning. In our research on the spaces in which learning took place, we observed that these efforts occurred at two levels: (1) designing the *master schedule*, and (2) designing *opportunities for students to take responsibility* for organizing their time.

Designing the master schedule. The master schedule is a critical organizing structure at any school. In personalized learning environments, students may be doing different things at any moment in time—learning looks different for every student. Each school designed the master schedule to provide some flexibility for students to allocate how they could spend time in the school. Three of these are outlined next.

Delaney Middle School built a daily "flex" period for students into its block schedule design. The flex period called on students to find their own space to work, collaboratively or independently, or visit with teachers. A former administrator of Delaney describes how:

> the intention [of flex time] was to provide students the opportunity to engage and organize in their own learning. At first, students "went wild," and teachers doubted whether this was possible. Over time, however, students learned how to know what they

> needed and teachers learned to reach out individually, both sides figuring out what to do with this unstructured time.

A Delaney student comments that, "one thing I really like is the availability that teachers have. So we have flex time and they are available there to help you if you don't understand something." Flex time became a structural first step in creating a learner-centered culture at Delaney.

In the Anderson High personalized learning program, students determine the time, place and pace of their learning. Students choose from a menu of learning goals in a computer adaptive learning platform and have control over how to complete what they need to complete. Because the program is available online, students can choose to login outside of school hours to complete their work and are often documented completing minor and major milestones in early morning hours. Teachers use log files, as well as learning outcome data, to consult with students about their progress and learning goals.

Carson Middle School provided a flexible master schedule that emphasized student agency over time. Students receive all their assigned work to be completed at the beginning of each month, and develop a plan with teachers to structure learning time to achieve their learning outcomes. Students could choose to do individual research, organize group inquiry projects, or attend seminars. Students are held responsible for keeping on task and accomplishing what they need to do within the provided timeframe. One student observed:

> We have the choice really. In Math, for example, they will give us assignments in our Google drive folder, and we have the choice if we want to get them done right away, and then in seminars … they help you learn something else but sometimes they can distract us but usually you can skip out on because you already mastered that skill.… Also you could take your time, and usually every seminar you focus on one of the documents.… We get choice in how fast we go.

Some Carson students completed an entire year's worth of math in one semester and have moved on. These students work more independently than the others, asking for help when they need it and checking in with the teacher when they are ready for an assessment. How students spend their time is not left completely up to them. They are expected to attend daily whole-group activities, and their elective classes meet on a regular schedule.

The "freedom within fences" idea described the organization models we observed in the IPL schools. Many educators in a traditional school context would recognize the practices described here as typical strategies to invite greater student ownership of their learning. However, in the IPL schools, the small steps to create student agency over time expressed an underlying commitment to personalized learning pedagogy. One Edison teacher said:

> it's a scaffolding process, and with our program, we're really intentional about [it]…. I've seen a lot of programs that … could totally model their program off of [ours], and

> it'd look completely different. [Our program is] all based off of that first question "What are you going to learn?" So we set up the parameters and kind of help them through that mode. Because what we've found is that if we didn't have that … [if] we didn't have our [mission] … it was a totally different experience for us.

The key lessons for us were the systemic efforts made by IPL educators to integrate agency over time and pace throughout the program, the search for a balance between school structure and student choice, and the persistent effort of educators in IPL schools to build on early successes in student choice over time so as to expand opportunities for student agency in their learning.

Designing for student responsibility. A culture of agency is also a culture of responsibility. IPL schools prioritize the experience of failing to manage time as a feature (rather than a bug) of the learning environment, and they foster schedule flexibility as a path to student pride in the ability to manage time. Two Balsam Middle School students stated that teachers "sort of gave you all the necessary tools for [time management], but you have to learn it on your own…. The students who succeed are the ones who have it down to a really fine line" and that "You ultimately have to get it to succeed here."

Carson Middle School students, for example, get a list of assignments to complete and they have to plan their time to finish all the assignments. Asked what happens if they don't finish them all, students responded, "it's your own fault and you have to try and get it done." A Carson teacher explained how failure is part of the school design:

> [We] let them fail. It's a huge piece of it. And I talked about that with all my families at the beginning of the year at the listening conference—especially our new kids—is to say, your child is going to fail. And they're going to fail a lot. But we have the support in here to help them recover from that. And I think that is so important. Especially with a lot of kids that we have in our program, because up until this point they've always been at the top of their class and things have come very easy to them—to have them come into an experience where, initially right off the bat, they're totally *unsuccessful, but part of that's by design*. We want them to be unsuccessful so we can teach them how to be successful. I think that's an important piece. (Emphasis added.)

Across the IPL schools, educators created situations for students to fail and to provide sufficient feedback to learn from the consequences. Balsam High School's principal noted that he and his teachers have to fight the adult impulse to define every moment, and he highlights the importance of Wednesday studio day:

> Our staff has a tense relationship with studio day. But if you put too many structures into studio day, you'll never get the failure you need to have the students learn what happens when I don't use my time well. And there's not enough failure in high school. So we need to have structures taken away for the students so they can kind of fall on their faces. So I think they learn it that way.

At face value, the statement “there’s not enough failure in high school” looks strange, given the challenges faced by so many students and educators to complete high school successfully. In the context of the personalized learning pedagogy shared across the schools, however, the room to fail takes on a different meaning. Failure in personalized learning is a step toward taking responsibility for one’s own learning. Failure, followed by feedback and renewed effort, is the pathway toward successful personalized learning in IPL schools. Student agency begins with the ability of students to make meaningful choices about where their learning will take place. A central role for teachers in open spaces is to lead students toward making the choices that will result in taking ownership over their learning. Facilitating student choice in the physical environment is an initial step to creating a culture of student agency.

B. Agency over the Space of Learning

The physical layout of the learning environment is an important condition that IPL schools establish for personalized learning. In our observations, we saw a commitment by the educators in the IPL schools to design physical spaces that would afford students agency in participating in learning activities. All five programs we visited had strong goals and philosophies that guided their decisions about spaces. Whether this was “making learning visible” at Delaney or fostering an arts community at Balsam, there was a sense that the program was embodied in the spaces. In IPL learning spaces, students are encouraged to make decisions about where to learn and with whom. We observed evidence of how the design of space created flexibility for *teaching* and flexibility for *students*.

Flexibility for teaching. This design of flexible learning spaces creates a more fluid environment for *teaching*. For example, Delaney teachers no longer have their “own” assigned rooms; instead, they teach in several different spaces throughout the day. Common spaces are shared and their use negotiated, sometimes in the moment. To provide flexibility in student workspaces and teaching assignments, walls were taken down and classrooms merged or adjusted. Teachers in all IPL schools moved around the classroom, perhaps to teach a seminar or sit one-on-one with a student. There was no obvious “front” in most of the IPL classrooms we observed. Other teachers worked simultaneously in the same spaces and made themselves available for quick check-ins or to offer guidance.

Flexibility for students. The design of space creates a more flexible environment for *students*. Students seem to move on their own as individuals rather than *en masse*, as characterized by traditional schooling. Students enter and exit the classroom alone, seemingly without adult permission. At Edison Elementary, the flexibility of the learning space addresses the needs of special education students. A Edison teacher related how one student, who was often in trouble in prior years, was allowed to organize his learning time. He splits his time during the school day helping around the school and engaging in the classroom. The Edison teachers believe that empowering him to use school spaces to meet his needs has helped his efforts to learn at grade level and to participate successfully in learning activities.

Carson Middle students are free to move among learning spaces whenever they want and select the place that best suits their needs at the time, but here the norms and purposes are more articulated, particularly with designated quiet spaces. Each school designated some spaces for quiet study. The Delaney Middle School principal noted, "what we've found with open spaces is you still need quiet areas to focus." The culture in each school is strong enough that we saw evidence of students monitoring and enforcing the social norms of their learning spaces.

One Delaney student reflected, "the flexibility helps kids to be able to learn better and then get things done by those deadlines because they don't, they're not restricted to that learning style, and they can go out and learn things on their own and they can tie it back and they can get assignments done by the deadlines." Flexible space is an intentional design factor in IPL schools because it creates the space to enact personalization pedagogy. In observations of how students exercised agency over the time and space of learning, we found that the formula "failure + flexibility + feedback" described a strategy to lead students to take responsibility over their own learning.

C. Agency over the Content of Learning

A key principle of personalized learning is for student interest to inform the content of learning. The emphasis on student control over the topic and direction of learning helps distinguish personalized learning from, for example, individualized learning or differentiated instruction (for a more developed discussion of the differences among personalization, individualization, and differentiation, see the National Education Technology Plan, 2010, p. 12, and Bray & McClaskey, 2013; table). Both individualization and differentiation tailor learning to student needs and abilities, but do so *for* students. The choice over the means (activities) and goals (outcomes) of personalized learning is done *by* students. This preference of *by* over *for* learners is a defining aspect of personalized learning.

The challenge of designing learning by learners, instead of for learners, is located in a tension between schooling and new media. The tension is found in the opposition between *interest-driven* and *standards-driven* learning outcomes. In traditional progressive school models, learning is organized around student interests. Students participate with similarly interested learners, or "affinity groups," in order to master the ways of the "discourse communities," in which competent actors think, speak, and interact (for a compelling discussion of the concept of an affinity group, see Gee & Hayes, 2009). Interest-based learning expands this by exposing learners to new discourse communities to master, inviting learners to acquire new interests and opportunities for mastery.

Standards-driven learning, on the other hand, is organized in terms of what schools, professional organizations, policy makers and others think that students "ought" to know. Schools are held accountable for the degree to which learners master the content guided by standards. Students typically have little input in the development of what is considered worth learning in a standards-driven environment. The work of educators is to develop learning

environments and practices that persuade students that the standards-based learning is really in their interests.

In our study, we experienced a range of strategies for how IPL schools invited students to help determine the content of their learning. The general tendency was for schools to distinguish between student control over choosing the *means* of learning vs. the *goals* of learning. Most schools allowed a wide range of student choice over the means of learning—over the activities that filled the daily student schedules. However, most schools determined the goals of learning. This balance allowed schools to design for interest-based learning in student choice over the means, and standards-based, school-determined control over the ends of learning.

What does it mean for students to have a choice of means, but for schools to have a choice over ends? When considering how traditional schools structure choice, students typically have some control, with their families, over the kinds of classes they would like to take (required course vs. electives), and, at a more basic level, the kinds of schools they attend, and whether to participate in the learning activities provided by that school. The IPL schools presented several additional dimensions of choice over the content of learning. These were bounded by parameters –or fences–that were defined by pedagogical commitments of educators in the school. This freedom within fences was expressed in two dimensions: *daily activities*, and the more elusive choice over the *outcomes* of learning.

Choice over the daily activities of learning. All IPL schools presented examples of how students organized the daily activities of their schedules. IPL students were observed designing learning pathways—the means through which learning goals would be accomplished. Even when targets were prescribed, students in personalized learning environments exercised some control over the design of their learning pathways.

Anderson High students get a "menu" of activities at the beginning of each week. Students use a computer-adaptive curriculum program to organize a variety of pathways toward learning targets. Students do not have a choice about the required activities, but they are able to choose the order in which they complete prescribed objectives. One educator described how "it's like going to a restaurant: What will you have? You have to eat everything by the end of the week, but what will you have today?"

Edison Elementary students are given weekly learning targets on Google sheets, and then they decide for themselves how to sequence the work. They can elect to attend seminars if they believe they need extra instruction or support on a topic, work in small groups, or work independently on computers or through individual study. Edison teachers monitor their students' productivity and steer them in productive directions when necessary. We saw one student sitting on a couch and acting unsure about what to do. The teacher suggested that he should, "reread the story, and highlight it, so you can come to seminar ready." These interactions between agency and guidance allow students to establish a network of support to make their decisions.

Carson Middle students also have control over the order and social aspects of daily learning activities. While there are some required activities throughout the day (all-school meetings, silent reading time, etc.), there is also a large amount of free-choice time. Students can decide if they want to work on their tasks independently or in small groups. Collaboration can range from simply asking peers for their opinions, to discussing content with the aid of whiteboards, to producing a product together. But Carson students also recognize the standards-based boundaries. During an interview, two students discussed where their agency comes to the fore during their learning processes:

> *Student 1*: You still have to follow the standards for Common Core.
>
> *Student 2*: So, for example, in science and social studies we are all doing the same things. We all take the same tests and basically do the same assignments. Um, the freedom that we have in it is the resources we use, and then if we do any projects like a presentation, for example. We get to choose what aspect of that unit we want to explore more into.

As one teacher explained, while most students follow the teacher-selected curriculum, there are alternatives for students who don't feel like the options suit their needs. Choice over the nature and sequence of learning activities is seen as an important step toward helping students take agency over their work.

Choice over outcomes of learning. IPL students may have some choice over learning activities, but, as they are still public school learning environments, standards continue to rule over learning outcomes. The accountability policies of the past 20 years require schools to organize learning in terms of content standards. Mandatory standardized tests for public school students also reign in the world of personalized learning. Each school in our sample regarded state tests as a required metric of quality for all students. The Northwest Evaluation Associations' *Measures of Academic Progress* (MAP) is used across the schools as a tool to provide just-in-time measures to inform a variety of decisions about designing the student learning program. Anderson High, for example, used MAP to admit students into its personalized learning program, group students for learning activities, assess the progress students were making, and determine when students could return to the mainstream academic program.

Outside of literacy and math standards, however, students have more choice about their learning outcomes. In many schools, science and social studies classes can be repurposed by educators to serve as further occasions for students to develop basic literacy skills (e.g., Au 2007). Some IPL schools used these subjects, along with the arts and business, as opportunities for students to design their own learning outcomes.

Carson Middle students, for example, have freedom to choose the means and the goals of their learning with their 20% project (modeled after Google's successful program by the same

name[3]). We observed an assignment where students were invited to develop new media representations in their 20% project. Students talked about their choice over representing outcomes:

> *Student 1*: "You get to choose how you present it, like some people make like a musical, or they did a play to kinda show what they had done."
>
> *Student 2*: "And people can make a presentation, a poster—"
>
> *Student 3*: "A model—"
>
> *Student 4*: "Anything!"

They are tasked with making a difference in the community by finding a way to complete this sentence: "Wouldn't it be cool if…?" and have control over their choice of topic, research methods, and summative presentation so long as the project is connected somehow to or with an external community partner. When one student at Carson talks about his 20% project, he gets excited about the process he's planned: "I'm building my own vending machine actually. And I'm modeling it first, and I'm kind of using a blueprint to model it out, and then I'm going to build it. I'm not going to go right into building, I'm probably going to model it, and then get all of my supplies."

Delaney Middle School students can choose the topic and format of long-term writing projects. One student decided to write about homelessness—an issue about which she is very curious—and plans to send her essay to the government office to request action on her findings. Delaney students can choose a world culture/art or business pathway and design a project to achieve the learning goals they specify. They then partner with someone from the other art/business track. Each group is given resources to produce a tangible product. They then pitch their idea to a community of entrepreneurs. The project ensures that students see their initial interests to fruition and enables them to experience what it is like to turn an artistic inspiration into a marketable product.

Balsam High School comes closest to an interest-based learning goal model for students. All Balsam students choose the path and the proficiencies for their learning. Students consult with teachers to maintain an e-portfolio that allows them to organize the kinds of expertise they need to achieve their learning goals and to assemble a coherent selection of proficiencies that serve as graduation outcomes. Balsam students not only select from available seminars, they also work with teachers to develop seminars that can be taught by teams of students and teachers. This flexible approach to "what needs to be learned" reflects the Balsam approach to student agency over learning outcomes.

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[3] For a brief overview, see http://www.nytimes.com/2007/10/21/jobs/21pre.html?_r=0; and http://www.iteachithink.com/2012/07/give-your-students-20-time-to-do.html

Even at Balsam, though, standardized proficiencies in math and literacy are required. Balsam teachers work with students to seamlessly integrate the required outcomes into interest-based learning trajectories. For example, a math, an English, and a social studies teacher developed a seminar in gamification—using the principles of game design to make other kinds of social activities engaging. One student, who had been struggling with the program, used his passion for massively open online gaming to engage in the new course development. Through calculating the background models for game success (e.g., theory-crafting; for a discussion of theory-crafting, see Choonatanom & Nardi, 2012), the student was able to advance toward his learning proficiencies as well as make progress toward his Algebra 2 learning goals. These kinds of collaborative practices help Balsam educators and students balance student interest with required school outcomes.

IPL educators develop learning environments that encourage student agency around the time, place, pace, space and outcomes of learning. As public schools, however, IPL educators continue to take responsibility for guiding students toward socially required outcomes. All learning environments have features that can be used to enhance or to diminish learner agency. IPL educators see the design challenge in terms of how to use the environment to develop a culture in which learners can take control of their learning process.

Question 2. How Do IPL Schools *Shift the Role of Educators* to Support Personalization?

Personalized learning opens up new possibilities for the role of teachers in student learning. The pedagogical commitments of personalized learning require teachers to reframe their role from presenters to facilitators of information. When teachers help students design personalized learning plans, their role is to support learner efforts to assemble meaningful learning opportunities, and to guide students toward the ability to make good choices about their learning. This is not to say that teachers abandon their conventional role as presenters of information. It does suggest, though, that teachers use their time for presentation as a complement to student efforts to organize learning activities, rather than the main event of classroom activity.

The issue we explore in this section involves the changing role of the teacher in personalized learning schools. Our research led us to a key insight about a change in the relation of teachers and students in the IPL schools—the role of *consultation* in the design of the learning plans and goals.

Consultations with Students

Our research with the IPL schools points to an intriguing new development in how teachers use data to inform instruction. In the past decade, teachers were able to integrate new sources of information *about* students into learning plans *for* students. The IPL schools are beginning to provide evidence that teachers are using data to construct learning plans *with* students. This shift from planning *for* students to planning *with* students is consistent with our observations about the IPL schools commitment to spark student agency in the learning environment.

We observed teachers consulting with students to design learning plans. Each school implemented some form of one-on-one conference or advising time that resulted in—and was then guided by—a personal learning plan.

Each Carson Middle student meets weekly with a teacher. The discussions range from progress on learning goals to problems with particular assignments. Other teachers in the program can leave notes for the advisor to talk through. The advisor documents the conversation in a Google doc and helps troubleshoot issues and guide students. The consultation concludes with a revised set of instructional goals for the student to achieve that week—which serves as the personalized learning plan.

Edison Elementary teachers have daily data meetings to review running records, high frequency words, and skill mastery, along with approximately five other indicators. Consultation focuses on presenting the results of these meetings to help students reflect upon progress and design of learning goals. Edison teachers call this time "conferring" and emphasize that it is at the heart of developing the student-teacher relationship. One teacher explains that conferring is the place where "students construct individual goals, and they can work toward those goals at their own individual pace, so you can make sure … that this student understands a concept before they go on to the next concept."

Balsam High students have weekly consultations in their mentor groups, which include one-on-one talks with their mentor. Balsam consultation has a virtual component—the school instructional information environment—which tracks participation, portfolio contributions, scheduling and goal setting. In-person and online consultation supports students in making decisions on how to manage their time as well as allows advisors to document progress and flag concerns.

Consultations serve as opportunities for students to have more independent assistance with their work and get help from teachers at the students' level. These individual conferences also guide the students and teachers in deciding the pace and path of students' learning by working on their individual learning plan.

Data-driven Discussions

The data used in conferences in the elementary and middle schools were typically presented in terms of how teachers interpreted the information for student learning plans and goals. In the high schools, we observed more direct interactions between teachers and students around the learning data collected by educators in the school.

At Anderson High School, students review results of their MAP tests with educators. Students are expected to use their achievement data to structure the interaction with teachers (and parents) to explain their progress. Consultation at Anderson focuses on the continuous development of this data-driven portfolio, which eventually includes college and career documents, such as a resume, letters of recommendation, and personal essays.

Consultation at Balsam holds students responsible for interpreting and presenting the results of achievement data to educators. For example, the ALEKS computer-adaptive math curriculum program generates data on student progress. The math teacher teaches specific seminars on specific math content. Students work through ALEKS to show mastery. Students monitor their progress at their dashboard, which shows the amount of hours spent each week as well as how many targets have been attempted and accomplished. While the teacher uses the aggregate data in ALEKS to determine when to teach "mini-lessons" on the content, students interpret and present their outcome results as evidence of progress to teachers in consultation.

In each of these cases we observed how instructional planning is reframed as an activity with students. Further, as we observed in the high school settings, the same data used by teachers to measure student progress are also what students use to make a case for their instructional plans and progress. This is not to say that instructional planning unfolds only among teachers and students. Our conversations revealed that much of teacher preparation time is dedicated to organizing this collaborative work among students and colleagues around data.

Consultation served as a foundation for integrating formative assessment into the teacher-student interaction. A Balsam teacher talked about the sheer number of interactions over the course of the year that built this foundation: "[we have] lots of online conversations at [Balsam]: I would say it's a thousand conversations. Or even electronic conversations. If they're typing something formally on Google docs, I'm commenting and sending it back for revisions." In the IPL schools, the number of interactions around teacher-student consultation about the means and the goals of learning, as well as about data on progress indicators, is intended to shift the nature of the interaction toward helping students become equal partners in their learning.

Question 3. How Are *Learning Technologies* used in IPL Schools?

Each of the IPL schools used learning technologies to create what we called *socio-technical ecologies*. Instead of thinking of digital devices and programs as add-ons to an existing instructional program, each IPL school selected and integrated tools into a coherent approach to transform teaching and learning. In some cases, organizations were already moving toward new practices, and technologies extended the application of these initiatives; in other cases, the technologies themselves sparked new approaches. Mature socio-technical ecologies develop routines that allow actors to collaboratively focus on the work of the organization—in this case, teaching and learning—rather than on the features or limitations of the tools.

New media technologies played a central role in allowing schools to manage data, coordinate instruction, and open classrooms into the wide world of real-life learning opportunities. However, as we were consistently reminded in our research, these new tools could serve learning needs when situated in schools organized around powerful pedagogical commitments to personalizing learning for all students. As a Carson teacher explained: "technology supports the model, but it doesn't define it. This is a pedagogically driven innovation and technology helps manage the information and take it to scale."

As we discuss below, educators and students used these tools together to create socio-technical ecologies around personalized learning. At a general level, the technologies were used to organize independent student learning that created time and space for educators to engage in consultation and facilitation activities with students. The technologies, especially the computer-adaptive tools in math and reading, expanded the power of educators to provide meaningful differentiation in the classroom space. The technologies bought space and time for the kinds of customized learning activities that define quality-differentiated learning. In the following sections, we provide examples of how each kind of technology looked in practice.

In the socio-technical systems we observed, learning technologies served several key functions:

- a reliable network of **information management and productivity tools** to support the day-to-day work of both educators and students;
- **computer-adaptive assessment** and **curriculum programs** that individuated skill and content development learning in math and reading;
- **digital media spaces** to foster creativity in activities such as gaming, coding, performance, production and making.

A. Information Management and Productivity Tools

Like most 21st century organizations, the IPL schools were awash with digital technology tools. Each school had programs for student information, scheduling, productivity, portfolios, assessment and creativity, on a number of different platforms including computers and mobile devices.[4] Table 2 provides an overview of the tools that we observed in practice across the IPL schools.

There are several interesting insights about the range of technologies in use in IPL schools. The diversity of tools reflects a user-controlled (vs. vendor-controlled) marketplace in which IPL schools select tools from a variety of vendors for a variety of purposes. The availability of tools—many of them free to use—encourages educators to experiment with tools that meet the needs of teaching and learning. The peer communities in which IPL educators participate (facilitated, in part, by the IPL) also act as "recommendation engines" to consider the kinds of tools already being used in other schools. Finally, increasing platform-independence of many of these tools invites schools to develop a constellation of technologies where educators (and

[4] By and large, schools took the responsibility for providing technologies for learning to their students. However, three of the schools discussed Bring Your Own Device (BYOD) policies for students to use technologies from home to complement the tools provided by the school.

learners) can select the tools that fit teaching and learning needs. These tools complement and extend the environment the school can provide to support student learning.[5]

Table 2. **IPL School Technologies**

Productivity	Learning Management	Computer Adaptive Learning (CAL)	Assessment	Content
Google Docs	MyLC	Achieve3000	ACT Aspire	BrainPoP
Microsoft Office	Google Classroom	Odyssey	MAP	RAZ Kids
Notability	ClassDojo	Acellus	A+ Test Often	News-o-matic
Google Sheets	Remind 101	ALEKS	Pathbrite	Newsela
Google Form	Epiphany Learning	Think Cerca		YouTube
Google Presentation	Career Cruising	Core5 (Lexia)		Free Rice
Keynote	Project Foundry	Edgenuity		Coursera
Powerpoint		TenMarks		BuzzMath
				Discovery
Prezi		IXL		Techbook
iMovie		DreamBox		Everfi
Weebly Website		Khan Academy		

B. Computer Adaptive Assessment and Curriculum Programs

All of the IPL schools used some kind of computer-adaptive learning (CAL) tools. These have become popular in many schools as a way to provide quality instructional activities at the level at which the student is learning. CAL tools build on research in cognitive tutoring and learning trajectories to assess the current skill level of the student and provide instructional examples and suggestions that guide learners toward desired outcomes (for a review of the history and current applications of cognitive tutoring tools to support teaching and learning, see Dede, 2014 and Koedinger & Corbett, 2006; for a discussion of research on learning trajectories, see Daro, Mosher, & Corcoran 2011). Programs such as Achieve3000, DreamBox Math, TenMarks, ALEKS Math, and Khan Academy all use aspects of CAL research to create engaging learning pathways for students. Automating the instructional trajectory allows students to progress at their own pace in a customized learning space.

CAL and differentiation. The schools use of CAL tools in everyday practice reminded us of a next generation of differentiated learning practices. Differentiation emerged as an instructional

[5] A further research question would be to document the tools that educators and learners use that may not be supported explicitly by the school. New media learning is marked by the ability of learners to design their own environments from the social media, information, making and communication technologies used in everyday life. In a traditional model, the schools are responsible for supplying the learning environment and resources for students. In new media environments, successful learners assemble their own learning environments out of tools both provided by the institution and available in general circulation. It would be interesting to know the kinds of tools learners use to complement what schools provide in personalized learning environments (maybe in comparison to students in traditional education environments).

strategy in the 1990s to meet the different learning needs of students in an inclusive environment. However, effectively implementing differentiation in classrooms stretched the ability of many teachers to adequately assess and address the wide variety of learner needs in the design of everyday lessons (for a discussion of the research on differentiation as an instructional strategy, see Subban, 2006; also see Delisle, 2015 for a discussion of the difficulties of successfully implementing differentiation in classrooms). IPL schools primarily used CAL tools to create autonomous "learning stations" in classrooms where some students would engage in self-directed activities while others worked directly with teachers (or with one another). In effect, CAL technologies allowed teachers to offload some of the diagnostic and instructional demand for differentiating learning onto programs designed around students' demonstrated needs. This usage led us to think of CAL integration as a new form of differentiated instruction that engaged students in technology-driven learning activities as a method of providing quality learning experiences while redirecting teacher attention to students with other learning needs.

In several of the IPL schools, students would use CAL programs to create learning pathways in math or reading, and accessed the programs during the school day (and often at home) to practice core skills. The CAL system tracked student progress and reported to both students and teachers about where students struggled and where they were succeeding. Educators could then use time freed up by CAL programs in several ways. Sometimes when teachers noticed that many students were struggling with a particular concept they organized a lesson to discuss the idea. Other times teachers used the time students spent on CAL programs to engage in consultation with other students.

Several IPL teachers spoke about the power of CAL tools for teaching. One Balsam teacher said, "for every teacher that gets concerned about the role of technology, I would say that actually the technology makes the teacher more relevant and more valuable in the class, not less." Providing diagnostic information on trends in student understanding allows teachers to focus on where help is needed by spending teaching time actually teaching relevant content and then allowing students to work through the program toward mastery. Using the CAL tools meant that some teachers did not spend as much time creating tests or grading. Students used data from the system to monitor progress at the program dashboard, which shows the amount of hours spent each week as well as how many targets have been attempted and accomplished.

Limits of CAL tools. There were limits to the effectiveness of using the CAL programs as stand-alone learning tools in the IPL schools. First, CAL programs only existed in certain subject areas. In our observations, CAL programs were used most widely in math, with several programs (Achieve3000, for example) used in reading, but few options for content areas such as science, social studies and the arts. The limited scope meant schools that relied on CAL programs as primary learning technologies taught without analogous tools in other subject areas.

Another limitation was on the depth of instruction. A Delaney student said that the CAL program "skims the surface, it doesn't go as in-depth as the teachers would like. Teachers use [it] to determine what they are going to teach, they go in-depth with it." Other educators felt that the

programs were good for review and skill development, but that the real teaching and learning needed to happen outside the CAL environment. We consistently found that educators used the instructional applications as starting points of learning. At Balsam, the science teacher introduced the basic concept of the lesson first, and then used questions like "What have you got so far," "Are you on the right track," "Let me read what you have so far" "Okay, try this, go into this classroom—you're skirting the whys and hows that I want you to get to." (We saw similar examples at Carson, Edison, and Delaney.) The CAL technologies were often used to set up situations for in-depth learning of both content and the learning process itself in which both educators and students could work in their zone of proximal development. In these cases, teachers were able to differentiate their instruction by drawing on a more nuanced understanding of what their students knew and where students needed to be challenged.

C. The Next Frontier: Digital Media Spaces

IPL schools also provided student access to new media design and distribution of tools such as iMovie, YouTube, Keynote and websites that helped students structure and distribute creative work. However, we did not observe many occasions where students were engaged in activities organized around media production and distribution. These activities appear to be on the horizon of the personalized learning environments we observed and may point to a future state for learners to truly direct their own learning in self-organized social and technical worlds.

Such a future may be distant for any school—even personalized learning schools. But this future is alive and present in learning environments outside of schools. Many technology enthusiasts use the ideas of *participatory cultures* and *new literacies* to describe these exciting learning spaces. Participatory cultures characterize the forms of social interaction that often arise around engagement with new media (see Jenkins, Purushotma, Clinton, Weigel, & Robison, 2007). These cultures are self-organizing communities that serve the interests of members:

> with relatively low barriers to artistic expression and civic engagement, strong support for creating and sharing one's creations, and some type of informal mentorship whereby what is known by the most experienced is passed along to novices. (p. 3)

Participatory cultures typically develop around entertainment media such as video games, fan fiction, fantasy sports, social media, maker spaces and media production and sharing environments. Successful participation inducts learners into new practices, knowledge and values that come to form an aspect of the identity of learners. Successful learners become adept in new literacies that emphasize production and communication as a pathway to grammar and vocabulary development (see Lankshear & Knobel, 2006).

Both participatory cultures and new literacies rest on the concept of *interest* as the primary motive for engagement. Learners invest in new cultures to learn how to think, create and interact in ways that allow them to pursue their interests. Although many of the IPL schools allowed for some forms of digital media production, many of these activities were at the margin of the school's effort to cultivate traditional literacy and math learning. In part, this resulted from the

prevailing school interest in guiding students to succeed on the same standards-based tests used by all schools. It is difficult to form participatory cultures in schools where learning is defined by standards, where learners ultimately have little input into the overall goals of their learning.

Digital media and assessment. Assessment of learning was one area where we saw student engagement with new media tools across schools. In each school, we observed students choosing how to represent their understanding (in certain assignments). Many students chose new media technologies to make their learning visible. Their ease of use of sophisticated programs allowed even elementary school-aged children to record, produce, and broadcast video and to create websites as assessments of learning. For example, Edison Elementary students were observed creating videos with iMovie and websites with Weebly. A Carson teacher describes this new media approach to student self-assessment:

> We like them to be as creative as possible, and that's—that's a process that gets developed with them as well. When they first come in, pretty much all of them do PowerPoints.… And then we gradually start to get kids who want to push the bar more, as far as what they want to do. We've had a couple students who have really challenged us artistically with the way that they do things.… In the end, they'll always have the option to do something different than what we give them. So if I gave them the comic book and they really didn't want to do it, totally fine with that. They can do it some other way. *The idea being as long as we can judge it by the same rubric, totally fine with that.* So we get kids who will push the bar a little bit more. Some of them are really comfortable and fine doing a traditional assessment, which is fine too. (Emphasis added.)

This quote illustrates how, in assessment as well, personalized learning teachers sought to balance standards-based demands of schooling with the interest-based motives of personalized learning. Digital tools provided students with a range of media to express their understanding, while the quality of the representation is measured by the standards-based rubric.

Balsam's participatory culture. Balsam High School came closest to encouraging learners to use digital media across the school to engage in participatory cultures and learning new literacies. Balsam is an arts-based school organized around seminars aimed at developing a wide range of proficiencies. Balsam students begin by selecting a focus of interest: writing, performing arts, music, or art. This focus becomes more narrowed to the student's specific interest as they progress. In consultation with their teacher mentor, students pursue their required competencies by signing up for a variety of seminars. Even within teacher-designed seminars, students are encouraged to set proficiency goals that meet their unique needs in the context of the course.

Every seminar promotes students to pursue social and technical learning activities. Most of the language arts, social studies, and arts classes give students a wide range to explore their creative interests. Customization occurs at the individual, classroom, and school level. One Balsam student describes how

> people here actually have a passion for what they're doing. And the way the classes are created, it's so that the students are all interested in what's actually happening. We're allowed to suggest things for seminars. I went with my family and saw the Kofi dance company, and I mentioned it to one of our teachers, and now they're doing a seminar next series!

Students have input in not only their own assessments but also in course offerings and how the school operates as a whole. Students organize their work and coordinate feedback with mentors through the MyLC learning management tools that track plans, goals and achievements. Balsam teachers use the MyLC tools to check in with students to determine if they've developed their own timeline, designated their final project, and are making progress. Teachers and students value developing students as agents in the design of learning plans that involve students and tools in a socio-technical community.

Is the learning environment at Balsam a participatory culture? In many ways, the Balsam learning environment reflects the central themes of participatory cultures. Participants engage in social interaction around shared learning goals that reflect the interests of the learners. Production in terms of the goals of the seminars is rewarded as successful students become known as valued members of the community in the school. Beyond the CAL model, learning is defined at Balsam in terms of participation in a larger culture and acquiring new interaction proficiencies.

There are two key differences between the learning environment at Balsam and authentic participatory cultures. First, the requirement that students weave topics (such as math competencies) into their learning plans suggests that the ultimate control of learning goals still belongs to the system, rather than the learner. Second, the learning communities at Balsam are internal to the school. The wide-ranging, multi-age and multi-ability cultures of, for example, massively multiplayer online games and citizen science, stretch far beyond the walls of a particular classroom to include incredibly diverse participants from around the world. Constraining the learning environment in terms of outcomes and location positions the Balsam environment on the way toward, but not quite in, the world of participatory cultures. Genuinely learner-directed participatory cultures seem still beyond the reach of the personalized learning designs of the schools in our study.

Conclusion

This report documents several aspects of personalized learning in practice at five public schools. We found that educators in the IPL schools sought to create cultures of agency among students, engaged in regular consultations with students to collaboratively establish learning plans, and developed socio-technical ecologies that integrated learning technologies into the everyday practices of teaching and learning. We were impressed with the dedication and skill of the educators in the IPL schools, as well as the abilities of the students to speak about their roles in their own education.

The idea of balance, of freedom within fences, pervaded the data we collected across the schools. Each school seemed to understand itself as living in two worlds—the world of standards-based education where teachers and students worked together to achieve state and district mandated learning outcomes, and the world of interest-based learning where student agency contributed to organizing the time, space, means and (sometimes) the ends of learning. Each school worked toward building the capacity for student voice and choice—a culture of agency—that was supported by the design of technology-rich learning spaces. These schools included many of the characteristics of traditional public schools—disciplinary learning, school information systems, teacher evaluation, special education and behavior management issues. However, our brief visits enabled us to begin to understand how a powerful pedagogical vision of high standards and student agency was helping transform these traditional school features into an exciting approach to the design of learning environments for all students.

Because this is a preliminary study, there are many limitations to our conclusions. We need to spend more time in each school and to find the educators and students who did not experience success as well as those who benefited from personalized learning practices. We will need to ask further questions such as:

- How do teachers assemble technologies and resources to create the personalized learning environments?
- How (and whether) the practices of personalized learning benefit students who traditionally struggle in schools?
- What is the relation between personalized learning and initiatives such as special education, Response to Intervention and Positive Behavioral Interventions and Supports?
- What is the role that the regional change agent (IPL) played in shaping local school practices?
- What are the political costs of large-scale implementation of personalized learning in traditional schools?
- What are the ways in which students experience their education outside of the school setting?
- What is the role of the arts (and more broadly, informal learning spaces) in the design of personalized learning?
- How can we prepare and support teachers to facilitate personalized learning?
- How can we support personalized learning students to succeed at the next stages of their schooling?

Most importantly, we will continue to pursue the relation of each of the practices we identified to improving student outcomes—both in terms of standardized test performance and other measures, such as persistence in school and non-cognitive measures, that shape the learning outcomes for students and educators in IPL schools. We will continue to refine the practices identified here into indicators that can be correlated to performance measures and used as a guiding model for schools on the pathway to personalized learning.

The dream of many educators—in and out of schools—is to adapt the power of new media technologies for learning to the day-to-day practices of schools. This dream has looked quite distant in recent years. In his book *The Anti-Education Era* (2013), James Paul Gee is not optimistic about the potential of schools embrace the potential of new media learning tools. Gee argues that the school tendency to adopt technologies that optimize learning to meet existing system goals—from data management systems to cognitive tutors—creates increasingly artificial education spaces where students learn to avoid the challenges of tangling with ill-structured problems and open-ended collaboration so vital to 21st century learning.

Gee noted how the appropriation of digital media technologies in the early 2000s seemed to lead schools down a path where the system goals (e.g., improving outcome scores) outweighed the value of using technologies as learning tools to face bigger social problems. While the schools in our report continued to use technologies to optimize standards-based learning outcomes, throughout our study we saw evidence that the kinds of self-directed, socially engaged habits of learning so desperately needed to address the messy social, political and scientific questions of our time can indeed be cultivated in our public schools. We look forward to continuing the research so that we can both trace these practices in depth and communicate them in ways that allow educators and students to chart a hopeful course for the future of education.

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Appendix

The results we present here are from the pilot phase of a 2-year study designed to document what personalized learning looks like in practice. The study is supported by the University of Wisconsin–Madison School of Education and the Joyce Foundation, and is designed to document teaching and learning practices in 18–24 personalized learning schools locally and across the country.

In this pilot phase, our research team visited five personalized learning schools between February and May 2015. Schools were identified by peers and a regional network for their implementation of personalized learning practices. The schools were chosen to represent urban and suburban settings and included an elementary school, two middle schools, and two high schools. All were public schools, one was a program school (a school within a school), and two were public charter schools. The school-within-a-school model had only a few fulltime equivalent (FTE) teachers while other schools we studied reached more than 70 FTE, in addition to numerous part-time, support, and administrative staff.

We spent 3–4 days in each school, getting to know the people and practices that shaped day-to-day teaching and learning. Over the course of the pilot, researchers observed 22 classrooms and conducted 23 interviews with 33 students and parents. The data we collected provided a snapshot of the typical organization of practices in each school. Table A1 outlines the types of data collected by our team to date.

***Table A1*. Data Collection from the Five Study Schools**

(Pseudonyms)	**Teachers Interviewed**	**Leaders Interviewed**	**Students interviewed**	**Observations conducted**	**Parents Interviewed**
Anderson HS	3	1	-	-	-
Balsam HS	1	2	2	6	-
Carson Academy MS	4	1	9	8	5
Delaney Academy MS	2	2	4	3	1
Edison Elementary	5	2	8	5	4

Interviews were conducted using a semi-structured interview protocol focusing on practices at the participants' respective level. Observations were conducted using an observation protocol. Data collection is ongoing. The goal is to conduct more interviews with parents and students and more observations in each school.

The research team developed 1,199 pages of field notes, transcriptions, descriptions and graphics of our visits, which were compiled and coded in the MaxQDA qualitative data analysis system. Data was initially coded to examine practices at the student, teacher, and school levels.

From this data we looked for emerging themes to identify distinguishing characteristics of personalized learning environments. The initial coding was guided by our Personalized Learning Framework document:

At the *Student Level*, we coded for:

- the **agency** students have for their work (to what degree is the work designed *for* learners or *by* learners?);
- the features of the **student personalized learning plan/profile** (how is it developed, refined and assessed?); and
- the degree to which the learner activities are guided by **student interests** or the **outcome requirements** of the school instructional program.

At the *Teacher Level*, we coded for:

- how teachers know **students have achieved learning goals** (how do teachers balance *summative* and *formative* assessment, and what role do student *representations* of their work play in assessing learning);
- the degree to which teacher work enacted as **instruction** (direct presentation of material to passive student recipients) or **facilitation** (guiding students through self-directed inquiry); and
- the degree to which teachers engage in **collaborative planning, teaching and assessment** with colleagues in and out of the classroom.

At the *School Level*, we coded for:

- The role that **learning technologies** play in facilitating learning in and out of the classroom (the role of 1:1 initiatives; learning management systems; computer-adaptive testing and curriculum systems; virtual environments to design and share student work);
- How new teachers are **hired, trained and inducted** into personalized school programs;
- How teachers engage in **professional learning activities** within and outside the school; and
- How the construction of the **school master schedule** for teachers, students and spaces affords or constrains personalized learning activities.

At the *Community Level*, we coded for:

- How **district policies** afford or constrain personalized learning efforts;

- How **regional organizations and/or professional associations** influence local personalized learning initiatives; and

- How **parent** and **business communities** perceive the advantages and disadvantages of personalized learning schools.

This discussion was drawn from this initial pass through the data. The findings that we present will form hypotheses for the next phase of the study in which we explore the degree to which the inferences made here characterize the practices of the larger sample of schools.