

## **Case Study of ePortfolio: Design Activity to Build an Instructional Core for Evidence-based Practice**

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### **Introduction**

The push towards ambitious teaching and learning requires an *evidence-based practice*. That is, schools leaders and teachers regularly consult data about teaching and learning, make decisions and develop strategies for instruction based on the data, and use the data to track their progress and that of their students. This concept is easy to accept theoretically, but what does it mean at a practical level to develop a culture of evidence-based practice in which tools, shared language, processes, and expectations are developed and integrated into the essential fabric of a school?

Through a case study analysis, we argue that a collaborative design process can be instrumental in bringing evidence-based practice into concrete form in ways that engage school leaders and staff in a process of change. Design activity can raise questions and facilitate conversations in which participants must identify priorities and contend with differences in values and goals in order to move forward. Furthermore, as new tools and practices are introduced into the existing school culture, the practicalities of using evidence in practice are pushed into much sharper relief. Typically, new time demands are created, routines and role expectations are challenged, and characteristics of the existing instructional infrastructure are revealed. School leaders play an immensely important role in the process by setting direction and priorities, tracking and reflecting on the work as it proceeds, and redirecting action as needed.

As a case study of on-the-ground collaborative research and development to introduce innovations that promote the use of evidence in teaching and learning, this study contributes a perspective that views design as generative in multiple ways. Design activity can lead to the creation and use of new innovations that work, but it can also catalyze a reflective process that generates cumulative insights among school leaders and staff. These insights can make the long-term enterprise of organizational change towards evidence-based practice manageable.

### **Case Overview**

In this case study, we present our initial design and development work on the ePortfolio tool that began in early 2004 and look at some key events that occurred in the two years that followed. We describe this work as it occurred in three stages based on diverse forms of documentation: structured interviews with school staff, design records, design review documents and notes, correspondence records, and field observations. We used this data to construct and interpret the course of events around the ePortfolio project from January 2004 through May 2006. Our

retrospective analysis draws primarily from our distinct roles: tool designers, school principal, and teacher leader. It focuses on the following questions:

1. What were the explicit problems of practice driving the design activity?
2. What were the tool design features? What were the plans for introduction and use?
3. What evidence and/or insights were generated?
4. What subsequent actions were catalyzed through this process?

By understanding the problems of practice, design rationales, insights, and actions as they unfolded over this time period, we are able to reflect on what we have learned about creating evidence-based practice in schools and the roles that design activity can play.

To provide context for this case, we introduce the principal actors in the design activity and describe the state of standards, portfolios, and assessment in the school in years prior to the ePortfolio work. We then describe and discuss three distinct stages of design activity, the insights the activity yielded, and the actions that followed from these insights.

### **Principal Actors in the Design Process**

The ePortfolio design process began in the winter of 2004. A core group of three people, a senior teacher, the principal, and a designer from the Information Infrastructure System (IIS), led the design process. Each played distinct roles at different times in the process and each brought ideas and skills to the process that shaped the effort in important ways.

**Informal School Leader.** Judy joined the teaching faculty at Charter School in 1999. She was an experienced teacher who had engaged in a variety of school improvement initiatives and instructional reforms, at the school and district level and in collaboration with the university community. Through these experiences, she developed a sophisticated understanding of the role of standards and assessment in instruction. She described herself as having "a better sense of what it [standards-based instruction] meant at a time when I am not even sure the board [of education] and state were clear on what standards-based meant." Her understanding of and belief in standards-based instruction gave her a sense of purpose at Charter School beyond teaching her subject area:

*I have an avocation for the whole standards-based movement and fear that because of misunderstandings, not just here, but throughout the whole world about what it is, that it is going to be thrown to the side of the road like so many other educational things and I truly believe in it. So I think that is my passion.... I really have invested in helping, wherever I could, the school move forward with this (May, 2004).*

Judy participated in efforts early in her tenure at Charter School to engage teachers in developing standards for student learning. A year later, she accepted leadership of the school's portfolio committee. She was the point person at the school when the design work for ePortfolio got underway, articulating for the IIS designer the school's goals for portfolios and communicating a vision of important components to include in the design.

**Formal School Leader.** In 2004, Stacy was in the first year of her principalship at Charter School. She had been on the teaching faculty the previous two years. As a teacher participating in a curriculum mapping effort, Stacy witnessed the development of a product—a curriculum map—that

teachers subsequently did not use. Citing this experience, she reflected on the important role the school organization played in teachers' use of an innovation:

*The practices need to be in place or supported on the school side...to actually take something concrete and put it into action, to make use of the tool. And either time needs to be provided within training or [professional] development that says, 'Okay, this is important and let's look at this and figure out how we implement it,'...or there needs to be push from the school side that somehow integrates the product into the work the school does. It can't be seen as something additional on this side, and with the curriculum mapping piece, once it was done, there was really nothing that brought us to pull it out of the drawer (June, 2004).*

Stacy kept herself apprised of ePortfolio's development and provided feedback to the IIS designer, but her primary role was to focus on what the school needed to do as organization to make the development of the tool possible and to prepare teachers to use the tool in productive ways. She orchestrated resources, planned professional development, and supported and pressured teachers as needed.

**External Agent.** Initially the rapid prototyper for IIS tools, Denise worked on design teams for two other tools before taking the lead on ePortfolio. These experiences focused her attention on clarifying the problems of practice that a tool was to address and understanding related work tasks in detail. Her first-hand experiences designing tools and her participation in IIS research and development team meetings also meant that Denise was well acquainted with a principle the IIS group used to guide tool design. This principle, referred to as "*the visualization is the analysis*," is explained by one of the IIS leaders:

*In a simple sense, good visualizations tell a story, as distinct from a lot of management information systems, which organize a lot of data and give people tools for manipulating data and doing statistical operations on it, which tend to produce more numbers. But then you are still left with the impression of, 'Well, what do I do with this?' How do you analyze it? How do you display it? ...Everything in the display is there for a reason. But the reason is [that] there is a problem of practice that this is supposed to inform and draw your attention to. In that sense, we say that the display is the analysis. What does the display draw your attention to? And there is also the flip side of this. Often times, ...the graphic has embedded in it a distracter. It leads you to the wrong conclusion. So what you end up paying a lot of attention to is [whether] there a way to misread this. So what about this could confuse people? (2004)*

Denise had a wealth of experience creating displays to guide individuals through work tasks and the use of evidence related to larger problems of practice. Further, she had a Learning Sciences background that enabled her translate ideas from teachers' work to functional technology. Denise initially saw her role as listening carefully to Judy and Stacy, as well as others who played a role in the design, to understand where computer technology could assist them and to create prototypes that clarified their ideas in visual form. This clarification helped lead to reflection and action at the school level about the work the faculty needed to do to prepare for use of the tool.

A number of people beyond this core group participated in the design of the tool. These included the lead designer for the IIS, members of the IIS research and development group during tool design

reviews, and teachers at Charter School who tested the tool and provided feedback about how it could better support their work.

### **Base State of Standards, Portfolios, and Assessment at the School**

The ePortfolio design process unfolded within a school context where there had been previous efforts to establish the use of standards and portfolios. We describe these efforts to provide insight into the conditions at the school that led to and also shaped the design process and initial implementation efforts. This account is recreated largely from Judy's perspective, in part because Judy was a first-hand participant in the various efforts. However, Judy's account also conveys a vision of a system for managing instruction that would strongly influence ePortfolio's design and the school's efforts to engage teachers with the system.

### **Standards for Student Learning**

Three years before the design work began on ePortfolio, an early effort to engage teachers with standards for student learning at a staff retreat "fell flat on its face." Teachers had been asked to write standards for the school based on a model developed at the national level<sup>1</sup>, but they did not engage in this work as expected. Judy explained, "It was just taking people too far, too fast, because...there was no history of talk around standards (May, 2004)."<sup>2</sup> She meant that the school had not yet made a serious attempt to build a curriculum around the standards. She attributed this in part to a misconception that a standards-based curriculum was a structured curriculum<sup>3</sup>, which conflicted with the school's focus on project-based learning. By the time of the retreat, she believed the school leader at the time had come around to seeing the value of standards and supported their introduction, but teachers were less receptive.

**Loosely coupled "standards."** Over the following year, the faculty focused on producing "exit standards" for each cluster<sup>4</sup>, primarily in the area of literacy, the core content area for the school. Judy described the exit standards as a "list of expectations of what people [i.e., students] should have" leaving a cluster. Categories defining broader concepts, knowledge, and skill areas that students should learn in particular subject areas across grades were a critical missing piece. These categories would have allowed teachers to examine the exit standards they had written in terms of larger goals for student learning, for example to identify areas the exit standards did not address. They would also have supported cross-grade conversations about the curriculum, potentially leading to greater curricular coordination. Although lacking structure, the exit standards were useful to individual classroom teachers because they were specific enough to guide their instruction and they served as an easy checklist of what students needed to learn and do before they proceeded to the next cluster. Thus, for teachers, the exit standards were a meaningful reference point.

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<sup>1</sup> *New Standards: Performance Standards and Assessment for the Schools*, National Center on Education and the Economy, 1998.

<sup>2</sup> All Judith Whitcomb quotes in this section are from a May, 2004 interview.

<sup>3</sup> In Chicago, the district had been encouraging use of structured curricula, which were curriculum manuals with detailed lesson plans that teachers were expected to follow lockstep.

<sup>4</sup> The school was organized into clusters where each cluster represented two consecutive grades.

**Underlying school norms.** According to Judy, one of the obstacles to teachers' full engagement with the logic of the standards was that teachers were "confused." Indeed, the logic of standards counters a normative view in schools—in part fostered by the traditional isolation of the classroom teacher—that decisions about instruction fall primarily within the purview of the individual teacher (Elmore, 2000). At Charter School, teachers were organized to support collaborative work through regular cluster-level meeting time and shared space. Faculty members participated in regular structured professional development opportunities to focus their attention on improving instruction for their students. However, elements of a teaching culture focused on individual classroom practice and preserving teacher discretion were present at the school, co-existing with elements of the school's professional community. As evidence of this, Stacy frequently encouraged the staff to be explicit about their expectations and how they evaluate student work and made this a theme of the school's professional development. Both she and Judy commonly remarked that expectations and assessments should not only be in teachers' heads.

Judy concluded from the initial attempt to engage teachers with standards that teachers needed to get "comfortable looking at and figuring out, 'How do I use the standards, and what do standards mean in terms of aligning the curriculum in a building?'" For Judy, the standards represented a shift from a private, individual practice to one that was open to view by others, i.e., a public practice, and shaped by collective goals for learning and collective decisions about instruction. She believed the shift required that teachers experience supported opportunities to make sense of what the standards meant for their practice. Judy's perspective finds strong grounding in sensemaking theory (Coburn, 2006), which holds that individuals and groups make meaning of new ideas by interacting with each other as they draw on ideas and beliefs from their experiences and in their local environment. As she saw it, her colleagues had been asked to embrace the standards without first constructing their own ideas of the value of the standards.

**Need for tighter coupling of instruction.** As we discuss in the description of Stage 1, the ePortfolio design process re-energized the effort at the school to develop standards around which it could build a curriculum and assessments. However, the school was also primed to turn its attention again to the standards in 2004 when Stage 1 began. Judy observed that by then teachers were beginning to understand that the standards had meaning in terms of their classroom practices. For example, she said that cohorts of students educated from kindergarten at the school were beginning to arrive in the upper grades and the upper grade teachers were surprised to find the students were not prepared in the ways they expected. According to her, primary teachers also expressed concerns about consistent expectations: "They get kids from one first grade room, they get kids from another first grade room, and what those [different groups of] kids are able to do is vastly different. Well, why is that happening? All of these kids have been passed on from first grade."

Teacher questions about student preparation and growing awareness of varied expectations within and across grades provided an opportunity for Judy to advocate for the value of a standards-based curriculum. A member of the school's Instructional Design Team, she helped seed ideas among other teacher leaders in the school about the importance of standards and worked with Stacy to initiate a renewed effort to engage staff in developing standards for the school. It was also Stacy's priority to create an aligned curriculum. When the ePortfolio design work began, the conversation about standards within the school had developed to the point where Stacy and Judy were ready to take action.

## Student Portfolios

**Vision of alternative forms of evidence to guide instruction.** The original charter for Charter School in 1997 called for a performance-based assessment system to evaluate student growth over time. The school's designers took their lead from educators who, earlier in the decade, had begun to explore the potential of student portfolios to serve as an assessment system for student learning that would be an alternative to high-stakes standardized tests. Similar to these educators, the school's designers believed that assessment of student learning should be grounded in student work created in classrooms. Further, assessment should generate evidence for instructional planning and decision-making processes in which questions of student progress were central. Unlike standardized tests, portfolios provided the opportunity to explore the use of assessment within the instructional process, evaluate student learning based on a school's curriculum and goals for learning, and consider learning in terms of growth over time (Klenowiski, 2002; Paulson, 1991; Stiggins, 2002; Wiggins, 1989, 1991, 1993).

Charter School made some early attempts to establish a portfolio assessment system. However, "teachers did not have a common understanding of the purpose of a more formalized portfolio system. They were uncertain of what to collect, how to store materials, and what collected artifacts would reveal about student learning (Brunswick, 2003, p. 35)." Thus in 2001, the school organized a portfolio committee to address the issues of how to put a workable system into place. Judy, the leader of the committee, described their effort:

*So a lot of tough work of deciding, 'What is this going to be for us as a community? What do we want from it?' A lot of give and take and push and shove and talk around it went on for that year, but when we were through, we were all satisfied that we had a concept of what the portfolio should be that would work really well for us.*

**Exploring how student work can serve as evidence for practice.** One of the questions the committee had to contend with was, "How does the work represented in a portfolio help the teacher to better understand the student learner (Brunswick, 2003, p. 43)?" This question is about how student work can serve as evidence to inform a teacher's instruction. A committee member who had been trained in the Descriptive Review Process, which came out of the Prospect School in Vermont, suggested that descriptive review be used in the school's portfolio system. Concerned primarily about the individual child, Patricia Carini, the founder and leader of Prospect School, summarizes the ideas underlying the Descriptive Review Process:

*The importance of the child's or any person's uniqueness, complexity, and integrity. The role of description in representing these. The attentiveness to the manner in which, for any person, dynamic polarities, seemingly contradictory, enact that person's expressiveness and complexity. The assumption of human capacity, widely distributed, as the taproot value nurturing all these ideas. (Carini, 2000, p. 4)*

The goal of descriptive review is for teachers to gain insight into a child's education through close examination of the child's work within a group process that emphasizes descriptive rather than evaluative language. It is an inductive process that focuses on one child at a time and can be slow. Descriptive review became the solution to Charter School's problem of deriving meaning from student work for instructional purposes. Members of the portfolio committee, as well as other teachers, participated in training at the Prospect Archives and Center for Education and Research in Vermont.

Charter School's adoption of descriptive review reinforced a tendency in the school to view portfolios as primarily providing evidence about the individual student over time. Questions of how portfolios might provide evidence about groups of students or about a teacher's instruction were unlikely to occur in a context where the priority was to understand a student in her complexity. Also, the school embraced the ethic in descriptive review that the purpose of examining student work was to deepen knowledge of the student's learning without evaluating it. Teachers became invested in portfolios as representing a set of values believed to be the antithesis of the evaluative orientation of standardized tests. ePortfolio would begin to shift the vision for student portfolios to a middle ground where student work would be directly connected to standards for student learning, generating evidence that could be used to answer a variety of questions about learning and instruction in the school.

**Informal leadership advancing the vision.** Interestingly, according to Judy, the introduction of the Descriptive Review Process was important to the school's progress toward a standards-based curriculum. One might not expect such a connection because the standard belongs to a worldview concerned with ensuring accountability, which involves evaluation, whereas descriptive review is primarily humanistic in its outlook, eschewing the organizational concerns that might interfere with educational processes. Judy believed, however, that descriptive review made student work the object of study and discussion by teachers throughout the school, which was a new development. Further, teachers' discussions of student work created opportunities for Judy to talk to her colleagues about the purpose of the standards in terms they could relate to:

*It is not until you really start looking at student work, figuring out what you are doing with them, figuring about where you want them to go, that you can begin to talk to them [about standards-based practices]. Well, that place you want them to go, that is the standards. That is the standard and we want to make sure that we have that same expectation for every kid, every single kid. Looking at the student work, that is where that comes from. That is where that, 'Ahh now I see. This is where I want the kid to go.'*

Given the school's history around standards, it is not surprising that the portfolio committee did not identify the state of the school's standards as a problem for their work. The committee agreed that the exit standards should guide teachers in making decisions about the student work to select for portfolios. The exit standards were printed on cards to help teacher make decisions about and track the contents of portfolios. Judy, however, saw unfulfilled potential in portfolios that were designed around the exit standards: "I didn't say anything to anybody, but that is when I began to feel the sting again of not having a truly aligned curriculum because as I looked from card to card, there was no information there...What is all this, what are we doing with this, what is it leading to"?

Judy expected that the portfolio committee would begin to understand the limitations of the exit standards when the system went into use. "While I was frustrated looking at these standards, I thought 'Okay, next year as we start to collect artifacts and look at this, it is going to become clear to people that something is not working here.'" The committee implemented the "portfolio system" the following year, but the school's professional development agenda focused elsewhere, and momentum on and leadership for the portfolio system stalled. Some teachers, particularly those in the primary grades who already kept student work as part of their literacy practices, used the system, while others did not. Without the support of professional development to reflect on student

work and its meaning for instruction, "the system" tended to revert to a collection of student work in a file folder that could be shared with parents.

## Assessment Tools

**New ideas beginning to challenge teacher beliefs and norms.** In Judy's vision of a system involving standards and student work, formal assessment tools were critical as well. Alignment and assessment went hand-in-hand. Assessment tools could come in a variety of forms, depending on the learning being assessed and the stage of the learning process. Judy emphasized that what was important was not that there be standard assessments, but that teachers be able to articulate for themselves and others how they assessed student work in relation to the standards, both in terms of the criteria teachers used and their reasoning around particular student work. Judy understood that this would challenge the belief of some teachers that their primary responsibility was to attend to their students, not to formal tools such as assessments, and also that the press for formal assessments might be perceived as infringing on their autonomy:

*We have been pushing this idea of rubrics. We have had a little give and take. We did some work earlier in the year over the science standards and looking at what [teachers] have done in science.... So [this primary teacher] was saying, 'Well, I do that,' when she saw the standard.... I said then how do you know that the kid does that? 'Oh, well observation.' A lot of what we do is observational and I said, 'Good. Then put that down'.... Then at a subsequent meeting the observational thing for the primary people came up again and I had a chance to say, 'Well, it is observation. What in your mind are you checking as you observe the child? What in your mind are you doing?'....[This primary teacher] and a couple of other people resist the idea of anything that structures [them] because they believe, like I do, that students' discourse and ideas have to be central to instruction. Anybody who talks to you about a rubric are like, 'No it is going to take the freedom out [of instruction].'*

For Judy, teachers need to externalize assessment processes that were too often internal. Judy did not tend to use the language of "public practice," "accountability," and "evidence." However, implicit in her vision for a standards-based curriculum was an argument that, within a school community, teachers need to be able to examine and reflect on their practices and those of their colleagues. They need to do so with an eye toward strengthening the educational experiences of students whose learning over time would reflect the overall organization of instruction as much as individual teacher efforts. Standards, portfolios of student work, and assessment tools could work together as a system to promote this attention to instruction as a collective effort.

**Formal leadership advancing the vision.** A focus on assessment at the school began to take shape in the months just prior to and during the initiation of the ePortfolio design process. In a series of professional development activities, teachers used a writing rubric to examine students' writing products across grades. Stacy framed the activities as an opportunity for teachers to develop consistent expectations around student work and to begin to understand the development of students' writing skills through the grades. Judy saw this work as part of the vision that she shared with Stacy to strengthen the curriculum and believed it helped set the stage for a renewed focus on portfolios (and its close cousin, the standards-based curriculum) through the development of ePortfolio.



*No matter how old we are or how smart we are or anything else when you tread into new territory, there has got to be that work that goes on ahead that validates why you want to get into it...The way that we have been developing our eye for looking at student work had to happen before teachers would buy-in to developing the aligned standards-based curriculum.*

As we see later, this activity and discussion around standards, portfolios, and assessment helped pave the way for Judy and Stacy to lead the school to venture into new territory that represented a greater commitment to evidence-based instructional practice.

### **Making Portfolios Electronic: Need for Efficiency**

A leader at the Center for School Improvement<sup>5</sup> suggested the idea of electronic portfolios at a retreat when the portfolio committee first presented its vision to school staff in the winter of 2002. Judy tabled the idea because she felt she needed to first understand how a paper-based system would work. "In the year we were working on development the idea, I was like, 'Don't even talk to me about that. I can't think ePortfolio until we know what we are going with portfolio.'" She felt that figuring out the role of computer technology in the initiative would complicate, and perhaps detract from, the effort to make sense of the role of student portfolios in the school's instructional program. However, after the first year of implementing the portfolio system, Judy reconsidered. "It became very apparent that by the time the kids got to 8th grade there was not going to be a manageable way of holding all this work through all these years. This fall, then, I said to Stacy and Nichole [lead designer for the IIS], 'Okay we're ready now to look into an electronic portfolio.'"

Charter School turned to electronic portfolios primarily because it had become clear that the paper-based portfolios required lots of paper and storage space and would soon become unwieldy. Multiply one folder per student per subject area times the number of years the student attends the school and the volume of a single student's work explodes. Also, Judy was sensitive to the financial expense of printing cards with the exit standards to insert in student work folders and that any revision of the standards would contribute to the expense. Judy expected the electronic portfolio to improve the efficiency of the system the portfolio committee had designed. However, she was quick to understand that designing an electronic portfolio held the potential to advance a system of instruction in which standards, student work, and assessment practices all played a prominent role.

## **Stage 1: Early Design Activity**

### **Design Activity: Creating a Prototype Tool**

**Beginning to identify problems of practice.** In January of 2004, our design and development collaboration between the IIS and the school began around an electronic tool that would eventually become known as *ePortfolio*. As we described, there was a substantial history of work around designing a portfolio assessment system at Charter School. Despite this, the early design discussions about the functions of an electronic tool raised many questions about its scope and purpose. At an initial meeting that included Judy as leader of the portfolio committee, Denise, who was the IIS designer, and portfolio committee members, the group discussed a number of goals for an electronic portfolio system. These were mostly consistent with the Descriptive Review Process approach described earlier. The focus was on creating a holistic picture of the student with

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<sup>5</sup> The Center for School Improvement changed its name to The Center for Urban School Improvement in 2005.

student work artifacts that could provide an assessment alternative to test data. Goal discussed at this meeting for the new system were to:

- Promote student ownership of portfolio materials
- Base evaluation on school exit standards
- Be able to show progress of students over time
- Be able to provide a well-rounded profile of the student
- Provide access to standardized text data when view student information/materials
- Be able to use artifacts as evidence for decision-making and/or discussions with various stakeholders
- Provide a means for students to present their portfolio materials in a face-to-face context

The driving idea at this stage was to be able to create portfolios that could capture each student's best work. Portfolios would be collections of student artifacts that could be connected to school standards. Teachers would be able to indicate student progress by marking a student as being at an *introductory*, *developing*, or *mastery* level. In a later interview, the Judy summarized the committee's vision, but acknowledged that teachers in the school, outside the committee, did not necessarily share this vision: "[The portfolio would] provide an array of assessments that allows us to look at a three-dimensional picture of the learner, so that we're not dependent solely on standardized scores... We could get a well-rounded picture of the learner that would give us a historical perspective also of the learner throughout pre-K to 8 years."

This initial meeting represented the beginning of the important design task of identifying problems of practice that the technology would mediate, as well as the roles, norms, and existing tools and practices that would come into play. From the IIS perspective, these were elements of the design environment that needed to be understood.

**Seeing technology's possibilities for enabling the use of student work as evidence.** In the months following this group meeting, design and prototyping of an electronic tool ensued. Follow-up meetings and correspondence between Judy and Denise continued as part of this work. Based on these discussions, Denise created scenarios of use, screen designs, and plans for the underlying information structure of the tool. This work synthesized the goals and priorities from the portfolio committee with newer ideas and possibilities that arose from discussions about the affordances technology could bring to the system. Also, through Denise, IIS perspectives on internal school accountability, instructional coordination, and data visualizations began to inform the design.

In these discussions, we begin to see a shifting orientation towards more evidence-based practice. Teachers still talked about a portfolio tool to support the student-centered analysis of student work as it was conceived in previous years at the school. However, another thread that became increasingly prominent in the design work was the view of a portfolio as providing a body evidence to inform instruction and analysis of teacher practice. Consequently, in addition to the functionality of adding student work artifacts and assessing them in order to look at individual collections of student work, discussions also included ideas about various reports and data visualizations that could be useful for highlighting issues of teacher practice and instructional coordination across the school.

**Producing an initial design.** By early March of 2004, Denise had created a prototype that was based on the initial ideas of the portfolio committee. Electronic versions of student work

artifacts could be entered into the tool and associated with a certain standard. Once linked to a standard, the artifact could be assessed and marked as indicating three possible levels of progress toward a standard: *introductory*, *developing*, or *mastery*.

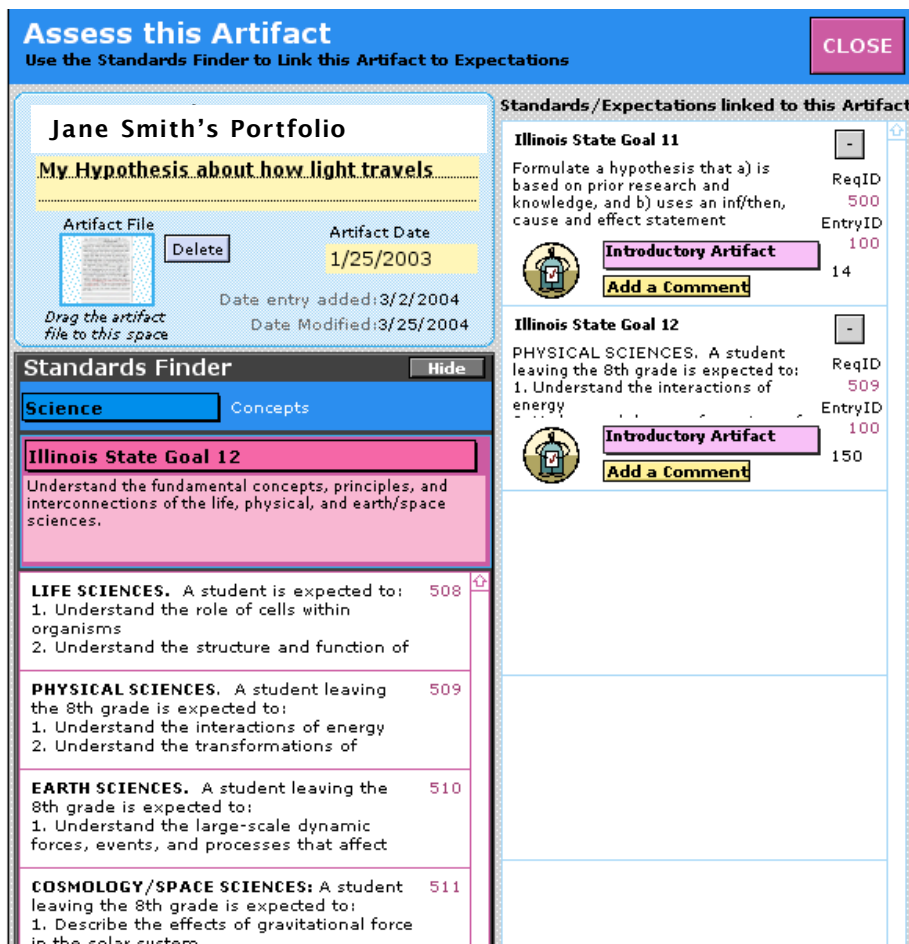


Figure 1. Screen shot of ePortfolio prototype in Stage 1

As this design activity proceeded, the work of defining problems of practice, concretizing the ideas of the portfolio committee, and understanding the possibilities of a technology-based system of assessment presented a number of key issues and questions not addressed in the school's prior work around portfolios. These centered on the goal of coordinated work across the school. The first issue was the need to have an organized system of standards that could be included in the ePortfolio tool.

### **Insight from Design Activity: The Need for a Coordinated System of Standards**

Our prototype was taking shape, but there was no explicit decision about how specifically this functionality would be used by teachers (or students), and there were no plans yet for implementation. That is, the list of goals identified by the portfolio committee might have implications for a variety of specific practices, for example, report card parent-teacher conferences, professional development sessions, or end-of-year student presentations. This was an issue that needed discussion and clarification among the collaborators. However, it was apparent that assessing the state of the school standards and figuring out how to systematize standards into a tool

would be an important immediate task, no matter how the school decided it would use the tool in practice. In an interview, Stacy described how the design activity generated work on the standards:

*The process that Denise went through in designing [the tool] also then did, in a very logical way, put more energy around the school reorganizing the standards...Thinking through that process forced us to go back and revisit some of what we had and improve the organization and alignment and content of the standards that feed into the tool...because that was one of the things about the school—everybody did everything exactly the way they wanted.*

In order to incorporate the standards into the tool, we needed to know exactly what the standards were and how they were structured; the database necessitated this specificity. In our early efforts to populate the tool with the standards we discovered that although the school had some documented standards, they were not kept in one central place, they tended to be in the hands of individual teachers or cluster leaders, and they were not in a standard format. Judy described the school's literacy standards as “unclear” and the staff’s language for talking about the standards as “not appropriate.” By the latter, she meant that teachers did not use the terms “exit standards”, “benchmarks,” and “standards” consistently and often did not distinguish between the terms. Judy identified the need to coordinate standards and develop a shared language for the standards, as well as assessments. Thus, the need for a database to organize standards in the tool created the next steps for the school's work on its standards. These steps were: determine a structure for the standards that could work across the school, write standards that were consistent with this structure, and gather the standards together for the tool.

### **Action from Design Activity: Principal's Role in Motivating and Coordinating Work to Organize School Standards**

**Leading standards development work.** Because the process of writing and gathering standards had to reach across the entire school, Stacy began to play a leading role in the tool development work. At an Instructional Design Team meeting of teacher leaders in March, Stacy prioritized the examination of standards, consistency among the standards, and alignment. She expressed clear concern about the state of the standards and the need to work towards alignment. At this meeting, Stacy charged Judy with coming up with an initial template for the standards. She also decided to allocate time for teacher leaders to work with their colleagues at the cluster level to use the template to produce revised and in some case entirely new standards for the school. Stacy then collected standards documents from teachers through email and forwarded them Denise to enter into the tool. Denise in turn reminded Stacy of the standards that were still needed based on gaps in the growing database of standards. These activities also raised the need for specific discussions about literacy standards in the upper grades and Stacy organized key staff together to do this work.

Throughout this stage of the work, Judy and Stacy both connected the need for creating a consistent set of standards with the need to build the ePortfolio tool. Particularly for Judy, who had advocated for standards in previous years, but had seen efforts falter, building the tool represented a unique opportunity to rally thinking and work on the “the big ideas [about standards and assessment] that we have worked for three years on for the portfolios.” For her, this project brought together important concerns about standards and assessment practices that she felt the school needed to address.

For the remainder of the school year, staff continued to work on modifying the standards and looking at alignment across grades. By May, standards documents in literacy, math, and science from almost all the grades were collected, yet it was apparent to Denise who needed to enter the standards into the tool that there were still differences in the overall organizing structure and language for the standards. Acknowledging that this would be important for the alignment of the standards and after comparing documents and looking at the state standards for reference, Stacy made an executive decision concerning basic structure and format for the standards. She later said, "Thinking through that process forced us to go back and revisit some of what we had and improve the organization and alignment and content of the standards that feed into the tool." Deciding on a consistent structure and language for the standards was a key step in being able to create a complete database of school standards for use in ePortfolio.

**Developing a collective understanding.** Meanwhile, Stacy dedicated several meetings in the spring to the introduction of the ePortfolio prototype to the faculty and she facilitated conversations about the goals and plans for the ePortfolio tool among faculty. At a faculty meeting in mid-March, some staff members raised fundamental questions about the purpose of the tool, indicating that there did not exist a shared sense of how ePortfolio exactly was to add value to teacher's work and how they were supposed to use it. Other staff members proposed a number of purposes, such as to identify students who were not meeting standards, to aid in developing interventions, or to provide students with the opportunity to create their own portfolios. However, no determination of priorities came out of these meetings.

By the end of the school year, the work of identifying and prioritizing specific problems of practice for ePortfolio was not complete, yet from Stacy's point of view, the related work on standards and assessment in the school was essential to arriving at a point in the future where the ePortfolio tool would make sense within teachers' practices:

*The professional development piece is absolutely key on this and it is making time to let that stuff happen... We don't have the practices at school in place yet [for ePortfolio], and so with that piece that's why we are looking at student work, that's why we've developed the universal writing group rubrics, that's why we have gone back and reviewed the standards and need to go back and review the standards again, the exit standards, because we have to got to develop the school practices that, once the electronic portfolio is done, we have to have the school practices ready at the same time in order to make best use of that tool.*

The fact that specific practices for ePortfolio's use were as yet unclear might be seen as an obstacle in making progress on the tool's development. However, the tool's design process contributed to progress within the school on related streams of work and to faculty conversations about that work. Faculty members were engaged with the possibilities for change and this contributed to the development of a collective understanding about the role of assessment in the school and how a technology tool could add value.

## **Stage 2: Preparing for Implementation**

### **Design Activity: Continuation of ePortfolio Prototype Development**

During the 2004-2005 school year, the work on the ePortfolio project continued with additional development of the school standards and the creation of a pilot group of teachers to further design

and revise the prototype. Stacy invited four people into the pilot group to represent teachers from across the grade levels and a range of content areas. Through meetings and discussions with this group and Stacy, Denise continued to synthesize emergent ideas and to translate them into concrete form in sketches and in the prototype.

The design conversations that occurred during this stage generated a few key insights that continued to turn the design towards a vision of ePortfolio as a tool for evidence-based practice. This vision valued teacher accountability to school standards, teacher reflection on practice, and instructional alignment across the school. Simultaneously, the design still supported the commitment to the student-centered vision of the early portfolio work. Stacy describes this dual framing of ePortfolio in an interview from that year:

*The last meeting we asked about really what people would want to see coming out of [ePortfolio]. It is a twofold thing. It is this vertical picture of a student and you can see different cycles of growth and where their strengths and weaknesses are and their different modalities and how they learn. Also, from a teaching point of view, 'Where am I in regards to teaching the specific types of skills that I need and where are these children in regards to these specific skills? How I need to do this better?'*

While the first purpose remained in conversations about ePortfolio, it was this latter aspect on which prototype revisions centered during Stage 2.

### **Insights from Design Activity: New Possibilities for Teacher Reflection and Teacher Practice**

**Pushing the design further to inform teacher practice.** In one set of design conversations, at which Stacy was also present, a pilot group member with an analytic orientation towards using evidence to inform instruction described various scenarios for Denise of how she would use a tool like ePortfolio. This teacher valued the ability to view student growth with student work artifacts as evidence, yet she also saw in ePortfolio the potential to provide information about her whole class to inform practice. These conversations led to designs of color-coded visual displays that would help teachers identify patterns of student achievement on standards and benchmarks. This teacher also saw possibilities in the tool for promoting teacher accountability to school standards. For example, she requested that the tool help her know what student work artifacts to collect and whether she had collected work from every student. She saw this feature as one that would “keep me honest.”

Another set of pivotal design conversations occurred with Judy. These centered on the language and logic of assessment and exploring ways of emphasizing these in the design of teachers' interaction with the tool. For example, to promote teachers' thinking about assessment, the design expanded to include a database of assignments that would prompt teachers to indicate links to standards. The design also prompted teachers for the assessment tools (e.g., particular rubrics or checklists) used to evaluate student work on assignments. Student work artifacts added to ePortfolio could then be indexed as a certain type of assignment. Judy referred to this articulation of assignments, assessment tools, and how they linked to the school standards as an “assessment blueprint.” In this way, the prototype was beginning to incorporate ideas that reflected Judy's vision of managing a complex instructional system in which elements of the curriculum, instruction, and assessment—and the links among them—would be explicit.

**Producing a new version of the design.** Through the design activity that occurred with Stacy and the pilot group during Stage 2, a number of new features became prominent in the tool. Student work artifacts had to be associated with teacher-specified assignments. Prompts in the tool asked teachers to show how assignments linked to standards and demonstrate exactly how student work was assessed. A “Reports” section was also added and, at that time, included a single data visualization summarizing how groups of students were meeting or not meeting a set of benchmarks. These features demonstrated an emphasis on teacher practice by making instructional elements explicit and by providing a report that could be used to inform a teacher’s instructional decisions.

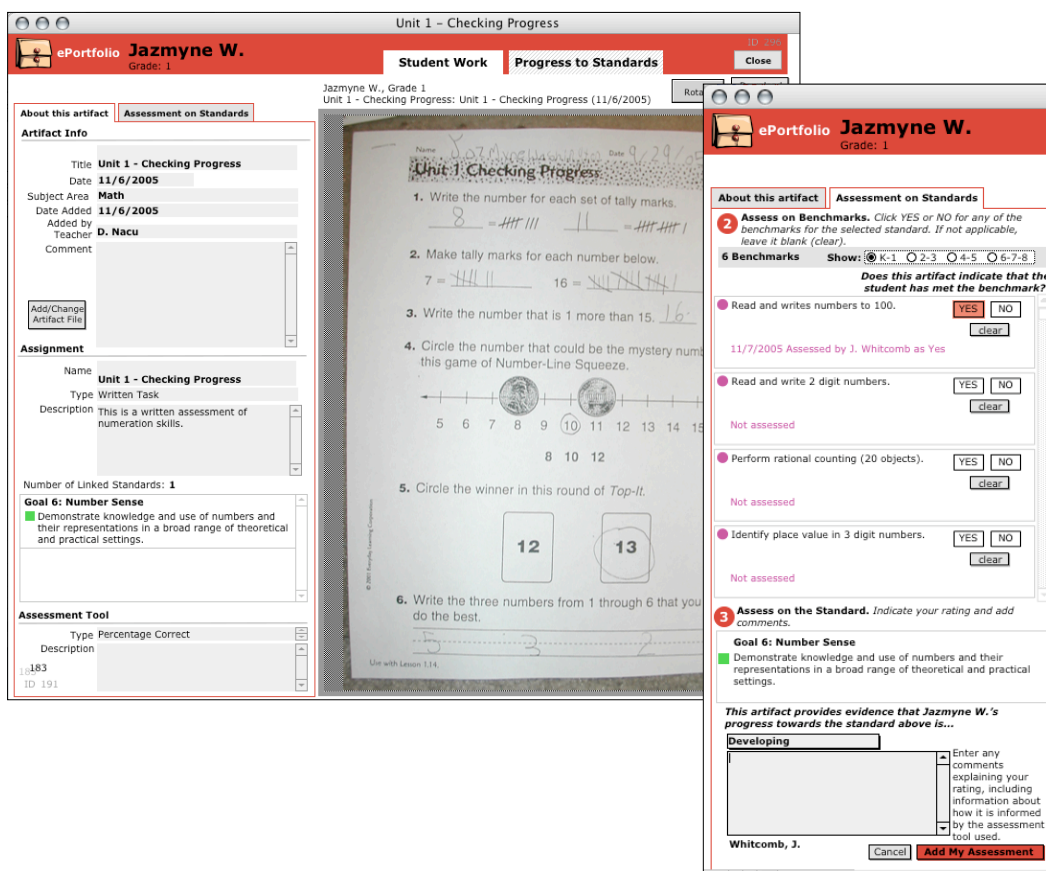


Figure 2. Screen shots of ePortfolio prototype in Stage 2

### Action from Design Activity: Initiating Professional Development

**Engaging teachers in a more reflective practice.** While we had developed a more substantial feature set in the ePortfolio prototype by spring, Stacy had decided against introducing a new tool mid-year. Instead, an all-school faculty meeting introduced the most recent prototype tool and the process of adding assignments and student work artifacts and making assessments. Another meeting prompted teachers to discuss what kind of artifacts teachers would add to ePortfolio and why. In yet another meeting, teachers were asked to identify core student work artifacts for use in tracking student progress on the standards. According to Stacy, this activity engaged teachers in the kind of thinking about instruction that she wanted the portfolio tool to support:

*So it was this idea of, 'Take the artifacts and figure out what [standards] you have hit with this' I threw too much at them at the same time, but people got through the ...[activity] and I think they had this understanding of, 'Okay, these map in.' Then the idea was for clusters to look at their benchmarks and say, 'Okay, what have I done already? I want to make sure I get into the portfolio [the student work] that meets these benchmarks. What maybe do I need to do before the end of the year so we are getting some of the meaningful artifacts into the portfolios?' Previously, it was just a checklist of, 'Get these things.' ...Now it is, 'Collect artifacts that meet these benchmarks.' That is a very different process.*

This professional development work also surfaced some unresolved questions among teachers, which Stacy described:

*I do think that in some sense there are still some very core philosophical conversations that we have to have. Because with the portfolio there are two ways of going about it. There is, collect it when the skill is secure to show the child got there, or there is the kind of more descriptive review piece or Montessori kind of piece, which is to collect pieces of work overtime to show growth.*

In the two approaches to collecting student work, we see a tension possibly stemming from the early views of a portfolio system (“descriptive review piece”) in contrast with a view that could be seen as more evaluation-oriented (“show the child got there”).

**Signs of organizational progress.** Despite the fundamental questions that remained, it was apparent to both Judy and Stacy that the school organization had made important strides towards the overall goal of improving instruction and assessment in the school. Reflecting on the development of ePortfolio and related work at the end of Stage 2, Judy commented:

*It helped move forward the language that the school is using around standards because I could never get us all talking about you know, the same thing because our whole standards thing was such a mess for a while...Now we've gotten our community to talk about goals, standards, and benchmarks. So even though the tool itself isn't ready, there's been a big impact on how we communicate throughout our school, which is also going to push forward the alignment of work that we have to do.*

Stacy noted the increased prominence of standards in the discourse of the school and hinted at further work to be done:

*Over the last year and a half we have gone and we have completely rewritten and reformatted the exit standards across three different content areas. We have increased use of it and we spend more time going back and looking at it and thinking about it, then trying to reference back in to it. It has caught on in certain places better than others.*

The design and development work in Stage 2 helped to advance the prototype itself, as well as conversations around the school around standards, assessment, and the purposes of the portfolio tool. The school year ended with the plan of rolling out the use of ePortfolio across the school in the upcoming fall.



### Stage 3: Introducing the Use of ePortfolio to Teachers

#### Activity: Initial Implementation of ePortfolio

At the beginning of the 2005 school year, Stacy and Denise planned a number of professional development meetings to begin the process of using ePortfolio across the school. Their plan was that near the end of each term, all teachers in the school would enter at least one piece of student work for each student, as well as the assessments for those artifacts. There was no specific plan at that time for use in other practices, such as instructional planning meetings or report card meetings with teachers. A basic goal at this stage was to gather student work in this electronic format so that an initial set of artifacts would be in the tool by the end of the year. They considered getting student work artifacts into the tool essential to demonstrating the tool's usefulness and potential applications.

Near the end of the first term, Stacy provided dedicated time during faculty meetings for teachers to work on entering student work artifacts into ePortfolio. However, teachers did not respond to the tool as expected. It had been hoped that the prior work on standards and assessment in the school would help engage teachers in use of the tool. Many teachers engaged in the activity leading up to the entry of student work into the tool. This activity was to create a standards-based assignment, develop an assessment, and discuss the resulting student work with colleagues. However, only a few teachers completed the process of entering and assessing student work against the standards, as Stacy had asked them to do.

After this initial trial of using ePortfolio with teachers, a set of teacher interviews were conducted mid-year. With feedback from the interviews and our observations of how teachers engaged with ePortfolio, we were able to take stock of what we learned.

#### Insight: Teacher Engagement

In interviews, teachers said using the tool was time-consuming. This had different meanings to different teachers. For some, it meant that entering the student work was unnecessarily laborious, which pointed to technical issues that the IIS design team had not yet solved. For others, it meant that assessing the student work against the standards took too much time, which reflects a reality of assessment systems based on student work. For still others, it meant that they had plenty to do in their jobs as classroom teachers and adding yet one more thing was not possible. These meanings were not mutually exclusive. On the surface, it appeared that the technical shortcomings of the tool were behind teachers' lack of engagement. Teachers were, however, provided with a variety of supports to make use of the tool less burdensome, including an assistant's help in entering student work into the system. Furthermore, some teachers entered the student work and engaged in the assessment process as designed without any help. Other teachers who received assistance did not then follow up to assess the student work.

**Teacher beliefs.** Teachers' beliefs about instruction was one factor that shaped their engagement with the tool. For example, one teacher found using the tool productive, despite its inefficiencies. She believed that documented evidence could inform her understanding of students' learning progress and that she should explicitly refer to the standards in planning her instruction. The tool was compatible with these beliefs and this teacher became invested in using the tool once she saw how it could benefit her practice. Another teacher, in contrast, viewed the tool as a potential distracter from the instructional process. She valued her observations as a source of

knowledge about her students and viewed the standards as a general reference that should not overly determine her sense of what her students should learn. This teacher tried to remain open to the possibilities of the tool because she knew its use might be required. At the same time, she was prepared to defend her teaching practice against the expectations represented by the tool that she perceived were not in the best interest of her students.

Teachers' beliefs about the tool itself also shaped their engagement. Teachers tended to focus on the idea of the student portfolio in ePortfolio. At the most basic level, this idea meant collecting and preserving student work for later reference. Some teachers saw the tool as merely a high-tech (and inefficient) replacement for the folders of student work they already kept. However, ePortfolio had been designed to support a system of standards, student work, assessment, and instructional practice, not just to preserve student work. Teachers also tended to view the tool in terms of how it could help them in their individual classrooms. Some doubted that knowledge of prior student work would be helpful to them in understanding a student's learning needs. However, ePortfolio had been designed not just with the individual classroom in mind, but to help the school achieve the community goals of curricular coordination and alignment and thereby benefit students through increased instructional coherence.

The rationale for ePortfolio within the school came directly from the original rationale for portfolios grounded in the descriptive review process. The stated intent of ePortfolio—to understand individual student growth over time—was largely the same as it had been four years previously. The instructional management system that ePortfolio had become through the design process was not reflected in this rationale, possibly contributing to the mismatch between teachers' beliefs about the tool and the tool itself. There is also evidence that the values teachers associated with student portfolios (e.g., the importance of not being evaluative and of understanding the whole child) conflicted with the values that they perceived ePortfolio represented (e.g., a stance of evaluation and the achievement of specific learning goals).

**Norms of teaching.** There may also have been ambivalence among teachers about ePortfolio as a system that would generate data about practice. One teacher, Andrea, is a case in point. Andrea was uncertain about value of the tool, which is a common experience for individuals before they decide to adopt an innovation (Rogers, 2003). Having neither rejected nor embraced the tool, Andrea was able to articulate the source of her uncertainty. Andrea asked, "How is this going to be useful to us and to administration and to anyone looking at any data?"

Andrea's reasoning in trying to answer her own questions reveals a mix of ideas about data and its potential uses. Andrea was a member of a school community where data was increasingly the topic of discussion and she viewed ePortfolio's potential in this light. "It's data. And data is important when you're talking about a school and discussing a school." On the other hand, Andrea believed the principal's first-hand knowledge of teachers and their practices meant that data would inform the principal of what she already knew. "I think even Stacy has a good feel for what's going on. She knows, I think she's pretty aware of what's going on in each classroom and things like that. Now she might not have data that says what's going on in each classroom but she has a good, I think she understands well what's going on."

Although data might not provide additional information to an observant leader, Andrea believed that, as documentation of practice, data could be useful to the leader in discussions with teachers about areas in which their practices might need improvement. "It might be helpful to her to have in

discussions with people about their practice. Whereas it would be, 'Well I don't think that you're, I think that you need to work on this, that and the other' as opposed to, 'Well, here it's showing me that you need to work on this, that and the other.'" Thus, Andrea had a somewhat qualified view of the value of using data within the school. Importantly, her view did not include the notion that data can be a source of new knowledge or of insights into practice not available through observation.

At the same time, Andrea had a sense that an unspecified "they" might use the tool. She asked, "Who are they going to take this to to benefit?" She explained the source of her question:

*We are the trees inside the forest and like we, you know, I'm doing what I am and I can in my classroom. Then we're doing the things that are outside of what's going on in our classroom, like these other data collection [efforts]. Some of it informs teaching, don't get me wrong, some of it does inform the teaching that goes on inside the classroom, but there's a bigger picture that doesn't directly involve me and I'm wondering what is that? Who is that that it's [benefiting]. Is it for the greater good as a teacher? ...Is it meant to inform other schools how to look at their teaching and learning? Is it to just to show that anybody can learn about teaching and learning?*

Andrea's concerns reflect a perception that the "bigger picture" of ePortfolio was not primarily about instruction at her school. In describing herself as a "tree in the forest," Andrea suggested she didn't necessarily share the interest others might have in the tool. One wonders too if perhaps she was giving this "interest" the benefit of the doubt when she said, "Is somebody else going to look at our data and say, 'Oh, this is what this school does and this is how they've built their practice and this is how they became better and they used these tools. This tool was really helpful for our school to have this because then they were able to do that'" (December, 2006).

Data can make practice public. Andrea seemed to be asking how public ePortfolio would make the practices of Charter School and for what purpose. Andrea's questions about ePortfolio reflect the normative view that in teaching the classroom is a private space and the teacher's interests do not extend beyond this space. Her comments raise the possibility that ePortfolio was suspect among some Charter School teachers because it is a tool that can make classroom practice public.

Andrea's comments also reflect the view that observation is the best way to understand the practice of a teacher. Elsewhere in her interview, Andrea indicated that first-hand experience with a student was the best way to understand the student's learning needs. For her, this called into question the need to examine a student's earlier work products. By discounting the value of documented evidence, views such as Andrea's preserve the notion that good teaching is based primarily on what individual teachers do within the four walls of their classrooms with their particular students and can be known only through personal experience. This is likely another normative obstacle to the use of a tool such as ePortfolio. Andrea accepts the use of data primarily by a trusted supervisor whom she accepts may need to persuade independent-minded teachers to change their practices. This is a more limited notion of the use of evidence than the vision of instructional coordination within a professional community that Denise, Stacy, and Judy believed ePortfolio represented. Significantly, many of the teachers we interviewed were at a loss when we asked them about the potential value of ePortfolio for their school community.

## **Insight: The Need to Redefine Purposes and Sharpen Vision for ePortfolio**

Going into the initial implementation, Stacy had a vision of how the use of ePortfolio could lead to more evidence-based practices. She wanted to see:

*More explicit instruction and more performance-based, and hopefully more concrete thinking about benchmarks and assessment in front of instruction.... So more thought going into the planning process. And hopefully better feedback to the kids, and the students having a better understanding of what they are supposed to do.*

Even with this big picture driving the work, she had modest expectations for what would be accomplished during this trial:

*My expectations for the first round were very much that teachers would have a difficult time seeing value. That it really was about getting people to use the tool, getting feedback about the tool, trying to get some work into it, with the idea that by the end of the year we could have...realistically, at one point we talked about six artifacts, realistically something in there, perhaps three or four artifacts, and learn and figure out. Like putting one artifact in and assessing it, the odds of you getting some value out of that are really pretty small, but we have to be able to get through those pieces to be able to get it done.*

Stacy understood that the value of a tool like ePortfolio would only be realized after a body of artifacts accumulated over time and that, at the outset, there would be little apparent value to teachers for adding student work to the tool. Because of the obstacles encountered, she decided not to push teachers to collect student work artifacts in ePortfolio as was planned and turned dedicated professional development to other work.

Following teachers' first experience using ePortfolio, Judy as leader of the portfolio committee and Stacy went through a process of regrouping and reflecting on the ePortfolio process. It was clear to them that in addition to the technical and logistical problems, there were some fundamental questions and tasks that needed to be addressed before pushing the ePortfolio tool design and process forward. Stacy asked the committee to reflect and help determine the next steps. Judy planned to reconvene the portfolio committee to "revisit and restate/refine the purpose(s) of the ePortfolio" and "to determine how to get immediate and on-going staff (and other stakeholders) feedback on the portfolio process." In one interview, Judy describes the questions that needed to be revisited:

*So, how – and that's the question that I keep putting in front of the committee is—how do we help this become something teachers value so they will want to do? Because, initially, it's going to take more work. Ultimately, it's going to be easier—like any new thing there's that learning hump to get over. How do I make this part of my practice? ...That's the biggest challenge. Because once a teacher feels like this...you know they can see the benefits. Any good educator will work through the other challenges.*

Thus, this implementation trial caused key players in the ePortfolio project to reconsider fundamental issues such as the purpose and implications for teacher practice. There was a sense that this work was pushing against norms of teacher practice as described above. At the same time, it also provided concrete experience and examples of attempting evidence-based work that could be

used in subsequent reflecting, envisioning, and planning. For example in an interview after the initial trial, Stacy talks about observations she made of teachers' use of ePortfolio:

*I think we had an interesting thing happen with the K-1 folks, because they all entered a very similar piece of [student] work. ...I think the same assignment got created four times. But here is an interesting thing. If they used the same assessment and they entered the same work, it will be a very good conversation within [professional development] to pull it and pull their assessments and start thinking, "This is a K, this a 1, this is how you assess this. Are we thinking in the same way? Are we aware of what we are emphasizing at certain times? Does it mean that we are going to get kids to the benchmarks by the end of first grade?" So there is a [professional development] piece of it there...There are some logistical things that we would really have to figure out with that, but I think we see that.*

For Judy, Stacy, and Denise, the first implementation of ePortfolio beyond the work with the pilot group highlighted the need to have a sharper notion of the purpose of the tool. For example, in order to address the issue of what types of student work would make the most sense to enter into ePortfolio, we needed to have a clearer understanding of purpose and a more specific vision of kinds of conversations teachers would want to have. Teachers were certainly not clear about how ePortfolio would add value to their practice. This was seen as a missing piece and might have helped engage staff in the process, despite the logistical and technical issues.

### **Action: Reflecting and Moving On to Next Steps**

The insights gained from the implementation helped Stacy think about concrete next steps. In an interview in February of 2006, she reflected on what we learned:

*There are a couple of things that we need to figure out. When it comes to adding more [student] work, is it that we need to focus into particular pieces of work so that we can build these vertical strands more quickly and to ideally be able to have some of the conversations about work and create a kind of an isolated, but vertical experience around, 'Hey, this work is in here and where are we?' ...Then, going forward is... trying to somehow, and I don't know how to do it yet, but push this piece of thinking about the standards and benchmarks as I am designing my activities, so the work falls into ePortfolio in a way that makes sense. The other piece of it is, we still need to clean up the math standards and those will get cleaned up when we really make our final decision around what the upper grades math materials will be.*

Here, Stacy describes three next steps—two rather specific ones, and one more abstract. For the specific steps, she identifies the need to answer the question—*what kinds of student work make sense to have in the portfolio?* She also points to the need to work on the math standards. The more abstract step she mentions is thinking about how to push teachers to think about standards and benchmarks when designing instructional activities. She sees this as a task that is important in order for work on ePortfolio to continue.

It is significant to note that while work on the ePortfolio tool itself halted at this point, a number of other related efforts in the school gained traction later on. In the spring of this school year, Stacy launched the effort to do curriculum mapping (Jacobs, 2004). This involved documenting essential questions, assessments, learning plans by month, and connecting their curriculum to the school

standards. In a sense, this can be seen as a continuation of the ePortfolio work. It was a step that seemed logical to Stacy for helping teachers become more familiar with the standards, a priority she identified coming out of the implementation trial.

For this line of work, the IIS designers again worked with Stacy in designing a tool that would support the curriculum mapping process. The tool development was rapid and by May, teachers had a simple database for documenting and sharing their curriculum maps. Teachers were asked to document a few of their curriculum units and link them with the school standards. Stacy set out expectations for teachers to use the Curriculum Mapping tool at the end of the school year, and dedicated time for it the following school year. In comparison to the ePortfolio implementation, teachers generally seemed more engaged in the process and met the expectations set by the principal. In an interview in December of 2006, Stacy reflected on the work that occurred around the Curriculum Mapping tool: “It’s adding value around the standards and I think we can push into it more as we go.” We surmise that teachers’ were more engaged with the curriculum mapping process compared to the ePortfolio trial due to its narrowly defined focus and constrained feature set. Teachers could more easily see value in the Curriculum Mapping tool for their practice.

In another effort, Stacy and the instructional coordinators in the school participated in work the following summer that took the standards development even deeper—developing curriculum goals and standards that were specified by grade (the existing set of standards were grouped by clusters of grades). Following this work, instructional coordinators also developed a new set of formative assessments in math and literacy that were based on the standards. These were developed across the grade levels and would be given to students three times per year. Another tool was developed solely for the purpose of analyzing the data from the formative assessments. Color-coded visualizations were created to understand individual student performance and classroom patterns of standards achievement based on assessment items.

Here, we see Stacy continuing the work of building evidence-based practice beyond the ePortfolio tool development. These efforts to work on sharing curriculum, further specifying standards, and developing formative assessments can be seen as concrete steps to construct the building blocks of an instructional infrastructure that is needed for evidence-based practice.

## Discussion

This case study demonstrates a recurring pattern of design and development that we have recognized in the course of our work developing other tools with school partners (depicted in Figure 3).

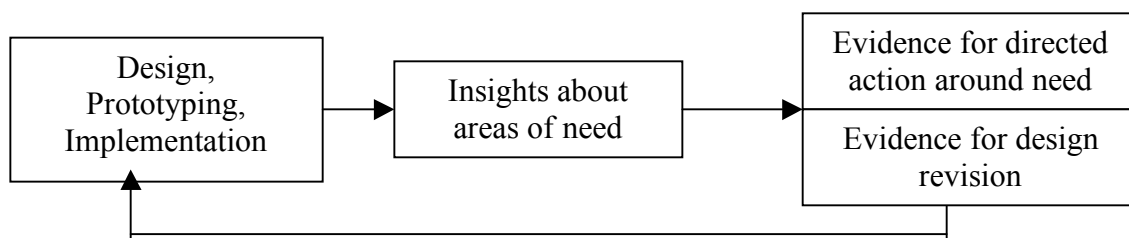


Figure 3. Pattern of design and development

This pattern begins with an initial design process that demands specificity and prioritization. In working towards specification of design, the existing state of the instructional core is uncovered. Particularly for efforts to promote a more evidence-based practice, the development of tools for use across a school tend to raise issues of consistency and coordination and to reveal areas of weakness or inconsistency. Exposing such areas of need subsequently helps to catalyze action in response.

This is what we observed in the early design activity described in Stage 1. The design activity revealed an immediate need to work on standards. Having a system of standards was a key building block for moving the work forward, and the process helped to demonstrate that it was missing. Although the initial work on the ePortfolio tool involved lots of discussion about possible uses and directions, the need for aligned standards became a focus of work and a priority for Stacy. For the Judy, the tool design and development became a cause for motivating action around standards and assessment that was difficult to do in the past. In Stage 2, the design led to exploring other areas of need that were not in the foreground previously. These had to do with engaging teachers with the logic and language of assessment in order to promote reflection and better alignment of curriculum, assessment, and instruction. These needs were consequently reflected in revisions of the prototype.

Another version of this pattern begins with the introduction process of a new tool and practice. We saw in this in the description of Stage 3. Just as the design specification process yields insights, the initial trials of introducing a new tool into existing practice expose potential barriers to practice change. Issues not previously recognized or not prioritized come to the foreground. We see specific ways in which new practices bump up against existing norms, and how individual beliefs and the ideas represented in new tools can come into conflict. Again, this provides a basis for motivating action around a discovered need.

The initial trial of ePortfolio described in Stage 3 also helped to highlight the need to understand how teachers perceived the ePortfolio tool and to figure out how such a process could add value to teacher practice. For Stacy, we also saw a realization of the need to help teachers use standards when designing their curriculum. Clearly, the emergent intention behind ePortfolio and its use was to support evidence-based practice. However, we found throughout the stages we described that pieces of the puzzle were not sufficiently in place to make the specific activities around the tool valuable for teachers. An important positive result of the work was a persistent push by Stacy to spearhead work on curriculum, standards, and assessment that were aligned with the original goals of the portfolio project. We view the design activity that occurred in the three stages described in this case as processes that helped contribute to the long-term project of building an evidence-based culture in the school.

From our case, we see design pushing on practice and practice pushing on design—and both of these dynamics working towards improvement. Both design activity and the subsequent trials of introducing the new tool and practice into the setting is therefore informative for the refinement of the design and for understanding *what it takes* to create organizational changes towards evidence-based practice. Specifically in this case, we found that having a coordinated system of standards was a significant first step towards building an instructional infrastructure. We saw that building shared language, concepts, and integrated practices of curriculum, instruction, and assessment is a critical piece of the overall endeavor towards a more evidence-based school culture. We also learned the importance of how leaders frame the introduction of new evidence-based activity, how teachers make sense of the new practices, and how new practices can reveal areas of conflict with existing norms and beliefs. We saw that the concreteness of design and development processes

helps provide insights to principals and other school leaders (formal and informal) about intermediate steps towards longer-term organizational goals.

One implication of this view is that school leaders should take a reflective stance toward using design activity for improvement. This requires the ability to take on work that may be risky and involves trial and error, but that with reflective monitoring of the work, can yield long-term benefits. Stacy describes how she sees this work:

*You don't need to present this kind of work in the sense of, "I know it. I know where we are going and I've got all the answers." I was going through some stuff about ePortfolio with [the Committee Chair] the other day and some of the earlier conversations with [teacher X], conversations with [teacher Y], conversations with [teacher Z], to try to figure out and get that touch base of where people are with things. Then us just kind of constantly talking through what direction...how far we think we can push things and how we want to prioritize them as going forward.*

*In truth, so much of this, whether it's right or wrong is a very kind of reflective, iterative process of trying to figure things out and we are constantly trying to juggle or balance our way, a lot of different priorities, make them feel coherent, help teachers understand that things flow in one direction, and to emphasize the right pieces.*

*But I think sometimes we are kind of designing on quicksand, so we try to figure out what it is that is going to work best and think as we go.*

Participants in this kind of design activity should expect the process to identify other, related areas that will need attention and work. Leaders will need to decide how to redirect work or organize parallel lines of work. As we see in the case study, the design activity is necessarily concrete and can provide a form of evidence of improvement that can inform decisions that school leaders make. We need to learn more about how the insights and evidence created at each stage can become more easily available to leaders and others and accessible for reflection and planning of next steps. Leaders can also play an important role in shaping goals and expectations around various stages of this kind of work.

For teachers and staff, working with new tools and practices in their formative stages can be frustrating. Thus, this case raises the question of how can we leverage design activity to iteratively push for organizational change while minimizing possible negative consequences. Some ideas include making expectations about goals for stages of work clear and facilitating conversations to openly discuss the ongoing work. When working in a pilot group or working in an early implementation, technical problems or logistical glitches should be expected and ways of documenting and responding to these should be established. Also, staff should view themselves as participants in a collaborative, design process.

For tool designers, this case raises questions about how to better support school leaders and others by providing evidence for reflecting on design activity. For example, how can the tools themselves help school leaders monitor the success of an implementation trial? How can the design process itself be structured so that evidence of organizational change can be analyzed and used for planning? Also, this case provides examples where the instructional infrastructure of standards and curriculum were found to be weak or missing. For designers of tools for evidence-based practice in



particular, we might expect this to be a common issue we see in schools working toward improvement. Thus, we may need to consider ways to help schools uncover these underlying issues and develop tools that are responsive to schools in terms of developing their instructional infrastructure.

## Conclusion

Developing cultures of evidence-based practice is difficult, long-term work. Without a perspective of design activity as generative and iterative, initiatives to build an evidence-based practice can be viewed as unsuccessful. Through this case study on the development of the ePortfolio tool, we have highlighted patterns of design and development that we believe can help a school engage in a change process. School leaders and teachers who are working towards evidence-based practice should consider the insights and evidence generated from design activity as useful for understanding their current state and developing concrete steps for getting closer to long-term goals of improvement.

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