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Abstract

This study explores the perspective of students, teachers and parents to evaluate the use of digital portfolios as an additional way to capture and enhance the learning of elementary students in a public school setting and as an opportunity to communicate this learning to parents. The research questions address three problems: complex assessment of learning, parental participation, and student and teacher satisfaction and the impact of the portfolio on teaching methods. Particularly, we are interested in the subjective satisfaction of students, teachers and parents in the portfolio development process. We are also interested in whether students learn to reflect constructively on their work, whether teachers have changed their teaching methods and whether parents believe the portfolio was used or could be used for enhanced communications.

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The Problem

Learning is a complex and multidimensional process which is often difficult to capture, assess and communicate to stakeholders. In the United States current climate of high stakes testing, a single standardized test may determine the next year's grade level placement for children as young as eight and nine years old (Texas Education Agency, 2008). In many elementary classrooms, the joy of creating and discovery has been replaced with a cycle of working through test preparation material, learning test taking strategies, taking practice tests and test simulations. This study was undertaken to explore additional ways to assess and document learning in a more multidimensional way than standardized tests afford. Digital portfolios were used as an additional way to capture and enhance the learning of elementary students in a public school setting, provide those students with both voice and choice in what they consider important artifacts of their learning, and as an opportunity to communicate this learning to parents. In addition, the researchers rated the student reflections to see if the students began to look at their work or their way of learning more reflectively.

Sarason (2004) expresses his frustration about the ambiguity that surrounds the word "learning" for educators. He offers a definition of learning as a complicated negotiation of emotions, attitudes, motivation and cognition. Further, he notes that reducing the measurement of learning to simply a change in behavior severely limits both students and teachers. Assessing students primarily with standardized tests, while important, offers only a limited view of the students' skills. It also allows the teacher and parents only a meager glimpse into the students' learning and development. Yet educators understand that learning is complex. Clearly, educators need a way to evaluate students' learning, recognizing its complexity but not interfering with the standardized tests. Portfolio assessments offer another dimension to the assessment process.

Further, as previously noted, motivation is an important prerequisite to learning (Deci & Ryan, 2000; Sarason, 2004). Kay (public presentation, July 2005) notes that people rarely adopt powerful ideas by just being exposed to those ideas. If they do learn them, they have their own reasons for doing so. Standardized tests can motivate some, but not all students to learn (Ryan & La Guardia, 1999). A key factor of motivation is enjoyment, or fun. Papert (2002) challenges educators to consider "hard fun", work that is fun *because* it is hard, not *in spite* of being hard. Therefore, educators can increase motivation by offering students multiple ways to document their learning.

Portfolios require reflecting on work the student created (Kilbane & Milman, 2003). This reflection is an important metacognitive skill that can benefit students for years to come. Because it is unlikely that students will put textbooks or worksheets in their portfolio, it is a way to push teachers beyond those stock resources and into creating more authentic projects for their students that include considering "hard fun."

Finally, research clearly supports the value of involving parents in the education of children (Comer & Hayes, 1991, Epstein, 1995, 1997; Helm, Beneke & Steinheimer, 1998; Sarason, 2004). Yet in today's world, with single parent households and/or two working parents commonplace, the ability of parents to partner in their children's education is diminished. This disconnect between educators, students and parents could not only discourage students' learning, but also shifts substantial burden to the educators alone. Therefore, educators need a twenty-first century means to communicate with parents and encourage their participation in their children's learning.

This exploratory study is design research (Barab & Squire, 2004) which is further defined in the Methodology section. An important component of design research is an understanding the

context, specifically for this article the digital portfolio context in the public elementary school setting. The portfolio process used in this study was adapted from the model for adult educators by Kilbane and Milman (2003). The original portfolio model is highly reflective and consists of four main parts: 1) the focus and framework of the portfolio, 2) an educational philosophy statement, 3) a collection of artifacts, and 4) a written reflection on each artifact. The focus and framework asks educators to identify their purpose for the portfolio and the way in which they would like to frame the contents of the portfolio. For example, teachers can use subject area standards for the framework or an exploratory question for the framework. The educational philosophy statement is a reflective piece that describes the teacher's beliefs about education, the learning process, the teacher's roles, the students' roles and more. The teacher then selects any number of artifacts that represent his/her work and writes a written reflection on each artifact. The written reflection asks teachers to connect the artifact to the educational philosophy statement and evaluate the teaching transformation that has occurred as a result of the artifact.

For the third and fourth grade students, the model was modified slightly but maintains the highly reflective nature. All portfolios were designed as learning portfolios (Barrett, 2007) and the framework was constructed around the school year. Specifically, each six weeks grading period of the school year was designated as the timeframe for each artifact. Instead of educational philosophy statements, the young students created learner's philosophy statements. These statements guided students to reflect on themselves as a learner, how they learned best and what helped them most while learning. Finally, instead of written reflections, students were guided through the reflective process using an interview protocol to conduct peer-to-peer interviews which were digitally recorded.

Barrett (2005) notes that portfolio literature research is challenging because of the many reasons people create portfolios and the many contexts in which portfolios are used. Specifically, Barrett notes that research surrounding portfolios in higher education and adults is significantly more common than research surrounding portfolios in K-12 education. Further, Carney (2004) notes that most research cites theoretical underpinnings of portfolios with scant systematic and empirical evidence. The portfolios described in this study are considered learning portfolios (Barrett, 2007). The purpose of this study is to contribute to the theoretical research and begin the process of compiling empirical evidence of the value of learning portfolios in K-12 settings.

Research Questions

The research questions center on the benefits of the portfolio development process for third and fourth grade students, their teachers and their parents. Particularly for the students, we were interested in determining whether the students perceived any subjective satisfaction, whether they enjoyed the process and importantly, whether they learned to reflect constructively on their work. This last research question offers new empirical evidence from learning portfolios in elementary classrooms. From the teachers, we were interested in determining whether they perceived subjective satisfaction in the process and whether the portfolio process has impacted their teaching methods. Finally, from the parents, we were interested in whether they perceived any subjective satisfaction in the process and whether the portfolio was used or could be used as a vehicle for enhanced school/home communications. Therefore, this project is important because it will use the perspective of the students, teachers and parents to evaluate the three problems noted in the previous section: complex assessment of learning, parental participation, and student and teacher satisfaction. It also offers empirical evidence that highly reflective

learning portfolios create an environment in which students learn to reflect on themselves as a learner and on the subject matter learned.

Description

During the 2006 – 2007 school year, two multiage classes of third and fourth graders in a North Texas suburban public school compiled digital portfolios of their work. Early in the year, under the direction of first author, each student developed a learner's philosophy statement and designed a navigation banner for a personal webpage as a place to display learning artifacts of their choice. Each six weeks, students selected one artifact from their work for that term as an example of an important project. Using pocket PCs, the children worked in pairs to interview and record each other about their chosen artifact to justify its inclusion in their portfolio, and reflect on their learning during the project. Pocket PCs, sometimes called Personal Digital Assistants (PDAs), are small devices that fit into the palm of the user's hand. These devices have calendar and contact software, but also contain productivity software such as Microsoft Word and other functions such as a voice recorder. Recordings of their interviews and digital reproductions of the artifacts, if available, were posted on the website of the first author.

Methodology

This preliminary study is an example of design-based research (Barab & Squire, 2004). This type of research methodology acknowledges the unique context from which the study emerges and also seeks to revise the designed context to further study. The portfolio process described in this article is the designed context for the study. This study offers a mid-year snapshot of the portfolio process which will be further refined and modified for further future study. Specifically, this study is a mixed design that is primarily qualitative, but includes quantitative survey data, as well. Auditory podcasted reflections were coded for evidence of

reflection on the learning process and focus group interviews were analyzed looking for themes and patterns to emerge on the value and satisfaction of this type of assessment. Likert-type survey data was tabulated for percentages of subjective satisfaction.

Once the students had two entries on their electronic portfolios, the research partners conducted a content analysis of the podcasts of each of the electronic portfolios looking for evidence of either reflection on the subject area content of the chosen project or evidence of student reflection on themselves as a learner. If the researchers noted two or more instances of reflectiveness, the students were rated as "reflective," if the researchers noted one instance of reflectiveness, the students were rated as "somewhat reflective," and if no instances of reflectiveness were noted, the students were rated as "non-reflective."

Reflectiveness was determined in three ways. First, when the child's remarks made connections to the content as in instances of considering what they learned about content such as, "I learned that Jupiter has seventeen moons." or "I learned that a shell is like the bone of the creature inside.", these remarks were considered reflective, whereas "I learned about the Solar System." or "I learned about shells" was not considered reflective. Some amount of content specific detail was required for reflectiveness. Second, instances when the child commented on themselves as a learner were also coded as reflective, such as "Whenever I messed up – I didn't give up and kept trying." or made a connection to their learner's philosophy statement like "I wrote in my learner's philosophy statement that I like to do things like do experiments and building things, and this really shows that because we had to build the ecosystem in the hallway and this was really fun." Evaluating the quality of their own work was third type of evidence of reflection. Comments such as "I might make more flip parts to it (science cycle animation project) – put more detail into it.", "I was doing a rhyming poem, so I had to find the right

rhyming words….make it in a little bit better hand writing and make it a little bit longer and make better rhyming words." or "I tried to make mine perfect [shell model], but it was kind of hard and it got cracked…I would probably try to look closely at it and try to make it a little bit better." were all considered reflective statements. When students made one reflective statement, they were moved from "non-reflective" to "somewhat reflective." When students made two or more reflective statements, they were moved from "somewhat reflective" to "reflective." Researchers separately coded the interviews and then compared codes. Consensus building was used to reconcile all discrepancies (Boyatzis, 1998). Then, percentages of each type of student was compared for the first and second six weeks terms looking for increases or decreases from non-reflective to somewhat reflective to reflective.

In addition, a purposeful sample of eight children with at least two from each reflective category, were chosen to participate in a focus group interview. The transcript of that interview was transcribed and coded using a grounded theory approach looking for patterns in the data (Strauss & Corbin, 1998). Again, consensus was developed on any coding disagreements through discussion and determining which code was most appropriate (Boyatzis, 1998). Finally, all student participants answered a Likert-survey questionnaire that rated their satisfaction about and reflective nature of the portfolio process. The questions were stated in both the positive and the negative for increased validity and reliability. Triangulation of these multiple forms of data was used to ensure the trustworthiness of this data.

Parent and teacher data was collected after two portfolio entries were posted on the website. The parents were given the user name and password and directions on how to access the site at parent meetings, through the classroom newsletter, and through communication by their children. Parents listened to their child's reflections and teachers listened to their students'

portfolio reflections and completed both a Likert-type survey and open ended questionnaire. The parent and teacher surveys were developed in the same way as the student surveys in both positively and negatively stated statements. The open ended surveys were coded using a grounded theory approach and consensus building in the same manner as the student data.

Findings and Discussion

Students

According to the Likert-type survey and the focus group questions, students clearly perceived subjective satisfaction with the portfolio process. From the survey, students were asked to indicate whether they enjoyed the process "lots of the time," "some of the time," or "none of the time." Sixty-four percent of the students indicated that they enjoyed the process "lots of the time." An additional twenty-four percent enjoyed the process "some of the time." Conversely, students were asked whether they believed they were wasting their time by creating a portfolio. Eighty percent of the students chose "not very often," indicating their positive perception of the process. Finally, the focus group interview data, which is further explored below, supports this positive perception.

While the vast majority of students enjoyed the portfolio process, a small group of students did not. The survey was not designed to elicit open-ended responses, but during the focus group interview, students responded to the question, "What part [of the portfolio process] would you like to change?". The suggestions for improvement surrounded two areas: the interview protocol and the learner's philosophy statement. First, several students noted that they would enjoy the process more if the interview questions were changed each time. One student noted that he "would really like to change what you have to do like the questions. I'd like to change them because some questions you can't remember something that you need to do it for or

you don't have enough time to answer or something." Two other students agreed that changing the questions would improve the process. Researchers and practitioners who have used protocols for an extended period of time note that it typically takes up to five times through a protocol for users to notice the subtle yet profound differences the structure makes (Blythe, Allen & Powell, 1999; McDonald, Mohr, Dichter & McDonald, 2003). Indeed, later in the school year when students were presenting work to each other, one student began spontaneously using the interview protocol questions to probe his fellow student. Further, several students did not feel limited by the protocol and added questions as appropriate to assist listeners in understanding the work. Second, the students in the focus group noted that the process for creating their learner's philosophy statement and relating it to their artifacts needed improvement. Specifically, one question on the interview protocol asks students to think about their learner's philosophy statement and to relate the current artifact to that statement. However, students did not always have their learner's philosophy statements in front of them during the interview. Since this feedback, we have asked students to read their learner's philosophy statement immediately prior to their interviews to help them remember and reflect more deeply. Another student noted that she would like to have revised her learner's philosophy statement. Some students made time for themselves and updated their philosophy statements on their own but others did not update their statements as time was not set aside in the classroom for that purpose. This continual updating of the learner's philosophy statement is an important component of the process and one which we hope to include more intentionally in upcoming investigations.

Overall, the focus group interview highlighted some common themes. Students were asked specifically about what they enjoyed and what was hard about the process. The

overarching themes that emerged from the interview process included fun, choice, and the power of the digital aspect.

Over and over again, the focus group participants cited "… it's just really fun." when discussing the most enjoyable aspects of compiling a portfolio. The "fun" the students noted permeated all the other themes as well and became a powerful tool with which the students described their feelings such as one student's statement "…I worked really hard on it and it was fun to do." Thus, this "fun" can be best described as Papert's (2002) "hard fun." Because this theme was diffused throughout the other themes, it will be discussed in conjunction with the other themes that emerged.

The theme of students' choices emerged in the areas of product and process. Most students indicated that their choice of artifact was the most difficult and the most enjoyable part of creating their portfolio. One student said, "The hardest part would be picking them [artifacts] because I have so many good things about the six weeks…." The personal aspect of choice is illustrated by one student's response, "I enjoy that it is like mine. It's not anybody else's. It's mine and I can put almost anything I want on it." Other students indicated their satisfaction with choice within the process. For example, some students chose to write their answers to the reflection questions prior to the interview which was not a requirement. Other students chose to listen to their interview, evaluate it and rerecord it until they are satisfied.

Students found satisfaction in the digital aspects of the portfolio, including the public nature of their work posted on the Internet, the authenticity of creating their own navigation banner and the value of the pocket PC used in the reflection interviews. A common theme emerged as students discussed the importance of their work because it is displayed for the world. For example, one student said, "And it is something that you need to do good because it will be

shown to the whole world and the whole world will see it when you get done." Additionally, students created their own navigation banner on paper which was scanned and used on their portfolio. Several students noted the authenticity of this project as well as the creative and choice aspects. Finally, students perceived value in using the pocket PC as a tool in creating their digital portfolios. Students found the pocket PC to be a natural tool to use because "… it is like you are just speaking to the pocket PC." Another dyslexic student commented "you just speak it all out which is quick and easy." All the students were fascinated by hearing their own voice on the pocket pc, including one student who also noted the authenticity of the recording commenting that "You can hear yourself again and it records it the exact way that you said it and it doesn't pause or anything so you can laugh at how your voice sounds and things like that."

Based on the data of coding each portfolio reflection and focus group interviews, students are learning to reflect constructively on their work or on themselves as a learner as a result of the portfolio process. Students' reflections progressed significantly over time. During the first six weeks, only thirty percent of student reflections were coded as "reflective" whereas during the second six weeks, half of the students were coded as "reflective." Conversely, half as many students were coded as "non-reflective" in the second six weeks as compared to the first. From the focus group interview, students noted their ability to remember or retrieve information and their increased metacognitive skills. One student noted, "… it refreshes my memory on the project and makes me think about it more." Another student commented that the reflection process "…makes me think harder about what I did and sometimes it makes me think harder about how that is going to make a connection in my older life to remember."

Teachers

The data from the teacher questionnaire indicate that teachers clearly perceive subjective satisfaction from the students' digital portfolios. A strong theme from both teachers was the authenticity of the portfolio process using words such as "real-life application of their learning" and "watching children take their work seriously." However, the portfolio process is not without its difficulties. Both teachers specifically noted "time" as a difficulty with the process. The time factor was also noted by a significant number of teachers in other portfolio research (Herman & Winters, 1994). Additionally, one teacher commented on the difficulty in obtaining and coordinating the security releases necessary for the students work to be shared on the Internet. Clearly, these are both areas in which further study is warranted.

The data further indicate that the teachers perceived the portfolio process has impacted their teaching methods. The students' selection of artifacts and their reflections on their work have offered each teacher insights into the child as a learner. Specifically, one teacher commented "I am … hearing what the children like about learning." These insights are also offering the teachers new perspectives on what is learned and on what the students perceive as important and relevant in the lesson. One teacher noted, "They sum up what is learned and the importance…." These insights are leading one teacher to "think more critically about the learning objectives and how I am designing work toward that objective and communicating the intentions." Finally, the portfolio process has strengthened the teachers' view of children as strong and capable learners. They described students as "more engaged," "reflecting more" and taking "ownership in their education." This strengthened view of children as capable protagonists in their own learning has allowed one teacher to have deeper discourse with students about themselves as learners, noting that "the children and I can talk about what they did as

learners that made them successful or what they need as learners to be successful." Clearly, the teachers viewed the portfolios positively for the students and for themselves.

Parents

Through both the Likert-survey and the open ended survey, parents indicated benefits to the digital portfolio process. The strongest benefits included documenting progress, the digital aspect of the portfolio and the reflective nature of this work Parents indicated that the digital portfolios gave them a glimpse, or window, into their child's classroom. Each parent noted their enjoyment of the digital aspect of hearing and/or seeing as part of their perception of being included in the life of the classroom. An additional dimension of the digital nature of these portfolios is to actually hear their child's voice while reflecting on their work. As with the teachers, worries about the teacher's time was listed as a drawback for this type of assessment.

Conclusions

Overall, students, teachers and parents attributed subjective satisfaction to the portfolio process. Additionally, students began thinking more deeply about the content and about themselves as a learner while teachers obtained valuable insights into those thoughts. This finding is particularly useful because as previously mentioned, empirical findings are limited particularly for elementary aged students. Finally, parents began to perceive the portfolios as a means of communicating their child's classroom learning, connecting home and school more deeply.

As this is design-based research, it is important to discern the important elements of the portfolio process that should be protected and the elements that require adjustment. We view the overall process as strongly reflective and seek to maintain that stance with any future changes. However, there are areas that could be improved. We have begun a new school year and have

made several adjustments to the process in order to further the design-based research. First, we adjusted the interview protocol script to offer more context at the beginning of the interview. We also discussed with students the option of varying the script as necessary for the circumstances. We even played some of the prior reflective interviews where students had deviated from the script and discussed whether that change benefited the listeners or hindered the process. Second, we would like students to revisit their learner's philosophy statement in the middle of the year to revise it as necessary. Clearly, this part of the process was the most challenging for students, but is certainly a worthwhile area to pursue. Indeed, it is when we stretch students beyond what is comfortable that we create a space for them to be more than they are (Vygotsky, 1978; Winnicott, 1971). Finally, we have migrated to a new system that allows students to take more ownership of the portfolio process. Students are now able to scan and upload their own artifacts as well as upload their reflective interviews. We believe these changes will have a positive effect not only on subjective satisfaction but also on their growth as a reflective learner.

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