Reviewing, rethinking, recalling: The impact of digital portfolio reflections on students and teachers

Abstract: With the widespread interest in using digital portfolios with college students, this research evaluates the impact of reflective digital portfolios on elementary students and their teachers. The digital portfolio process is cognitively demanding and creates an inclusive and dynamic learning environment. Specifically, the study used a mixed methods approach to evaluate how young students learn to reflect constructively on their work and learning and how listening to the student reflections affected their teachers' methods and planning. The results indicate that disciplined reflection has significant positive effects for students and teachers.

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Introduction and Theoretical Framework

In America, our current educational climate continues to be focused on a single standardized test that carries with it the power of grade level advancement for children as young as eight or nine years old (Texas Education Agency, 2008). Critics, including parents, teachers and students, contend that the position of privilege that standardize tests hold has a number of unintended negative side effects including more teacher centered practices, narrowing the curriculum by teaching only what is tested, more time spent on test preparation than teaching, stress on both children and teachers and higher drop out rates (Barksdale-Ladd & Thomas, 2000; Hoffman, Assaf, & Paris 2003; Neil, 1998; Triplett & Barksdale, 2005). There is even some thinking that students are actually learning less than in the past because of narrower thinking and curriculum (Neill, 1988) and that America has traded its position as a leader in creative and innovative thinking for higher standardized test scores that focus on lower level thinking (National Center on Education and the Economy, 2006). The public is now asking for more "portable skills" such as problem solving, critical thinking and making connections across curriculum and disciplines. Fluency with technology is identified as the number one skill and discipline for all students (Wallis & Steptoe, 2006). Clearly, learning is multidimensional (Sarason, 2004). We need a similarly multidimensional tool to document and assess that learning.

Examining Student Work: Portfolios and Protocols

As we begin to see a shift from the one dimensional, bottom line accountability of learning through standardized test scores alone (Barksdale-Ladd & Thomas, 2000; Triplett & Barksdale, 2005), to a more holistic view of the child as a problem finder, solver and thinker, we need additional, more contextual tools, such as the portfolio process and protocol use to provide a more inclusive and authentic way of evaluating learning.

Designed after the visual arts model of showcasing best work, in the educational context, portfolios are usually considered to be a collection of self-selected work samples, or artifacts, that best represent the capabilities of a student (Resnick & Resnick, 1992). In addition to showcasing products, portfolios can also process and demonstrate growth (Hill & Ruptic, 1994). Kilbane and Milman (2003) include a reflective component in their definition of portfolio. This reflection is an important metacognitive skill that can benefit students for years to come. Further, research on adult learners has demonstrated the effectiveness of reflection in becoming self-regulated learners and that this reflection can be purposefully developed in time (Masui & De Corte, 2005). While portfolio research is varied, the majority of the literature surrounds the theoretical aspects of digital portfolios and explanations of particular implementations. Further, most research uses adults and/or higher education rather than elementary students (Barrett, 2005). This study aims to demonstrate that young learners can also develop this important skill.

Protocols, or disciplined discussions, are another way to examine student work. By collaboratively looking at student work with a specific set of questions and consistent set of procedures, a framework for teachers emerges that promotes participation, ensures equity of voice and ideas, and builds trust (McDonald, Mohr, Dichter, & McDonald, 2007). Protocols are used in science to ensure faithful repetition of an experiment or research project and social scientists use them for interviews. Many educators understand the impact of looking at student work on teachers and teaching (Blythe, Allen & Powell, 1999). By using protocols, groups of teachers evaluate students' learning to inform their own teaching. Typically, these protocols are used by the adults after the student has completed the work and outside the context of the student work. Our work places the protocol in the students' hands, or rather in their mouths. The students used a protocol to interview each other for their reflections. Teachers then listened to these protocol-driven reflective interviews periodically, noting how the experience informed their teaching. Carlina Rinaldi (2006) refers to this careful listening to children as the "pedagogy of listening". As teachers listen, even greater insight into the thinking of the students is made possible.

Cognition

Reflecting on an important learning artifact or process places the learner in an evaluative and reflective stance (New, 1998). Learners must consider the units of study for the evaluation period, which product or activity was meaningful and demonstrative of learning that occurred, consider why this piece is evidence of some important change in their learning or understanding, and communicate this self understanding to others. These processes of analysis, synthesis and evaluation in the portfolio process positions this work at the top of Bloom's Taxonomy of Cognition. The reflective nature of this process is cognitively demanding and, when paired with making connections to a personal philosophy of learning, leads the student to becoming metacognitive in regard to themselves as learners.

Technology

Technology can enhance the portfolio process. Computers provide physical space saving place to store digitized artifacts (Niguidula, 1998) and a web-based portfolio expands the authentic audience for students. Additionally, the use of the digital recorders for podcasting student reflections, removes the need for writing, which might impede some young students' ability to demonstrate their reflectiveness. Exposure and experience with these new technologies provides 21st century learning opportunities. Importantly, this novel use of technology has proven to be paramount to student engagement, ownership and deep reflection within the portfolio.

Digital Portfolios as a Crossroads of Technology, Instruction, and Cognition

Digital portfolios are appealing because they can utilize and showcase students' digital literacies as well as content learning and they offer a broad and authentic audience when they are posted on the World Wide Web. Distant family members and friends to whom the learner gives access may also review the student's work. By including the learner in the process and providing a way for adults to observe children's thinking and learning, the digital portfolio provides a venue for more discussion on the learning, and thus, the deeper kinds of understanding that accompanies it.

Purpose

This preliminary study is a mixed methods case study of thirty-eight third and fourth grade students and their two teachers (one of whom is the first author) involved in a pilot program of technology integration during the 2006-2007 school year conducted by the second author as part of her doctoral work. As part of this integration, students created a digital, web-based learning portfolio (Barrett, 2007) to demonstrate their learning throughout the year. Additionally and importantly, this study was not limited in considering only student learning, but also but also what teachers can learn from student reflections as well. The two main research questions focus on the following:

- Will the use of a digital reflective portfolio model increase elementary student reflectiveness over time?
- How does listening to student reflections on their work affect teacher planning and teaching methods?

This study focused on two primary goals. First, it aimed to assess student growth in reflection. Specifically, the research team rated student demonstration of reflective thought using interviews from digital portfolios from the first, second, fourth and fifth six weeks for this study. These interviews were selected as a sample of the entire year which could demonstrate growth from the beginning of the year to the end of the year. The second purpose of the study was to identify any change in teacher planning or teaching methods as a result of listening to the student reflective interviews.

Context and Procedures

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. The digital portfolios were adapted from a highly reflective model for adult educators (see Kilbane & Milman, 2003). The adult model consists of four parts: 1) the focus and framework of the portfolio, 2) an educational philosophy statement, 3) a collection of artifacts, and 4) a written reflection of each artifact (Kilbane & Milman, 2003). Each part is connected to the others to form a cohesive, integrated and reflective portfolio. Of course, adults can create a learning portfolio, a professional portfolio, or an assessment portfolio (Barrett, 2007). However, we modified the framework for the student. Specifically, we asked students to 1) create a learning portfolio as the focus of the portfolio, 2) create a learning philosophy statement, 3) choose one artifact for each six weeks evaluation period, and 4) reflect on their artifact, learning and learning philosophy statement through partner interviews digitally recorded. Specifically, students chose and reflected upon one artifact each six weeks that demonstrated some important learning for that evaluation period.
Web-based technology was chosen for the portfolios for three reasons. First, using a digital portfolio, particularly a web-based portfolio, expands the authentic audience for students and provides more opportunity for school and family communication. Second, paired with the use of the digital recorders, it provided an opportunity for more experience with current technology. The audio component of the digital recorders by-passed potential difficulty of writing interfering with deeper reflections of these younger students.

Early in the year, the second author, McLeod, facilitated sessions to help each student develop a learner's philosophy statement and design a navigation banner for a personal webpage as a place to display learning artifacts of their choice. McLeod also planned and conducted a unit on interviewing and developed the interview protocol (Appendix A). Each six weeks, students selected one artifact from their work for that term as an example of an

important project. Using pocket PCs and the interview protocol, the children worked in pairs to interview and record each other about their chosen artifact to justify its inclusion in their portfolio, as well as 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 second author. The resulting portfolio included six audio recorded interviews and a digital image of each chosen artifact.

While the portfolio design and the technology changed slightly in the year following this study, several elements were considered crucial to the process and were not altered. For the technology, using the audio recordings of the reflective interview and maintaining the web-based nature of the portfolios were both deemed crucial. For the portfolio process, the reflective nature of the portfolio, including a learner's philosophy statement and a reflective interview, along with the interview protocol use were regarded as important.

Methodology

Student Data

Each audio podcasted reflection interview was analyzed and coded for evidence of reflection during the first, second, fourth and fifth six week grading periods of the 2006-2007 school year. Because the students were using a reflective protocol for their interviews, it was important that some interviews were selected after students developed some experience with the protocol. Blythe et al. (1999) note that it can take three to five times with a protocol before users feel comfortable with it. Student reflections were rated as either non-reflective, somewhat reflective or reflective based on a content analysis of the instances of reflectiveness of each portfolio entry. 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." Then, percentages of each type of reflectiveness was compared for each of the six weeks data collection periods looking for increases or decreases from non-reflective to somewhat reflective to 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).

Initially, the researchers analyzed the first and second reflections of the same student separately, and then compared ratings with 100% agreement. They next analyzed the first and second reflections of five students with 100% agreement. During the third round of analyzing a question arose about a particular student reflection and one researcher marked it with a question mark. The research team discussed unclear instances of reflectiveness until agreement on a ranking was reached.

In addition, a purposeful sample of eight children with at least two students 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).

Teacher Data

After two portfolio entries were posted on the website, teachers listened to their students' portfolio reflections and completed an open ended questionnaire via email (Appendix B). Teachers' written responses were coded by the two researchers separately and then coding categories found in both teacher responses were compared and discrepancies negotiated. The questionnaire data was coded using a grounded theory approach (Strauss & Corbin, 1998) and consensus building (Boyatzis, 1998) in the same manner as the student focus group interview data.

Findings

Students

Students became more reflective as the year progressed, which is demonstrated quantitatively and qualitatively. Quantitatively, the researchers first evaluated frequency counts of each of the categories of reflective, somewhat reflective and non-reflective. During each assessment period, the number of students who were rated as reflective increased. After the first six weeks, 30% of the students were rated as reflective. By the final six weeks, 57% of the students were rated as reflective. Conversely, during the first six weeks, 35% of the students were rated as non-reflective whereas the final six weeks had only 20% of students rated as non-reflective. These differences are statistically significant at the $p<.05$ range. Additionally, over 70% of students were reflective at least once during the sample and over 40% were reflective more than once. Finally, approximately 40% of the students increased their reflectiveness during the year and their ratings never lowered.

Two strong recurring themes that emerged from the focus interview data gave some insight as to how children became reflective during this digital portfolio process were: 1) the process of reviewing work and 2) choosing the work to represent their learning. When asked how their portfolio helped them demonstrate their learning responses such as "Like you can go back and when you see it you know you learned it. It reminds you [that] you

can pull that [the artifact] out of your piles and piles of folders with all the information because you remember you've done that and you can… when you really need something like that or something or a test about it you know the test is coming up so the day before the test you can go online and go to your portfolio and you know you've done that and so you pull it out of your mind and get an A on the test". Or another student liked the fact that her portfolio might teach someone else what she learned, *"What I enjoy about my portfolio is that when people log onto my portfolio they can learn something that I already learned."*

"When asked what was hard about this process, most students indicated choosing their artifact. This difficult decision making to determine which artifact represented an important learning piece for each six weeks provoked the students into making evaluative choices.

> Jordan: *The hardest part would be picking them because I have so many good things about the six weeks.*

> Leigh: *Because we worked on it for a long time and you like all of them so it is hard to choose which one.*

> Bryson: *I agree with Jordan and Bailey and Leigh because it is really hard to choose the artifact…it's really hard because you just can't decide. If there is like four things and you have to just decide on one of them. It is just really hard to pick which* one.

Children chose work that they described as both "hard" and "fun" (Papert, 2002), work that took a great deal of time and/or allowed for individual choice (Schlechty, 1990; Deci, 2000).

Teachers

In terms of how the student reflections affected their planning and teaching methods, the following categories emerged: insights into the learner, redesigning student work around student interests and preferences, clearly articulating learning goals and opportunities for student empowerment. 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 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." As the teachers listened to the interviews, they discovered the kinds of work students found engaging and valuable. These insights offer the teachers new perspectives on what was 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 led 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 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."

Conclusion

In summary, this research demonstrates that with disciplined reflection, students and teachers both significantly benefit from digital portfolio work. The process of creating a digital portfolio produced a shared learning environment. There are three components in this process: 1) students are included in the evaluation of their own learning; 2) teachers are listening for the students' understanding of the intended learning and/or the students' understanding of themselves as a learner; and 3) teachers are listening for broad insights into their teaching and lesson designs. All of these components work together to bring new dynamics to the learning environment.

By viewing the children as a capable partners in their evaluation, we elevate their status to worthy rather than needy (Mooney, 2004). In elevating the view of student learners, we, in turn, elevate our status as teachers (New, 1998). Reflective, responsive teachers move their practice from a technocrat working on an educational assembly line tweaking a "product" to meet production quotas on a specific time table to a professional decision maker (Mooney, 2004; Schlechty, 1990). The feedback about the learning that occurred for each student provides evidence and data to make better informed teaching moves for the next units of study.

The technology choices for this portfolio work increased authenticity of the work and removed a potential barrier of deep reflection as well as providing more opportunity to use current technology. Because the authors believe in the importance of deep reflection, student reflection is a crucial piece of this type of learning portfolio. For young students who are learning to write and who must completely compose and edit all of their writing on paper, written reflections can be barriers to the type of deep thinking desired. The students articulated this as well, "I like the pocket pcs because its… you don't have to write it all down and if you like type it or write it it takes so long and on pocket pcs you just speak it all out which is quick and easy". Another student noted, "You can hear yourself and if you say something wrong you can do it over again and correct it. And it is like you are just speaking to the pocket pc."

While both teachers indicated they enjoyed the process of the digital portfolios and found them valuable for providing feedback as to lesson and learning effectiveness, both also identified scheduling time for these reflective interviews as difficult. One teacher also said making time to listen to the portfolios was also difficult, but in later reflection determined it didn't take any longer than grading a set of papers. 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. These are both areas in which further study is warranted.

Clearly, digital portfolios have a significant place in preparing students for their future. When used purposefully and intentionally, reflective digital portfolios help students become more metacognitive and reflective. They also assist teachers in evaluating the effectiveness of their lessons, provide insight into the child as a learner and provide opportunities for student empowerment. These skills are hallmarks of mature learners and responsive teachers, making digital portfolios an important tool for 21st century learners.

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Appendix A
Interview Protocol

Reflection Questions

Why did you choose this project for your portfolio? How is it important to you?

What was the most important or exciting thing you learned from this project?

What was hard about this work?

What do you think you were supposed to learn from this work?

Think about your learner's philosophy statement. How does this project show your beliefs about learning that you wrote about in your learner's philosophy statement?

If you were going to do this project over again, what would you do differently?

Appendix B
Teacher Questionnaire

Do you enjoy the portfolio process?

What is your favorite part?

What part was hard?

Which part would you change?

Have the portfolios changed the way you plan work?

Have the portfolios changed the way you implemented your lessons?

How did the portfolio strengthen the teaching and learning in your classroom?