A case study about the use of e-portfolio assessment for secondary students with and without disabilities in an inclusive classroom

By

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Abstract

This qualitative single case study examined how one teacher used e-portfolio assessment in an inclusive classroom setting. Specifically, this research describes (a) the teacher's perceptions of e-portfolio assessment; (b) how e-portfolio assessment was used; (c) the relation between e-portfolio assessment and curricular content; and (d) how the relationships among e-portfolio assessment, curricular content, and instruction varied for students who did and did not have IEPs. The four month study took place in an inner city high school math class. Data were collected using semi-structured interviews, participant and passive observation, document analysis/physical artifacts, and field notes. Data collection and analysis occurred simultaneously. Coding was used in the final analyses. The results reveal the e-portfolio assessment was defined by the fusion of its purpose, creation, selection of activities, and ongoing development. Overall, e-portfolio assessment benefited the teacher and his students. Students' e-portfolio entries helped the teacher identify conceptual understandings and errors. This information determined the content of and processes for subsequent instruction for individual students and the group and helped the teacher reflect on the efficacy of his instruction. E-portfolios also enhanced students' motivation, provided students with a more flexible environment in which to complete their work, and allowed students to easily edit their reflections as they grasped clarified concepts. All students produced high quality e-portfolios. However, the students with IEPs needed additional support in editing and learning the concepts being taught. Barriers related to using e-portfolio assessment were teacher time, computer accessibility, digitalization, and situational factors. The meaning of the results and the implications for practice and future research are discussed.

CHAPTER I

INTRODUCTION

Assessment is an important part of meeting the needs of students with and without disabilities. In particular, ongoing assessment allows teachers to make informed decisions about serving the needs of students with disabilities. Regular and special education teachers must engage on ongoing assessment of students with disabilities to comply with the requirements of No Child Left Behind (NCLB) and the Individuals with Disabilities Education Improvement Act (IDEIA), which emphasize the importance of an ongoing evaluation system in educational settings (Campbell & Collins, 2007). In meeting IDEIA and NCLB mandates, all educators should use various types of assessments (e.g., ecological, portfolio assessment, functional behavioral assessment; norm-referenced and criterion-referenced measures, including high stakes assessments) to obtain the information needed to deliver effective instruction and document student achievement (Cole, 2006). General educators also use the results from high stakes assessments to document student achievement (Ward, Montague, & Linton, 2003). Additionally, they use different type of assessments such as portfolios, book response journals, oral presentations, group projects, practice exams, rubrics, and research papers (McIntosh, 2011). Nowadays, technology has begun to change assessment as it has been changing daily interactions, access to information and the world, learning, and teaching.

The growing use of technology creates new avenues for learning, which in turn create a new type of theories. Today's students are active learners. If students have questions about any topic, they feel confident that they can "google it" and find answers. Students can choose what they want to learn, how they want to learn, and how they

corroborate new information. This new era of information allows learners to become more self-directed and independent (Carmean & Christie, 2006). Based on the realities of the emergence of a new type of learner and the spread of technology, McCain (1995) suggests that educators should use technology-based assessment to evaluate students with and without disabilities.

Technology-based assessment, a recently developed and therefore less widespread approach, presents teachers with the opportunity to use a complete method of assessment in the classroom that helps to monitor students' learning process, change instructional practices if needed, and grade students (McCain, 1995; Salend, 2009). Because it is new, it is important to define what it is. "Technology-based assessment generally refers to the use of electronic systems and software to assess and evaluate the progress of individual children in educational settings" (Greenwood & Rieth, 1994, p.105). Some examples of technology-based assessment include but are not limited to active responding systems (clickers), digital observations/diaries, educational games, performance assessment using presentation software, or online and digital learning products such as blogs, digital videos, podcasts, digital storytelling, computer simulations and virtual learning experiences, and e-portfolios (Salend, 2009). The benefits of using technology-based assessment are numerous; technology makes the assessment process easier and quicker, adds another dimension of validity and relevance to the testing process, and makes evaluation more comprehensive by integrating video, text, graphics, and audio (Greenwood & Rieth, 1994; McCain, 1995). There are some barriers, however, that may affect the implementation of technology-based assessment, including accessibility, cost,

the need for training and support, and rapid changes in electronic materials (Greenwood & Rieth, 1994).

Despite the potential disadvantages, technology-based assessment has been used. For example, Irvin and Walker (1994) used video-based computer technology to assess children's social skills. They concluded that the assessment approach that was used "facilitates aggregation and integration of multiple assessments, … is well suited for ongoing comprehensive documentation of construct validities [of the assessment process], … [and] facilitates the matching of student social skills deficits" (Irvin & Walker, 1994, p. 195).

Similarly, Gerber, Semmel, and Semmel (1994) promoted DynaMath, a dynamic computer-based assessment system for students with disabilities. This system offers an output based on students performance multiplying multi-digit problems. DynaMath offers an output with the zone of proximal development, a printout of students' performance, and suggested instructional interventions. In another example, Fuchs, Fuchs, and Hamlett (1994) studied "the digital expert system," a computer program that provides instructional advice to teachers so they can make adjustments in their instruction in order to improve student outcomes. This program was validated by experts to ensure that the quality of instructional advice and feedback for teacher can be used to improve their instructional practices. This system takes into consideration students' curriculum-based measurement (CBM) results to measure students' progress, and instructional stage, and performance on various components. This expert system was used with CBM in reading, spelling, and math. Researchers found that when used in math and reading, the expert system's advice to teachers, resulted in better lesson planning and boosted

students' academic achievement. The expert system generated similar gains in writing, albeit not as strong as those demonstrated in reading and math. The researchers concluded that this expert system is a reliable way to assess students' potential for learning.

Furthermore, in New Zealand, a national technology school-based assessment was implemented. This system is a software application called Assessment Tools for Teaching and Learning (asTTle) (Hattie & Brown, 2007). This system

> "generates a 40-minute test of any one subject customized to the teacher's priorities in terms of curriculum content and difficulty. Once student, school, and question performance data are entered into asTTle, teachers and administrators have a wide range of graphical reports by which they can interpret student performance against norms, criteria, and standards and which, in conjunction with a Website, can identify appropriate teaching resources. This system supports diagnostic, formative, and summative interpretations and gives teachers feedback as to priorities for teaching and learning activities and reporting to parents, students, administration, and government". (p. 191).

Hattie and Brown (2007) concluded that the implementation of this system improved the quality of teachers' work. They recommended this system to other nations to improve their learning and teaching outcomes.

Technology holds promises for providing alternative, effective assessments. One technology-based assessment is e-portfolio assessment. The following sections include an overview of e-portfolios, the statement of purpose of the proposed research, the research questions, and its significance.

Overview of E-portfolios

As technology continues to present new possibilities for assessment, some educators propose the use of electronic portfolios as part of student assessment (Henry, 2006). Understanding the definition of the electronic portfolio requires knowing about three philosophical assumptions. First, the e-portfolio is a learning story or live text (Yancey, 2001) that is "OWNED by the learner, structured by the learner, and told in the learner's own VOICE (literally and rhetorically)" (Barrett, 2004, p.1). Second, e-portfolio encourages lifelong learning (Acosta & Liu, 2006) by connecting formal and informal learning experiences across settings and backgrounds (Tosh, Werdmuller, Chen, Light, & Haywood, 2006). Lastly, e-portfolios should be created in a sharing community of learners that focus on developing a collective responsibility for the learning of all (Van Aalst & Chan, 2007). In this community of learners, students are able to reflect on others' work and give them feedback that promotes intellectual development (Yancey, 2001). Additionally, students record, interpret, integrate, and evaluate their own learning (Yancey, 2001).

E-portfolios have been used in higher education in a variety of countries such as Austria (Roemmer-Nossek, Peterson, Logar, & Zwiauer, 2008), Scotland (Peacock, Gordon, Murray, Morss, & Dunlop, 2010), Austria (Hiller, Pauschenwein, Sandtner, Sfiri, Porotschnig, & Hitter, 2008), France (Staccini, Hergon, Bordonado, Jullien, & Quaranta, 2007), Canada (Hiradhar & Gray, 2008), Russian Federation (Smolyaninova & Ryzhkova, 2009), Switzerland (Christen & Hofmann, 2008) and the United States (Bolliger & Shepherd, 2010). E-portfolios have also been implemented in various university programs and individual course or activities. These include, but are not

limited to, programs that prepare teachers (Deneen & Shroff, 2010; Fiedler, Mullen, & Finnegan, 2009; Sonya, Olfman, & Ractham, 2007; Wickersham & Chambers, 2006), librarians (Florea, 2008), dentists (Gardner & Aleksejuniene, 2008), and nurses (Robertson, 2009); and as part of a Management Information Systems course (Zhang, Xuesong, Olfman, & Firpo, 2010), and in a geriatric medicine fellowship program (Ruiz, Qadri, Karides, Castillo, Milanez, & Ross, 2009). Although the use of e-portfolios has been studied in higher education, the use of e-portfolio as part of assessment PK-12 schools has not been studied enough.

Despite the paucity of research related to e-portfolio assessment in PK-12 schools, e-portfolio research is increasingly appearing in journals. For example, Acker and Halasek (2008) published one of the most recent studies of e-portfolio use in high school. They used e-portfolios as a means to help students improve their writing skills and prepare them for a successful transition to post-secondary education. College and high school faculty were paired to work together giving electronic writing feedback or e-responses to the forty-one (41) students. The researcher collected data that included numerical scores of formative and summative essay assessments, teachers and professors' comments about students' essays, and conversations about the workshops and writing practices students were learning. They found this approach was an effective way to assess students' writing, improve their writing skills, and push them to reach a higher writing level.

In another study, Meyer, Abrami, Wade, Aslan, and Deault (2010) involved 14 teachers and 296 students in the examination of using ePEARL, a web-based e-portfolio tool. ePEARL was created to develop self-regulation skills, such as task analysis, self-

motivational beliefs, goal setting, self-observation, self-judgment, etc.. Using this web-based system, students were able to share, reflect, edit, and get feedback on their work; as well as add videos, podcasts, pictures, and other kind of work. Teachers have access to the ePEARL; students are also encouraged to share them with peers and parents. Using a non-equivalent pretest/post-test design, they found that, when used regularly, teaching with ePEARL had a positive impact on the development of student literacy and self-regulated learning skills.

When searching for research or descriptive articles about e-portfolio assessment, it is common to find information on how to use e-portfolios or how they are being used in some schools. For example, Barret (2007a,b), one of the scholars promoting and providing workshops for teachers about the challenges and benefits of using e-portfolios, posted a list of more than 30 different tools to create e-portfolios for learning on her blog.

McCarthy and Donini (2009) wrote about Mountain View School, which has been developing the use of e-portfolios as a tool to provide a bridge between high school and adult life. This initiative was born in the English Department at that school; the teachers asked students to place copies of their narratives and reflective papers in a media center location. Although this work was available in the media center, this arrangement resulted in the school community having limited access to the work. It also limited students' access to their own work, some of which would have been helpful in job applications or a volunteer work experience. As a result, the faculty decided to digitalize the work using Microsoft Publisher (the program was available in the school), resulting in the creation of e-portfolios. Additionally, they required students to include a resume, students' work and reflections, and a skill assessment based on the Secretary's Commission on Achieving

Necessary Skills (SCANS), and a transition plan for moving from school to adult life that addressed workplace skills and other adults' necessary skills. Following their engagement with e-portfolios and through students' reflections on their work and transition plan, students were not only more prepared to be adult citizens in their communities, but were also able to demonstrate their readiness for adult life years (obligations, requirements, skills) with e-portfolios that showcased their abilities, skills, and achievements (McCarthy & Donini, 2009).

In 2003, Dubinsky described his observations of classes wherein teachers had implemented e-portfolios. These observations led him to conclude that e-portfolios empower students to improve their own learning process because e-portfolios encourage students' to reflect on their own learning. In a similar discussion, Zuger (2008) describes how e-portfolios have been used in different schools, and their effect on student motivation.

Although these articles make a good case for e-portfolios, there is still an insufficient amount of documentation on the use of e-portfolios, and more particularly, e-portfolio assessment in middle and high school. Continued research is needed in this area, especially since education has moved into an era of heightened accountability for student learning. In this environment, e-portfolio assessment may be very useful in providing a portrait of the breadth and depth of students' learning.

Statement of Purpose

The use and possible benefits of e-portfolios as part of assessment deserve more attention in the education field. In fact, the understood benefits and challenges of e-portfolios are based mostly on observation alone. There has been a lack of sufficient

systematic observation or research documenting the possibilities and drawbacks of the application of e-portfolio assessment in primary and secondary education. Examining the nature of e-portfolios, their uses, and the potential impact of e-portfolio assessment should be a priority in education in a time when social change is constantly redefining our understanding of assessment and learning, and in a culture where technological skills are at a premium (Carmean & Christie, 2006). More specifically for Special Education, there is no information about using e-portfolios to assess students with and without disabilities in inclusive settings. To jumpstart this important conversation, my research describes how e-portfolio assessment was used by a general educator in an inclusive setting, its impact on classroom activities and lesson planning, and the teacher's perceptions on using e-portfolio assessment in his classroom.

Research Questions

The purpose of this research was to understand the use of e-portfolio assessment in one general educator's inclusive high school classroom. To accomplish this purpose, I asked four (4) research questions:

1. How does a high school teacher create and use e-portfolios to assess students with and without disabilities in an inclusive classroom?
2. How does the teacher perceive the use of e-portfolios as an assessment tool?
3. What are the relationships among the use of e-portfolio assessments, curricular content, and instruction?
4. How do the relationships among the use of e-portfolio assessments, curricular content, and instruction vary for students who do and do not have IEPs?

Significance

Using a case study approach, Pimentel (2010) studied Rhode Island high school teachers' perceptions on the use of e-portfolio assessment. Pimentel found that the teachers changed their teaching practices in order to use e-portfolio as part of their assessment. This mixed-method, single-case study research design documented how e-portfolio changed classroom practice in the following areas: portfolio tasks, content area, leadership initiative, teaching experience, and professional development. This is the only existing research study that focuses on teachers' perceptions about e-portfolio assessment and related changes in classroom practices. We know little about how the implementation of e-portfolio assessment, the teachers' perceptions of its use, and the resulting instructional changes in an inclusive classroom setting. This research studied those issues.

In my research, I sought to better understand the use of e-portfolios in assessing students with and without disabilities in an inner city school. As there is a limited amount of research about the use of e-portfolios in elementary, middle or high schools, the results of this study may be beneficial to the educational system as a whole, and the Special Education programs specifically. In addition, the results of this study may have an impact at the local and international level. At the most personal level, the study helped the participant teacher reflect on his teaching practices and perspectives with the possibility of improvement, and also helped refine his use of e-portfolio assessment in the classroom. As a result, other teachers in the school may decide to incorporate e-portfolio as an assessment tool, which in turn may lead them to develop innovative uses of e-portfolio assessment. Moreover, this research may invite administrators and teachers

around the globe to collaborate on the development of e-portfolio as a valuable assessment method. Ultimately, my goal is to help teachers reflect on their current practices, and advance the use of e-portfolio as a viable tool in the classroom.

CHAPTER II

LITERATURE REVIEW

Many research studies, books, articles and other publications have focused on assessment. The vast collection reflects the importance of this topic in education. Through assessment, teachers become more aware of students' understandings, knowledge levels, comprehension, behavior, and thoughts. In this section, I provide an overview about how students with disabilities are assessed. Next, I describe which types of assessments used to assess students with and without disabilities. Then I describe how portfolio evaluations have been used in Special Education. In the last two sections of the literature review, I focus on specific information related to this study. First, I describe e-portfolios and then I give an overview of case study.

Overview: Assessing Students with Disabilities

Assessment in Special Education (SE) is a process in which data is collected to inform decision-making related to creating interventions, instruction, curriculum, or supports to address the needs of students with disabilities. The purpose of assessment in SE is to provide information in order to determine eligibility, assess progress, and create or modify a child's educational program. Consequently, assessment is used to evaluate the efficacy of special education services and programs (Pierangelo & Giuliani, 2006).

Eligibility assessment is the process by which professionals determine whether or not a student meets the criteria that entitles the student to receive SE services. To make this decision, professionals collect holistic data on the child from his family, school, and community. Professionals may use ecological or contextualized assessment. Ecological assessment provides information about issues, needs, or environmental circumstances

that may affect a child's performance (Haney & Cavallaro, 1996). Some professionals recommend the application of an ecological assessment; however, a contextualized assessment may be more effective (Pierangelo & Giuliano, 2006). Contextualized assessment offers a broader vision of what constitutes the child's experiences, since contextualized assessment focuses on assessing students in context, or in amidst real world experiences, which takes into account environmental issues that may influence students' outcomes/performance (Bigge, Stump, Spagna, & Silberman, 1999; Pierangelo & Giuliani, 2006). Both approaches focus on the importance of knowing the child and his/her environment in order to decide if he or she is eligible to receive special education services. Usually the information obtained during the assessment of eligibility is also used to develop an initial Individualized Education Plan (IEP) or other plan (Pierangelo & Giuliani, 2006).

Program planning, and more specifically, the development and review of individualized plans, is the second purpose of assessment in SE. These plans include the Individualized Family Service Plan (IFSP) in early childhood, Individualized Transition Plan (ITP) in adolescence, and IEP from childhood through adolescence. In SE programs, an IEP team frequently carries out IEP revisions. The IEP team often consists of and/or should consider input from the student, general education teachers, SE teachers, parents, school psychologists, social workers, and other specialists or persons who may be able to identify a student's strengths, needs, and interests. IEP teams rely on assessment data to develop an understanding of who the student is and what programs or services may best assist the student's learning. By taking into account a more holistic understanding of the student, the initial or revised IEP may be more effective in

enhancing student development. In meetings subsequent to the initial IEP meeting, the team uses ongoing and/or new summative assessment data to determine what progress has been made toward meeting goals and objectives, and revising goals and objectives as necessary. The team also uses this information to determine which supports, services, accommodations, or modifications are needed to facilitate students' learning processes (Bigge et al., 1999; Pierangelo & Giuliani, 2006).

Program evaluation is the third purpose of assessment in SE. This includes evaluation of specific instructional programs and approaches, and overall program evaluation. Ongoing evaluation of instruction within a program is a complex process in which the first step is for teachers and other specialists to develop instructional plans to address identified students' needs. These instructional plans are implemented and continuously assessed to determine the effectiveness of the instruction. Usually teachers collect information about students' performance through observations, portfolios, checklists, rubrics, and Curriculum Based Assessments (CBA). This data can also be used to examine the interaction among students, lesson planning/instruction, and learning. As such, this data is used in overall program evaluation. At this level, program evaluation is more extensive and examines the success of the overall program and services to determine their merits (Bigge et al., 1999; Taylor, 2006). In the following sections, I discuss the types of assessments used: summative and formative, norm-referenced and criterion-referenced, and authentic assessment. Next, I describe controversies that surround one type of assessment, portfolios, as they relate to SE. I also describe how to construct portfolios as effective assessment tools.

Types of Student Assessment for Program Planning

There are a variety of assessment types and tools used to evaluate students with special needs. The team in charge of developing an individualized plan should take into consideration the outcomes of the different types of assessment available. Each type serves different purposes, and the various types provide complementary perspectives on the child.

All assessment falls into one of two categories: summative or formative. Assessment is also classified as objective/subjective, formal/informal, and norm-referenced/criterion-referenced. Summative and formative assessment refers to the function of the assessment. Summative assessment provides information about what the child has learned at a specific point in time. It is used to provide a summation of the student's learning. Formative assessment provides information about how a child is learning, which teaching techniques are working and strongest learning style. This information is then used to alter the teaching process or content (Bigge et al., 1999; Pierangelo & Giuliani, 2006).

Summative and formative assessments may be formal or informal. Formal assessments, which typically include tests, quizzes, etc., can help teachers determine what has been learned. Informal assessments are casual, and include observations, conversations, self-evaluations, etc. Formative and summative assessments may also be objective (one right answer) or subjective (multiple answers) (Bigge et al., 1999; Taylor, 2006).

Norm-referenced and criterion-referenced measures can be used as a part of eligibility determination, and to measure student progress in learning and overall

development at a specific point in time. Although criterion-referenced measures would be considered summative, in certain instances these assessments can yield information that can be used formatively. For example, a teacher may use a student's performance on a standardized test both to measure progress toward meeting a learning standard, and to identify areas where the student is in need of further instruction. In this case, the assessment tool is summative, but the information obtained is being used formatively (Jacobs, Martin, & Otieno, 2008; Taylor, 2006).

Although often thought of as a subset of formative assessment, authentic assessment measures (e.g., naturalistic, alternative, performance-based) have enough distinctive characteristics to merit separate attention. Consequently, after discussing formative/summative assessment and norm-referenced/criterion referenced measures, I conclude this section with a discussion of authentic assessment.

Summative and Formative Assessments

Summative and formative are the primary terms used to label and categorize different types of assessment. Summative assessments are used at the end of a unit, chapter, semester, grade level, academic year, etc., and involve summarizing students' performance. Examples of summative assessment tools may include tests, quizzes, midterms, final exams, portfolios, rubrics, and others. The purpose of this type of assessment is to provide information about how well students have learned the material, information, or procedures taught (e.g., skills, routines). In contrast, the purpose of formative assessments is to provide ongoing input about students' progress in learning. This type of assessment is a valuable way to analyze the overall effectiveness of instructional approaches providing information educators need to modify existing content

or strategies to better meet the needs of the student. Examples of assessment tools that can be used formatively include portfolios, mini-quizzes, curriculum-based assessments (or measurements), checklists, and rubrics (Bigge et al., 1999; Fuchs, Fuchs, Hamlet, Walz, & Germann, 1993; Taylor, 2006).

Distinguishing summative and formative assessments can be complicated. For example, a portfolio can serve as either a summative or a formative assessment, depending on the purpose of the assessment. Formative portfolios are works-in-progress (Carmean & Christie, 2006), where teachers evaluate both the content and the students' portfolio development process, thereby observing students' progress while the learning process is taking place. Summative portfolios are usually evaluated at the end of the academic year. In this case, the learning process is not observed; only the final product is assessed. Therefore, the type of assessment used will determine whether a portfolio will be treated as a final product to be assessed at the end of a semester or year (summative) or as an ongoing learning tool to improve student learning or teaching strategies (formative) (Beck, Livne, & Bear, 2005; Carmean & Christie, 2006)

Norm-referenced and Criterion-referenced

When considering assessments, the terms norm-referenced and criterion-referenced typically refer to types of tests. Norm-referenced tests compare a student's obtained score to a norm or reference group (Pierangelo & Guiliano, 2006). These tests are often called normative or standardized tests. The standardizing process takes into consideration the following components: the specific curriculum to be tested, the development of the test itself, administration procedures, scoring methods, and interpretative techniques to compare students' performances with a statistically based

norm. There are many norm-referenced tests including the Diagnostic Achievement Battery 3, Kaufman Test of Educational Achievement II, Wechsler Individual Achievement Test, and so on. Tests such as these are used to determine if a student is performing above or below the norm for his or her age/gender. Although norm-referenced tests can be useful when screening, determining eligibility for SE programs, or identifying students' strengths and weaknesses, this type of assessment has many limitations (Bigge et al., 2009; Taylor, 2006).

The main criticism of norm-referenced tests is that they are used to test students who differ demographically from the norming group. For example, some tests were developed a several decades ago. Students today come from a variety of ethnic, social, cultural, and economic backgrounds. Diverse backgrounds result in significant differences between today's students and "yesterday's" norming populations. As a result, the value of norm-referenced test results is often jeopardized (Pierangelo & Giuliani, 2006; Taylor, 2006). Because this type of test is frequently used to determine student eligibility for SE, the frequent use or over-confidence in the reliability of these tests could lead to overrepresentation of minority students in SE. When overrepresentation of minority students in SE is a concern, developing better ways to assess students from diverse backgrounds is critical. One final criticism of norm-referenced tests is that they provide little information that is useful in developing specific instructional programs for students with special needs (Taylor, 2006).

When creating instructional programs in SE, program developers typically rely on criterion-referenced tests. This type of test does not require comparing scores with other students. Instead, criterion-referenced tests measure students' performances, or mastery

of certain standards, goals, or educational objectives that are categorized as criteria (Bigge et al., 1999; Pierangelo & Guiliani, 2006). For example, these tests can be used to determine if a student can add fractions or read and comprehend 11th grade material, assessing the student's mastery level. Commercial criterion-referenced tests include multi-component instruments such as the Brigance Inventory and Multilevel Academic Survey Test-Curriculum Level (Taylor, 2006).

A key benefit of criterion-referenced tests is that they can easily be used to develop individualized instructional programs. When administering these types of tests, educators or evaluators can determine what students know, what skills they have mastered, and how they are progressing through a curriculum. Criterion-referenced tests provide specific information about students' knowledge in relation to the curriculum or learning standards. On the other hand, if a teacher wants to compare students with others, criterion-referenced test may not be helpful. If comparisons are important, norm-referenced tests are more suitable (Bigge et al., 1999; Taylor, 2006).

Other differences between norm-referenced and criterion-referenced assessments include the scope and depth of the assessment. Norm-referenced tests cover an extensive variety of areas, but these areas are not analyzed in depth. Criterion-referenced tests provide a deeper understanding of students' knowledge in specific content areas, but may not cover a wide range of areas. The depth of a criterion-referenced test depends on the intent of its creators. A company can create criterion-referenced tests to accompany or be independent of specific curricular materials. Teachers can also create their own tests. Teacher created tests facilitate measuring students' knowledge on specific learning tasks or specific parts of lessons or units. Teachers cannot and do not create standardized,

norm-referenced tests on their own, however, and therefore cannot tailor the tests to measure students' progress in programs or curricula, or address unique strengths or weaknesses. As a result, these existing "generic" standardized tests may not provide the information teachers need to develop students' goals for the next academic year. Teachers need more specific, in-depth information in order to develop effective instructional plans; as a result, norm-referenced tests play a supplementary role in assessing children with disabilities (Bigge et al.,, 1999; Pierangelo & Guiliani, 2006; Taylor, 2006).

Authentic Assessments

The last assessment type discussed in this section is considered a subset of formative assessments. The term "authentic assessment" is used to cover naturalistic, alternative, and performance-based assessments. These terms are used interchangeably in SE literature (Bigge et al., 1999; Pierangelo & Giuliani, 2006). What unites these terms is their conception of the nature of assessment: assessment takes place all the time. Students are assessed based on their performance in real-life activities or simulations. For example, if students are taking a course in school to earn a driver's license, they are assessed while driving or taking a test similar to the formal written driving test. When teachers use authentic assessment, students may be required to structure their projects or presentations around a real-life situation, perform a real-life or meaningful task, or construct and apply knowledge (Fuchs & Fuchs, 1996). Some examples of authentic assessments include interviews, evaluating students' demonstrations, plays or performances; science experiments; writing critiques, stories, and reports; and solving math problems with real-world applications (Hessler & Konrad, 2008). Layton and Lock

(2007) describe twenty authentic assessment techniques that can be used by teachers. They include but are not limited to collecting daily work, using portfolios, directly observing and recording students' behavior, interviewing stakeholders who know students well, and using rating scales.

Authentic assessment has many benefits. Students may be more motivated to perform an activity or learn new information or skills if these learning targets are relevant to their lives. Furthermore, transferring students' learning to another setting may be easier (Choate & Evans, 1992; Cohen & Swerdlink, 2005). When students face an assessment that is consonant with daily instruction, the assessment can be considered to more accurate, and students who have learned the material will be more likely to perform well. An important part of authentic assessment is that it includes self-assessment measures. These measures help students build their self-monitoring skills and habits (Choate & Evans, 1992).

Though this type of assessment has many advocates, it does have some weaknesses. The initial challenge is the amount of time required to create and set-up effective authentic assessments. Students need to show their work or their thinking processes. In order to record adequate evidence of students' learning, therefore, the teacher may spend a lot of time talking with individual students (since this is a one-on-one process) to select and/or develop the best methods by which students can demonstrate their learning. In addition, authentic assessment demands that teachers be creative and develop activities that are meaningful, in which students can problem solve or fulfill real-world tasks. This can take a considerable amount of time (Brandt, 1992).

The second challenge is to create real-world activities that follow the curriculum or learning standards. Often, curriculum and learning standards are not directly related to real-life experiences, and teachers have the difficult task of rethinking the material in order to create meaningful assessment activities. This can lead to validity issues, in which teachers are uncertain whether the assessment actually measures the content in question (Herman, 1992; Cizek, 1991).

One final challenge of authentic assessment is the development of clear, specific, but flexible grading rubrics and rating scales that give each student the opportunity to demonstrate learning in his or her own way. The rubric should function as a checklist that students could use to achieve the best possible grade; at the same time, the rubric should be flexible enough to provide students with opportunities to be creative. In addition, a good rubric should be constructed in clear way to avoid misinterpretations (Choate & Evans, 1992).

Finally, in today's educational system, Brandt (1992) states that authentic assessment may not be the perfect assessment model to prepare students for the challenge of taking high-stakes, standardized tests (e.g., placement tests, ACT, graduation tests). Some students need more direct instruction to acquire the diverse learning or testing strategies needed to successfully complete High-Stakes assessments. Many authentic assessments do not provide students these opportunities.

Portfolio Assessment in SE

The portfolio assessment is one of the most widely used assessment methods of students with disabilities (Kleinert & Thurlow, 2001; Thompson, Quenemoen, & Thirlow, 2003). It is also one of the most controversial. Many researchers have raised

red flags and asked whether the use of portfolios is suitable for students in SE programs (Carpenter, Ray, & Bloom, 1995).

Portfolios are supposed to be a meaningful collection of students' work that shows their achievements, interests, likes/dislikes, and progress over time (Gelfer & Perkins, 1998). In SE programs, the content is related to IEP goals and/or state content standards (Quenemoen, Thompson, & Thurlow, 2003).

Portfolios assessment can emphasize the process and product of learning in a holistic way that allows students to reflect on their learning. As assessment, they also can be used to obtain qualitative information and a holistic view of the child (Jardine, 1996; Keefe, 1995). In this section, I describe the purposes and types of portfolios, and discuss the strengths and weaknesses of portfolios as a method of student assessment in SE programs, and discusses issues in constructing effective portfolio assessments.

Purpose and Types

In SE programs, portfolios have been used for a variety of reasons (e.g., to individualized students work/outcomes, to collect evidence of students' progress, to show students' progress). Regardless of the reason, they can (a) be individualized by a student, (b) be used to record IEP goals and document students' progress over time, (c) show and build students' creativity and individuality (d) accommodate the learning styles of diverse students, and (e) enhance the development of self-determination skills (Ezell, D., Klein, C., & Ezell-Powell, 1999; Jardine, 1996; Kleiner & Thurlow, 2001).

The collection in a portfolio also should have a specific purpose, making it more than just a space in which students' work is collected. For example, a portfolio might be shared during an IEP meeting to show that a student has achieved a particular goal.

Students and teachers typically decide what will be included in the portfolios based on the purpose of the portfolio (Alper & Mills, 2001). Portfolios may include products related to social, cognitive, emotional, creative, physical, motor, and living skills.

Johnson and Mims-Cox (2006) describe 3 types of portfolios used in academic settings: learning and teaching (Bartell, Kaye, & Morin, 1998), development (Wyatt & Looper, 1999), and showcase (Wyatt & Looper, 1999). In learning and teaching portfolios, students reflect on their learning process and personalize their work. This type of portfolio can be used as summative or formative assessment. The developmental portfolio shows the growth and development of the student over time. In selecting content, students may reflect on their progress and, based on that reflection, choose the best examples of their growth. As is the case with learning and teaching portfolios, developmental portfolios can also be used as either summative or formative assessment. Showcase portfolios demonstrate success; students demonstrate their competency and perhaps aim to impress their teachers or classmates (Johnson & Mims-Cox, 2006).

In the case of all three types of portfolios, the content depends on students' learning experiences and desired outcomes. Possible materials include but are not limited to checklists, scrapbooks, observations, drawings, reading lists, photographs, self-evaluations, reflections, letters, videos, audiotapes, progress reports, test reports, homework, lists of books read, rating scales, behavioral observations, rubrics, and so on. These documents/artifacts may be stored in any form, including a box, a hanging file, an album, or a CD.

Strengths

The existing SE literature recognizes the benefits of portfolio assessment. When students use portfolios, they assume an active and reflective role in their learning (Jardine, 1996) and their motivation increases (Carpenter et al., 1995; Ezell et al., 1999; Frazier & Paulson, 1992). Furthermore, through the creation of portfolios, students improve their communication skills (Carothers & Taylor, 2003; Ezell et al., 1999) and involvement in their education. Conderman, Ikan, and Hatcher (2000) studied the effect of the student-led conference approach and concomitant use of the portfolio, and found that it allows students to be responsible for their learning and connect their learning experiences inside and outside of the school environment. When using portfolios, students also better understand what they are learning and what they need to learn (Stenmark, 1989). In another study, students who created portfolios demonstrated growth in regular classroom settings as well as in their IEP goals and objectives (Boerum, 2000). This study also found that creating and presenting portfolios improved collaboration among parents, teachers, and students.

Carothers and Taylor (2003) discussed portfolios' benefits when used as a method of authentic assessment. Portfolios allow teachers to collect authentic information about student learning across settings (e.g., home, classroom, and playground). In addition, Demchak and Greenfield (2000) reported their observations on a transition portfolio implementation; this type of portfolio is used when the student changes schools, moves to another town, or changes teachers or placement (e.g., less restrictive to more restrictive setting). Demchak and Greenfield observed that the main

use of this type of portfolio was to help teachers get to know students better in an effort to improve their students' education.

Weaknesses

Despite their benefits, teachers perceive the use of portfolios to be challenging. These challenges include time-intensive paperwork (Gelfer & Perkins, 1998; Thompson et al., 2003) and lack of knowledge in how to use portfolios (Johnson & Arnold, 2004). In a study by Flowers, Ahlgrim-Delzell, Browder, & Spooner (2005), teachers described their perceptions of several assessment methods. They reported that portfolios create an excessive paperwork load. Kampfer, Horvath, Kleinert, & Kearns (2001) documented that teachers spent around 25 to 35 hours of their time outside of school working on students' portfolios. Both of these research findings, however, may be influenced by teachers' lack of training in portfolio assessment.

Other potential weaknesses discourage the use of portfolios. Often portfolios are just a collection of students' work with no real purpose or clear method of showing students' growth. For example, Johnson and Arnold (2004) found that portfolios used as authentic assessment do not measure students' progress. Without a set of standards or criteria, students' learning portfolios are just piles of work, which are not suitable for assessing students (Carpenter et al., 1995). Creating an easy portfolio implementation method will help increase the use of portfolios as a successful part of assessment.

Issues in Constructing Effective Portfolio Assessment

Overcoming portfolio assessment challenges requires that portfolios be constructed to be purposeful and interactive. First, portfolios should have a clear and defined purpose; without a clear and defined purpose they will be ineffective and be little

more than busy-work. For example, when teachers and students understand the rationale behind a social studies portfolio assessment is to have students demonstrate an understanding of history, reflect on social issues, and develop writing skills using historical events as prompts, they can focus their efforts on the purposeful creation of the artifacts for the portfolios. In contrast, when students and teachers do not define and agree on the purpose of a portfolio, it may devolve into a meaningless waste of time that can obstruct the learning process. It is also important that times be set aside during the instructional period to allow students to work on their portfolios. Portfolios may be time-consuming, but with appropriate and focused use of time, they can be successful in the classroom (Cole & Struyk, 1997).

Second, clarifying goals, standards, and evaluation criteria will help to establish portfolios as purposeful. The portfolio should not contain any extraneous items; rather, only those materials that represent students' goal achievement should be included. Any work in the portfolio should reflect students' growth based on established goals. Students need to be aware of these goals, as well as the criteria that evaluate goal achievement. Teachers should give a rubric or checklist to students before they begin their portfolios so that students know beforehand what to include. With the expectations clearly laid out before portfolio development begins, whatever materials students and teachers include will be based on their goals for the portfolio (Cole & Struyk, 1997).

Third, students need to be involved in the creation, development, and decision-making surrounding their portfolios. Students must have an active and interactive role in determining the objectives of their learning experience. This foments intrinsic motivation, a sense of self-efficacy, and the satisfaction of academic achievement

(Zimmerman, Bandura, & Martinez-Pans, 1992). In addition, student involvement in decision-making and problem-solving regarding their portfolios will allow them to use higher-order thinking skills to make informed evaluations and judgments about portfolio goals, content, and outcomes, and to monitor their own progress (Zimmerman et al., 1992).

In summary, to be successful, portfolios require a clear purpose, established goals, standards, and evaluation criteria, and student involvement. Teachers must weigh their students' ideas with a clear sense of the portfolio's purpose, and how the students' will accomplish any pre-determined goals for portfolio work. Teachers need to be flexible, and be willing to modify their proposed learning goals based on students' input into portfolio development. In the end, successful portfolio development should reflect a collaborative process with student growth, development, and learning at the center.

E-portfolio

There is no consensus on the definition of an e-portfolio. Some experts view the differences between e-portfolios and more traditional portfolios as superficial. Heath (2004) defines e-portfolio as a collection of artifacts that are selected, organized, and reflected upon by the author with a specific purpose and audience in mind. Heath argues that the only differences between paper and electronic portfolios are the format of their artifacts and their methods of production. This definition does not take into account a variety of issues, including but not limited to the role of technology in the development and impact of e-portfolios. Batson (2002), on the other hand, views e-portfolios as a technological tool that supports a learner-centric approach to learning; an approach that

encourages students to think critically about and reflect on every aspect of each learning experience.

In general, a thorough definition of e-portfolios must address the use of technology, the importance of representing students' development, the creative and flexible possibilities for presentation, and the notion of sharing knowledge (Siemens, 2004). An updated definition should contain as many of the following characteristics as possible. E-portfolios are personal learning stories (Barrett, 2004), which digitally exhibit students' work goals, related to effort, reflection, development, and achievement (Batson, 2002; Blackbur & Hakel, 2006). E-portfolios are valuable learners' histories (Zubizarreta, 2004), which are shared within a community of learners that are engaged with their learning and the learning of others (Van Aalst & Chan, 2007). E-portfolios can be presented in a variety of ways, including video, digital photos, sound clips, animation, diagram, text, oral presentations (podcasting), links, and so on. I this section I describe the different types of e-portfolios, the steps that should be follow when implementing e-portfolios, and the benefits and challenges when using e-portfolios. Finally, I compare portfolios with e-portfolios.

Types

There are three different types of e-portfolios: showcase, learning, and assessment. Showcase e-portfolios show students' accomplishments and best work. They are frequently used as a vehicle to get employment (e-portfolio Portal, 2004). Learning, or formative, e-portfolios show students' development across learning experiences based on predetermined benchmarks or goals and are therefore recognized as works-in-progress (Carmean & Christie, 2006; e-portfolio Portal, 2004). They contain students' goals,

strengths, progress, self-assessment, outcomes, reflections, evaluations of growth; as well as teacher's feedback, evaluations of students' growth and progress (Carmean & Christie, 2006; e-portfolio Portal, 2004; Marcoul-Burlinson, 2006).

Assessment e-portfolios are used to demonstrate competence in a specific standard, domain, or skill. Usually they are evaluated at the end of the academic year and used as a summative assessment. This type of e-portfolio contains documentation that demonstrates the particular standards that a student reaches (Carmean & Christie, 2006; e-portfolio Portal, 2004).

E-portfolio Portal (2004) recognizes a fourth type called hybrid e-portfolios. E-portfolios are considered hybrids when they contain elements of multiple portfolio types. This occurs frequently, as e-portfolios often serve multiple purposes. For example, a showcase e-portfolio intended to help a student with job placement could also include documentation of relevant standards and skills achieved—the main body of an assessment e-portfolio. Other elements that must be included in e-portfolios are reflection and goals.

The teachers and students should engage in an e-portfolio development process, from which should emerge the type of e-portfolio and any specific goals it should accomplish. E-portfolios developed in a collaborative process support assessment *for* learning, rather than assessment *of* learning. This is a very important distinction for several reasons. However, Barrett (2007b; see also Barrett & Carney, 2005) also reconciles these two purposes in which "reflection, documentation, and collaboration" intersect. This dual purpose allows students to own their e-portfolio, which also can be used for accountability (Barrett, 2007b). On the other hand, this reconciliation could

affect e-portfolio process/outcomes if the two purposes are not well incorporated. When an e-portfolio is used for assessment, its purpose is imposed by an organization, its content is pre-established, and its review is based on extrinsic motivation; mainly, the e-portfolios are used to obtain a form of qualitative data, such as a high score or a "pass" (Barrett, 2004, 2007b; Barret & Carney, 2005). On the contrary, the purpose of e-portfolios that support assessment for learning support intrinsic motivation, as they are "agreed upon with the learner" (Barrett, p. 5, 2004) and the content is negotiated with teachers. The responsibility of learners to create a presentation of their own learning history promotes intrinsic motivation since it engrosses learners in the whole developmental process (Barrett, 2004).

Steps

There are many aspects to consider before developing an e-portfolio. Creating a development process may help both learners and teachers achieve their goals. Following six basic steps may help learners in its development: planning, collecting/selecting, reflecting, connecting/interacting, and presenting. (Barrett, 2004, 2007b; ePortConsortium, 2003; Glor- Scheib, 2007; Tuttle, 2007). Each are described below.

Planning. When learners or educators are planning to use e-portfolios, they should consider the e-portfolio's purpose and the tools available. These considerations will help prevent problems in the implementation phase. Determining the e-portfolio's purpose involves identifying the content, goals, and desired audience. It is difficult to justify the time needed to develop these learning tools if an e-portfolio lacks a clear purpose and a target audience (Niguidula, 2006). Outlining the purpose helps developers organize the e-portfolio and define its use. There are three ways to use e-portfolios: for a

targeted outcome such as employment (showcase), learning (formative assessment), and summative assessment. In most instructional settings, e-portfolios are used for formative and summative assessment; their principal use, however, should be learning assessment.

As stated earlier, the purpose of an e-portfolio is determined, in part, by the tools at the students' disposal. When actually selecting the most appropriate tools, there are additional considerations. Factors include Internet access, students' knowledge and experience, and the amount of time available. For example, with limited Internet access, programs such as Word, Excel, PowerPoint, Adobe Acrobat, iDVD, or iMovie are feasible options. Programs like iMovie and Adobe Acrobat require certain kinds of expertise, however. The need for expert knowledge and the amount of time consumed in the mastery of certain programs could result in learners' frustration and, consequently, a poor e-portfolio process. Using more familiar, user-friendly programs such as Adobe Acrobat or PowerPoint, can eliminate the disappointment brought about by learning a new program or software (Tuttle, 2007).

Glor-Scheib (2007) recommends that educators include the creation of e-portfolios using Power Point (one of the best programs to be used when the school has poor internet access) as part of transition planning for students with disabilities. In her book, *Building Electronic Portfolios: Get to know me better*, Glor-Scheib presents the many advantages of showcase transition e-portfolios. This portfolio may present a student's family members, job experiences, self-evaluations, learning preferences, hobbies, strengths, challenges, and other elements that the student considers important in his or her life. A transition e-portfolio results from a collaborative effort between students, parents, teachers, and other school personnel (Glor-Scheib, 2007).

If learners have a strong Internet connection, they have more options. A few examples include Think.com, Web 2.0, Open Source, Blogging, and various Google Applications. In her blog, E-Portfolios for Learning, Barrett (2007a) conceptualizes a model to build e-portfolios using Google Applications. In this workflow, Barrett incorporates many free Google Application services: Google Groups, iGoogle, Gmail, eBlogger, Google Docs, Google Notebook, Picassa Web Album, Google Page Creator, and Google Reader. This innovative idea allows students to manage their files (Google Docs), select e-portfolio viewers or people who can see it, write a reflective journal (eBlogger), share images and videos (Picassa Web Album, Google Video, and You Tube), have intellectual discussions (Google Groups), keep notes about links or interesting searches on the web (Google Notebook), be in touch with their learning community (Chat rooms) and publish their portfolios (using some or all previous Google Applications).

Commercial systems, such as LiveText, Scholastic Electronic Portfolio, TasStream, and Grady Profile, are useful alternatives, provided that students have a reliable Internet connection. One drawback, however, is that commercial systems are frequently designed to satisfy administrator's efforts to create summative portfolios that can be used for accountability. This focus on e-portfolio as an assessment of learning rather than assessment for learning spoils the intent of creating dynamic records of students' progress/ learning, and may compromise the possible benefits of an e-portfolio (Barrett, 2004).

Collection and selection. Students collect their work in electronic format using a digital camera, scanner, computer-generated documents or products, or a digital video

camera. Then, learners select the artifacts from their body of digital work to include in the e-portfolio. Although some aspects of this selection process can be negotiated with other members of the learning network, the final product should both reflect a student's learning story in his or her "own words," and meet the goals established in the planning phase (Barrett, 2003; 2007b).

Reflection. Reflection is the most important process when building a portfolio. Learners should create a reflection on each of the artifacts. The reflection may include what students like or dislike, what they learned, why a particular article represents progress, what they will do in the future, or how their continued learning may alter their future decisions or goals (Barret, 2003, 2007b). By reflecting on their work, students are able to develop metacognitive elements such as metamemory, metacomprehension, self-regulation, and schema training (Siemens, 2004) and can gain better insight into their successes, difficulties, and needs, allowing them to better know themselves as learners (ePortConsortium, 2003).

Interaction. At this point, learners interact with peers by posting feedback and comments on other students' work. This process requires that students reflect on their peers' work in order to share productive feedback. Students can then modify their work based on their peers' comments (Barrett, 2003; 2007b).

Presentation/Publication. Once they have assembled the artifacts, reflected on their work, and participated in peer review, students can select how they want to make their portfolios public. Possible publishing mediums include CDs, DVDs, html servers, or any other virtual form. In addition, the students select the artifacts or sections that they want to present to their audience.

Benefits and Challenges

E-portfolios can benefit the teaching and learning process, curriculum, and students' outcomes. One way this benefit can be realized is by the affect e-portfolios have on teachers. Using e-portfolios gives educators the opportunity to reflect on their teaching practices (Acosta & Lui, 2006; McLeod & Vasinda, 2009) and to expand their notions of literacy to reflect the emerging notion of literacy that integrates images, sound, words, and motion (Blair & Takayoshi, 2006; Hartnell-Young, 2006). In addition, the use of hypertext in e-portfolios promotes complex modes of thinking and new approaches to reading and learning (Blair & Takayoshi, 2006; Diehm, 2004; Heath, 2004) and provides teachers with a context from which to cultivate active learning (Zubizarreta, 2004).

E-portfolios can also aid in the effective development of curricula and teaching practices (Acosta & Lui, 2006; McLeod & Vasinda, 2009). Through e-portfolios, educators can evaluate elements of a curriculum and its implementation procedures (Acosta & Lui, 2006; Henry, 2006). For example, when teachers are designing e-portfolios strategies they need to examine the curriculum and decide the purpose of the e-portfolio in relation to the curriculum. This process helps the teacher become more connected to the curricular content and learning activities. Then, the teacher needs to decide which activities/practices will be used and included in the e-portfolio, and lastly, match these with the curriculum. Through this process, the teacher analyzes the curriculum and e-portfolio implementation in relation to the curricula. Further scrutinizing the curricula and its implementation procedures can help educators better align their practices with the curriculum (Niguidula, 2006).

The use of e-portfolios also benefits students' personal growth and learning experiences (McLeod & Vasinda, 2009). First, e-portfolios require that students be responsible for their learning (Carmean & Christie 2006), constantly reflect on their work (McLeod & Vasinda, 2009; Hsueh-Hua, 2010), and evaluate their learning processes (Batson, 2002). As a result, students develop a better understanding of themselves, how they learn and their limitations and strengths (ePortConsortium, 2003; Siemens, 2004; Hsueh-Hua, 2010). Attending to the community aspect of the e-portfolio, as described below, also provides an avenue to develop positive social interactions (Acosta & Lui, 2006).

E-portfolios could encourage students to engage in virtual interactions with other learners when using Internet, intranet, or other electronic forms of sharing information. The relationships formed can be intellectual or personal; in either case, sharing their experiences through digital media gives students a sense of community. This sense of belonging to a community in which students are willing to make valuable contributions to others' learning may stimulate self-confidence (Batson, 2002). In addition, it encourages students to produce excellent work (Archer, 2007) and improve their technologic skills (e-portfolio portal, 2004; Hsueh-Hua, 2010). Despite all of these benefits to student learning, however, e-portfolios can still be difficult for teachers, administrators, and students to implement.

A certain degree of reservation about new technological approaches is always expected (Hawisher & Selfe, 1997). In regard to e-portfolio implementation, there are two main challenges relating to technology: access and responsibility. First, teachers and students need to have access to adequate technological materials, such as scanners,

cameras, software or computers (Jones & Shelton, 2006; Lambert, DePaepe, Lambert, & Anderson, 2007). As specific hardware or software may be needed in order to create and read the e-portfolios, they can increase classroom costs. The high cost of technology is one of the barriers to providing students and teachers with access to adequate e-portfolio materials (Heath, 2004).

Responsibility is the second challenge to effective e-portfolio implementation. This involves administrators, teachers, and students. Administrators need to provide support and adequate resources for portfolio development. Teachers need to be willing to undertake any additional training that will assist them and the students in creating and using the portfolios effectively (Hawisher & Selfe, 1997; Heath, 2004; Wilhelm et al., 2006). Most important, students are responsible for their own learning/work since the portfolio concept is based on students' involvement in their own learning and assessment processes (Carmean & Christie, 2006). This could be a challenge if students are not really interested in the development of the e-portfolios. Although the portfolio process is potentially stressful because it requires administrators, teachers, and students to keep up with technology changes (Heath, 2004) and collaborate with one another, the benefits may outweigh the cost.

Comparing Portfolios with E-portfolios

There are many differences between traditional portfolios and e-portfolios. These differences include issues related to their form, as well as their storage, publication, accessibility, and dialogic function. The most obvious difference is that traditional portfolios are created in paper and electronic portfolios are created in digital format. This means a variety of media, such as videos, audio clips, graphics, and pictures, allow

students to include and/or demonstrate important events, skills, learning experiences, and their overall growth more efficiently (Heath, 2004; Moersch & Fisher, 1996; Waters, 2007).

Paper portfolios are usually stored in binders, making the process of collecting and publishing the materials inflexible and static. For example, a static product in "hard copy" limits the possibility of portfolio as work in progress, as the artifacts cannot be modified upon further reflection. In this sense, traditional portfolios are a passive collection of documents (Acosta & Liu, 2006). E-portfolios, on the other hand, are stored (Batson, 2002; Hawisher & Selfe, 1997) and presented (Heath, 2004) in electronic format, making them accessible to anyone from almost anywhere. This accessibility translates into virtually unlimited work collection space (Batson, 2002); gives the learners flexibility to analyze, reflect, and modify their projects (Acosta & Liu, 2006); and opens the possibility of e-portfolio as a lifelong learning tool (Waters, 2007). Moreover, it gives students the freedom to collaborate electronically and share their projects and assignments at any time (Blair & Takayoshi, 1997; Hawisher & Selfe, 1997).

Blair and Takayoshi (1997) state that the beauty of electronic portfolios is in the way they excel at "capturing the complex ways people read, write and engage with text… a shift becomes evident when we view electronic portfolios as tools for students to increase their knowledge of the rhetoric of electronic environments and to develop literacy that is inclusive of the workplace contexts in which formats other than the academic essay and audience other than teacher prevail (p. 369)." For Blair and Takayoshi (1997), the most important benefit of e-portfolios is that they prepare students to succeed in their life after the school.

Case Study

A case study is a research method used in the social sciences to describe in-depth one or more cases in real life settings. Frequently, researchers choose the case study method if they are asking "how" and "why" questions, when they cannot control the events, and when the research topic is an existing issue that occurs in a real world context (Yin, 1994, 2009). In case study, a researcher learns about and from a contemporary phenomenon (or case), while applying a holistic and naturalistic perspective (Stake, 1994).

A case study concentrates in-depth on a particular event, phenomena, issue, etc; at the same time, case study researchers strive to develop a broad understanding of the case and its context. The combination of these two activities enables researchers to create a more accurate description of the case (Simons, 1996). Case studies can be used to describe a variety of phenomena, including but not limited to interventions, social movements, social groups, and individuals in their natural context (Yin, 2003), with the aim of providing a thick and rich description of the case (Stake, 2005) through detailed study and explication (Flyvbjerg, 2004).

Case studies are unlike other types of research methods, such as experiments or historical approaches, and it is up to the researcher to identify when it is appropriate to use a case study. Experimental approaches are appropriate when the researcher is investigating a contemporary topic and has control of the dependent variables of the study. An historical approach does not require a contemporary topic or control over variables, but rather an issue or topic that can be studied using historical documents, pictures, maps, and images. Like experimental studies, case studies can be used to

investigate contemporary topics, and like historical research, this approach does not require that researchers have control over any of the variables (Yin, 1994). Because case study is a broad, complex approach, it is difficult to present a description of the case.

Researchers present an accurate, unique, and holistic description/understanding of the case in its context (Simons, 1996; Skate, 2000; Yin, 2003). When a researcher is designing a case study, he or she should decide on specific research issues that will affect the design and implementation of the study—choosing, for example, a theoretical perspective, a case, and its boundaries. The research steps should evolve out of a careful decision-making process based on the proposed research question(s). This same process must be used to determine if the case study will be qualitative, quantitative or both.

There are some important differences between quantitative and qualitative case studies that need to be highlighted. A quantitative case study searches for cause and effect, while a qualitative case study describes or clarifies phenomena (Stake, 1995). Additionally, while a quantitative researcher *discovers* knowledge, qualitative research *constructs* knowledge through the researcher's personal relationship with the participants. Another distinction is that a quantitative case researcher has an impersonal or distant relationship with the participants, whereas the qualitative researcher has a more personal and intimate relationship with the participants (Stake, 1995).

Both approaches have advantages and disadvantages. For instance, a qualitative research study may not be readily transferable to other situations, constraining its possibilities for generalization. It should be noted, however, that qualitative research is not intended to follow or imitate experimental procedures that allow replication (Toma, 2005). In a quantitative case study, generalizability depends on the research design,

which determines the domains, the context, and the research procedures. An investigator that embraces a quantitative approach to research may follow Yin's (1994, 2003) quality criteria to enhance the probability that the study's results can be generalized to other populations.

Qualitative researchers have developed methods and standards to assure the quality of the research using a qualitative approach. Some of these quality measures include searching for and reporting on disconfirming evidence, employing and describing researcher reflexivity, using external auditors and peer debriefing, creating an audit trail, and providing thick-detailed description (Brantlinger, Jiménez, Klingner, Pugach, & Richardson, 2005). Not all of these measures are applicable to all types of case study. Consequently, case study researchers should look for other ways to assure the quality of their research. Finally, researchers should be prepared to describe their process with clarity and detail, as one of the most important aspects of creating a good case study is to "clarify the methods used and the rationale for them" (Brantlinger et al. 2005, p. 201). Although there are many suggestions for creating a reliable case study, a researcher must develop her or his own method or recipe to gather and analyze data and report the findings as they relate to his or her research questions. In this section, I provide an overview of case study methodology. Additionally, I describe three possible approaches to case study (qualitative, quantitative, epistemological) and three foundational types (intrinsic, instrumental, and multiple cases) as well as their various combinations, and identify the steps that a researcher should follow when conducting a case study.

Overview of Case Study

When a researcher uses a case study, he or she is looking to learn about a specific case or set of cases. The case is specific (Stake, 1994), and may involve a person, a group of individuals, institutions/sites, social groups, or an event (Stake, 2005). For example, a case may be a school, a class, a teacher, or a student. In selecting the subject of a case, however, one must fulfill two characteristics: specificity and boundness. For example, observing teaching skills as a case does not satisfy these needs because teaching skills is too broad or general, we will need to set up specific boundaries. By definition, case studies take place in complex systems or environments; the researcher is therefore charged with the task of selecting a specific case within the surrounding context on which to focus his or her research. Because cases exist within these complex systems, the researcher will also find it useful to create careful boundaries that define what the case is and is not (Stake, 1995; Yin, 2003). For example, a researcher may be interested in studying an adolescent, the case, living in a poor neighborhood, the context. The researcher should focus on understanding the adolescent, rather than the adolescent's environment. The researcher does not ignore the environment, however, but instead studies it in order to contextualize the events and circumstances of the adolescent's life (Stake, 2005). Specificity and boundedness are defining characteristics of any case study.

Though all case studies share a need for specificity and boundedness, the end results may be qualitative or quantitative. Because the selection of case study as an approach is grounded in the unit to be studied and not for ideological or philosophical reasons (Stake, 2005), case studies can be quantitative, as developed by Yin (1994,

2003), qualitative, as articulated most notably by Stake (1995), or represent a combination of both qualitative and quantitative data and methods. A researcher decides between a qualitative approach and a quantitative approach based on what methods are most appropriate to answer the research question(s) associated with the case study (Gillham, 2000).

Quantitative case studies are suitable when (a) the researcher wants to analyze the findings objectively, (b) the researcher assumes a detached relationship with the case, (c) the case or its elements need to be isolated for the research purpose, (d) the principal purpose of the research is to develop generalizable findings, and (e) the researcher wants to demonstrate changes to the case. In a quantitative case study the researcher investigates the case using quantitative research methods and analysis such as statistical inference, regression, and multilevel analysis (Vogt, 2007), possibly without direct observation of the case (Yin, 1994). Researchers conducting a quantitative case study use experiments, surveys, or mixed methods.

Qualitative case studies look to create meaning in real-world complex interactions that are understood through an interactive relationship with the case (Gillham, 2000). Qualitative inquiry includes such methods as direct and detailed observations, interviews, and narrative inquiry (Stake, 1994, 2005).

The methods of inquiry available to a researcher are based on the questions he or she asks. Additionally, they are related to the researcher's own paradigmatic assumptions (Anfara & Mertz, 2006; Bredo, 2006). A paradigm is a "set of beliefs that guide action" (Guba, 1990, p. 17). Five principal paradigms inform case study research: positivism, post positivism, constructivism, participatory, and critical theory.

The first two paradigms, positivism and post positivism, are associated with quantitative case studies. The positivist and post positivist increase knowledge by collecting empirical data from which generalizations and conclusions about cause and effect can be articulated (Creswell, 2007). Positivist paradigm researchers work within the assumption that there is a reality that can be observed by manipulating conditions and variables. On the other hand, researchers using a post positivist paradigm approach reality more critically (Denzin & Lincoln, 2005). They "believe in multiple perspectives from participants, rather than a single reality" (Creswell, 2007, p. 20). When employing the case study method, a positivist or post positivist mostly uses a quantitative approach to data collection and analysis; there are occasions, however, when a qualitative or a mixed methods approach is appropriate.

The other paradigms are constructivism, participatory, and critical theory. A variety of qualitative approaches, including case study, reflect these paradigms. These three paradigms are subjective by nature; consequently, researchers who work from these paradigms usually use qualitative methods. Constructivism relies on co-constructed realities that are based on participants' personal and local worldviews. Constructivist researchers look to describe the meaning participants' ascribe to the events in question. The researcher constructs and reconstructs representations of these meanings through interactive and open dialogues with participants (Creswell, 2007; Denzin & Lincoln, 2005; Schwandt, 1994). Researchers using a participatory paradigm focus on marginalized groups, helping to change their lives by giving voice to the issues with which they contend. The work of participatory researchers targets the emancipation of the participants through political action. Because the participatory paradigm focuses on

emancipation, participants often assist in the study design process (e.g., research questions, data collection, data analysis). In so doing, they become partners in the research process, enhancing their control over how their lives are represented, and any subsequent actions taken to change them. The goal of this research is to create an action agenda through which participants can develop self-advocacy (Denzin & Lincoln, 2005; Creswell, 2007).

Like participatory researchers, critical theorists also advocate for participants, but do not develop an action-agenda (Denzin & Lincoln, 2005). Their goal is to illuminate social action, not create it. These intellectuals study the historical roots of social struggles in their desire to transform social life (Creswell, 2007).

Case Study Types And Approaches

The purpose of a case study determines whether it is an intrinsic, instrumental, and/or multiple case studies. An intrinsic case study is a study in which the researcher is looking for an in-depth understanding of a case just because he or she is interested in its particularities. The researcher has an intrinsic interest in learning about a case (Stake, 2005), and is therefore attempting to understand it without formulating a theory or identifying data that can be applied to other cases.

On the other hand, the purpose of an instrumental case study is to describe generalizations that help to refine or build a theory (Ghesquière, Maes, & Vandenberghe, 2004; Stake, 1995; Yin, 2006). In an instrumental case study, the most important goal is to understand an abstract issue that goes beyond the case. For example, a case study is instrumental when a researcher studies adoptive parents, and focuses on their overall parenting rather than learning about each specific parent. If the researcher is interested in

one particular parent and does not intend to make generalizations, then it is an intrinsic case study. Finally, if the researcher is looking to understand an issue by studying more than one case, multiple sets of adoptive parents for example, then the suitable type of design would be a multiple case study (Stake, 1995).

Multiple case study, or "multisite qualitative research" (Herriott & Firestone, 1983), is an instrumental case study that uses more than one case to optimize the development or refinement of theory. Several cases are used to identify commonalities, differences, and similarities in order to build a theory or alter existing theory to account for all points of view of the people who make up the cases. These comparisons will help the researcher represent a group, and make generalizations to other individuals and groups. In addition, subsequent cases may be replications of the first case, strengthening the findings associated with the first case (Yin, 2006; Stake 1995).

Case study research answers *descriptive* and *explanatory* questions. Descriptive questions ask *what*, such as "What is happening on the site?" Explanatory questions answer *how* or *why*: "Why are students' Mathematics scores improving?" or "How are students learning Mathematics in the classroom?" for example. Like the case study method, a historical approach is descriptive by nature and therefore appropriate for answering certain explanatory questions. Although issues of *how* and *why* can also be addressed with experimental research, experiments are generally used to establish a causal relationship between two or more elements. Questions of comparison such as "Which teaching strategies improve students' performance?" are best answered with experimental research. Finally, surveys identify the frequency or repetition of an event

and ask questions such as “How often do teachers use electronic materials in their classroom?” (Yin, 2003; 2006).

Steps

There are four essential steps when conducting a case study: (a) define the case, (b) collect data, (c) analyze data, (d) ensure trustworthiness, and (e) write the report. Each step is described below.

Defining the case. The first and most critical step, defining the case, will determine three essential elements: selecting the subject of the case, designing the study, and establishing the theoretical approach that will guide the research. Selecting the subject includes defining the case and describing its boundaries. Although this is the first step in the process, the researcher should continue to review the case after data collection begins to ensure that the selected case and its parameters are appropriate. If the case is not appropriate, the researcher may redefine the case, adding to or otherwise modifying the selection criteria (Yin, 1994, 2003, 2006).

The second element within defining the case is to decide which type of case study meets the research study’s purpose: holistic single-case, embedded single-case, holistic multiple-case, or embedded multiple case (Yin, 1994). The importance of identifying the type of the case is not to label it, but to better understand and define the case or cases and the possible subunits.

A holistic case is a study that has only one unit of analysis. On the other hand, an embedded single case study has “more than one unit of analysis” (Yin, 1994, p. 41) contained within the larger case. For example, in a study about a specific school, the school is the case. Embedded individual cases could include sub-units such as the regular

education teachers, special education teachers, the administrators, and the students. An embedded case study is useful when in-depth study of subunits is important. When using the embedded case study approach, the researcher focuses on the subunits, but should be careful not to lose sight of the case itself. For example, a study about inclusion involves teachers and students as subunits. If the study focuses solely on the subunits and disregards the larger case, the inclusion of students with disabilities, the research loses its focus. Understanding the case of the inclusion of students with disabilities should be the focus of the study; its subunits help the researcher develop a greater or more holistic understanding of inclusion. A researcher could change the topic or focus of the study based on how and what findings are emerging, however, when and if the "original research design is no longer appropriate for the research questions being asked" (Yin, 1994, p. 42).

In a holistic single case study, the researcher focuses on the single case. Using the previous example, that single case would be the overall nature of the school. One caution is associated with single case studies. Care must be taken to avoid misrepresenting the case or over-generalizing the findings (Yin, 1994).

The two other types of case study are holistic and embedded multiple case studies. The holistic multiple case study focuses on the "case" and does not concentrate on the subunits (Yin, 2003). For example, a researcher may want to understand the teaching-learning approaches used at high schools whose student bodies are composed of a high percentage of students living in poverty. In this study, the cases are the high schools. However, if the researcher intends to include foci on subunits in each of the schools, such

as extracurricular activities, parents' involvement, and/or teachers' and students' attitudes, the research becomes an embedded multiple case study.

Finally, the third step in defining the case is determining the theoretical approach the researcher will use. Yin (2006) recommends that novice researchers embrace an existing theoretical approach. A researcher could build, extend, and challenge existing theory, however, as well as test hypotheses. The use of an existing theory simplifies the data analysis (Yin, 2003). On the other hand, using a hypothesis-testing approach may limit the researcher, making it less likely the researcher will make new discoveries that are not contemplated in the objectives of testing a specific theory (Yin, 2006).

Collecting the data. Yin (1994) describes three principles of data collection: the use of various sources of evidence, the creation of a database, and the conservation of the evidence. Using a single source to collect data is not appropriate for a case study; instead, the researcher should collect and analyze diverse sources of evidence. The most common types of evidence are documentation, archival records, interviews, direct observations, participant observations, and physical artifacts.

Analyzing the data. Analysis is the action of making sense of the events. Qualitative researchers begin to interpret the phenomenon or the case at the point of entry into the field, and continue making meaning throughout the data collection process, e.g., during observations, initial meetings, informal meetings, and hallway conversations (Stake, 1995; 1998). Many authors target how to conduct data analysis in a case study (Creswell, 2007; Denzin & Lincoln, 2005; Mason, 2002; Miles & Huberman, 1994; Silverman, 2000; Wolcott, 1994), each author espousing his or her perceptions and convictions about how to analyze case study data (Stake, 1995). For example, Creswell

(2007) suggests the data analysis spiral. This interesting strategy interrelates data collection, data analysis, and the writing process using analytic spiral activities.

Regardless of the type of approach, data analysis in qualitative research is extremely complex (Yin, 2003). Because of this complexity, Yin (1994; 2003) encourages researchers to use two general strategies for data analysis: to rely on theoretical propositions and to develop a case description. The first is suitable for the types of case studies that intend to develop theory, such as explanatory and instrumental case studies (Stake, 1998). Conversely, when the researcher wants to study the case because it is intriguing, she or he does not immerse her or himself in the setting with a proposition in mind, but rather with an open mind to learn and understand the whole case. In this instance, developing a case description is the more suitable strategy.

Along with these two general strategies, Yin (1994; 2003) describes four techniques of analysis: pattern-matching, explanation-building, time-series analysis, and program logic models. These are excellent strategies when the nature of the research involves pre-established variables, predictions, hypotheses, and propositions.

When it comes to data analysis processes, qualitative and quantitative case studies are absolutely dissimilar (Stake, 1995; 1998). Stake recommends four strategies when analyzing data from qualitative case studies. According to Stake, in a qualitative case study the researcher looks for a single instance that is carefully analyzed and presented with more value and meaning than before so readers can easily understand the implications of the findings. This first strategy is called direct interpretation. The second method is categorical aggregation, also used by quantitative researchers, when the researcher looks for a group of instances that are relevant to her or his predictions or

emerging issues. The third strategy is correspondence and pattern in which a researcher identifies patterns that usually correspond to specific conditions. These patterns can be observed at any time during the case study process. For example, a pattern can be when a teacher does not set up clear steps for an activity and the students cannot complete it successfully. Analyzing and reflecting on these patterns and their correspondence with other data will help the researcher understand the case. The last strategy is naturalistic generalizations. In this strategy, after learning, analyzing, and reflecting about general aspects of the case, the researcher generates naturalistic generalizations and describes the findings in a way that readers can understand and relate these issues to their personal life experiences. As a result, the report writing process is an important part when publishing (Graue, 2006) a case study.

Trustworthiness. There are many approaches to assuring the quality of a case study. The exact procedures selected are based on the researcher's theoretical framework. Some strategies reflect practices and terms associated with qualitative research. Other strategies incorporate elements more typically associated with quantitative research.

Toma (2006) describes other criteria to enhance trustworthiness in qualitative research. Toma suggests the use of a complete description of the research design. This description should include researcher self-reflection, strategies to avoid biases collecting and interpreting data, protocol to deal with ethical issues, and an explicit challenge of researcher's interpretations. Triangulation is also used to reduce the misinterpretation of the events, or the case (Stake, 2005).

There are four ways to triangulate information. One way is to use different sources of data, such as observing the event in different places, times, or circumstances. Another way is to have different researchers observe the same event and/or analyze the same data. For some research it is difficult or impractical to use two observers. In these cases, the researcher may choose to discuss the observations with experts in the area of study. Such discussions may help the researcher develop alternative understandings. The third triangulation strategy is based on discussion of the event with different experts in the area. To be maximally useful, these experts should represent different theoretical orientations, so as to enhance the understanding of the event and its interpretation. Data is considered triangulated when experts agree or have similar interpretations. The most common way to triangulate is methodological triangulation (Stake, 1998), which means using different methods to collect data (Fontana & Frey, 2005).

Trustworthiness can also be assessed through member checking. With member checking, participants determine if the findings and interpretations are credible. When member checking, the researcher should present the original data and/or analyses so participants can provide insight into the findings (e.g., offer different words or interpretations) (Creswell, 2007; Stake, 1995).

Yin (2003) has a more quantitative approach to case studies. Although Yin recommends the use of triangulation, especially methodological triangulation, he cautions that it is not enough to assure case study quality, particularly as it relates to validity (Flick, 2002). Using a more positivist approach to case study Yin (1994, 2003) highlights four areas that need attention as the researcher addresses the issue of research quality: construct validity, internal validity, external validity, and reliability. The

researcher addresses construct validity when key informants review a draft of the case study or when the investigator uses many forms of evidence and creates a chain of evidence. The second standard, internal validity, applies to explanatory case studies in which causal relationships are established through using pattern-matching, explanation-building, and time-series analysis. External validity alludes to the issue of generalization -is the study generalizable? The researcher needs to establish at what point the results can be generalized, perhaps by applying them in another site or context. If the case study is replicated with other cases and the results are similar, generalization is possible and external validity is enhanced. The last criterion, reliability, refers to how closely the researcher adheres to the stated methods, or notes deviations from those methods. Clarity in describing the methods and any deviations there from is essential to establishing reliability. Without these descriptions, other researchers can neither judge the quality of the study nor replicate it. For this reason, Yin (2003), proposes the development and use of a protocol and organized management of evidence or data.

Generalization is addressed differently in more constructivist approaches to case study. The most important and frequently used criterion for intrinsic case studies, however, is construct validity, because most often they are not used to create generalizations or comparisons, nor are they described with the purpose of allowing replications. Instead, research generalizability is addressed by providing a rich and thick description of the case, allowing the reader to generalize findings as appropriate (Erlandson, Harris, Skipper, & Allen, 1993).

Writing the Report

Finding the best story that represents a case is part of the writing process. The researcher should look for examples that help readers both understand the case and make naturalistic generalizations. In this step of the case study, description is not enough; the stories, context, and events need to be developed to engage the readers' interest and their understanding of the case (Stake, 1996).

The first step is to organize the report. The researcher sets up this organization based on the topic, research questions, the study's purpose, how the data was collected and organized, and so on (Stake, 1995). There are many ways to organize the report: following the chronological order of events, using the researcher's view of how best to present the case to the reader, or describing the essential components or topics of the case. A researcher usually uses vignettes in the report to illustrate aspects of the case. Vignettes represent remarkable events or case characteristics (Stake 1995). In general, writing the report can be a difficult process. For this reason, Stake (1995) recommends that the researcher be ready to spend more time writing the report than collecting data. The researcher can improve the report by asking an audience (e.g., participants, peers, colleagues, professors) to read it and provide feedback (Yin, 1994; 2003).

CHAPTER III

METHOD

The purpose of this study was to learn how one teacher uses e-portfolios in an inclusive setting to assess students with and without disabilities. This research describes (a) teacher's perceptions about the use of e-portfolios, (b) which type of e-portfolio is used, and (c) how e-portfolio implementation is taking place in the classroom. In order to achieve its purpose, this research addressed the following question: How are electronic portfolios used to assess students with and without disabilities? This is an explanatory question (Yin, 2006, 2009) that aimed to learn about the use of e-portfolios to assess students with disabilities. I therefore focused on how the teacher used e-portfolios with students with disabilities, how the teacher perceived the use of e-portfolios, and how instructional programming and class development occurred when teachers use e-portfolios. The research sought to answer four (4) questions:

1. How does a high school teacher create and use e-portfolios to assess students with and without disabilities in an inclusive classroom?
2. How does the teacher perceive the use of e-portfolios as an assessment tool?
3. What are the relationships among the use of e-portfolio assessment, curricular content, and instruction?
4. How do the relationships among the use of e-portfolio assessment, curricular content, and instruction vary for students who do and do not have IEPs?

This chapter includes an overview of my theoretical stance. It also describes the study's design (single case study), the site and participant, researcher as instrument,

instrumentation, data collection, data analysis, trustworthiness, reporting results, ethics, and limitations.

Theoretical Perspective

In this research, I used a constructive theoretical perspective, also referred to as "naturalistic, hermeneutic, or interpretive" (Guba & Lincoln, 1989, p. 83), to frame the topic of my research. I chose this perspective because I believe that "knowledge and truth are created" (Schwandt, 1994, p. 125). Constructivism relies on co-constructed realities based on participants' personal and local worldviews, perceptions, and experiences. Constructivist researchers look for participants' meanings of the events. The research constructs and reconstructs the representations of these meanings through interactive and open dialog with participants (Creswell, 2007; Denzin & Lincoln, 2005; Schwandt, 1994). Reality is multiple and complex and may be the results of negotiations about the meaning of truth (Lincoln & Guba, 2003). Consequently, my role as researcher included facilitating the reconstruction of participant's voice about his constructed realities (Lincoln & Guba, 2003) surrounding e-portfolio assessment.

Design

Case studies may be qualitative, quantitative or mixed methods. The researcher decides between using a qualitative approach versus a quantitative approach based on what methods are most appropriate to answer the research question(s) (Gillham, 2000). Quantitative case studies are suitable when (a) the researcher wants to analyze the findings objectively, (b) the researcher assumes a detached relationship with the case, (c) the case or its elements need to be isolated for the research purpose, (d) the principal purpose of the research is to develop generalizable findings, and (e) the researcher wants

to demonstrate the changes. In a quantitative case study the researcher investigates the case using quantitative research methods and analysis, such as statistical inference, regression, and multilevel analysis (Vogt, 2007), but not necessarily direct observation of the case (Yin, 1994). Researchers conducting a quantitative case study can use experiments, surveys, or mixed methods.

Qualitative case studies, on the other hand, look to create meaning in real-world complex interactions that are understood through the researcher's interactive relationship with the case (Gillham, 2000). Qualitative methods include direct and detailed observations, interviews, and narrative inquiry (Stake, 1994, 2005).

The nature of my research question is such that I did not look for objective and generalizable findings, or conduct my research in a detached manner. Nor, did I isolate the use of e-portfolios or the instructional practices as separate. On the contrary, I observed how a specific teacher, in the real world, uses electronic portfolios to assess students with and without disabilities. This took place through interactive processes with the class and a personal relationship with the participant. The qualitative approach gave me the opportunity to construct a thick description of the case and understand the participant's worldview and interpretation of his realities (Denzin & Lincoln, 2005). As the qualitative approach lends itself to understanding the context of events based on the teacher's perceptions, interviews, observations, field notes, documents and physical artifacts, it was the most appropriate method to explore how a teacher used e-portfolios to assess students with and without disabilities.

A qualitative case study also provides an in-depth examination of an issue, and at the same time, requires the researcher to maintain a holistic perspective within a case to

learn about a phenomenon (Skate, 1994). Thus, by constructing a unique and holistic comprehension of a case, she or he offers an accurate description of the case (Simons, 1996). Case studies are appropriate to use when describing an intervention in its natural context (Yin, 2003), providing thick and rich description of that intervention and its consequences through a detailed study (Flyvbjerg, 2004 & Skate, 2000). To answer my research questions, I examined the intervention, e-portfolio assessment, and its connection to teacher behaviors in planning and instruction. In addition, this methodology gave me the opportunity to understand the participant's perceptions (Simons, 1996).

Furthermore, the selection of this methodology allowed me to study in-depth the use of electronic portfolio in a real class scenario. Narrowing the study to only one class section, I focused on describing the e-portfolio development process in that classroom. The unit of analysis therefore was a teacher in one of his class sections in a regular classroom. I observed how the teacher implemented e-portfolios, his perceptions about the use of e-portfolios, and his development and delivery of instructional programming. Using these boundaries helped me answer my particular queries, establishing strong evidence rich in description (Yin, 2006).

The suitable type of case study to answer my research question was an intrinsic and embedded single case. An intrinsic case study attempts to learn about a particular case, chosen because of the researcher's interest (Stake, 2000). I selected this issue because it is intriguing to me, and I wanted to learn about the use of e-portfolio to assess students with disabilities. Furthermore, it is embedded because the case contains various entities or subunits to be examined (Yin, 2006; Yin 2003). The overall *phenomenon* is

the use of electronic portfolio in one section of a regular classroom; the sub-cases are the use of e-portfolios in the classroom, the teacher's perceptions of e-portfolios, and the instructional programming and class development that occurred while they are being used.

Site and Participant

The research took place in a general education math class in an urban school, La Alicia High School. The school enrolls 600 students from various socioeconomic but common cultural and ethnic backgrounds in grades 7 to 12 and is located on a college campus.

Selection of the site was based on three criteria: (a) school staff who were open to the use of technology, (b) school that had adequate technological resources, and (c) students who were likely to be familiar with technology. Because of the last criterion, I selected a high school because students at this level are more likely to be familiar with the use of various forms of technology than younger students. Familiarity with technology was important because it eliminated the need to train the students to use technology prior to learning how to create e-portfolios.

The selected high school, La Alicia High School, has a variety of technological resources available for teacher and students. Furthermore, it supported the use of portfolio, and some teachers are already used portfolios as a tool in their classes. However, none of the teachers were using e-portfolio as an assessment tool and there was little interest in using the e-portfolios as an assessment tool. Fortunately, one teacher who was very comfortable with various forms of technology expressed a willingness to try using e-portfolio assessment.

The participating teacher taught tenth grade math. He selected his geometry class for the study. The class had twenty-nine students (age fifteen to sixteen), 8 of whom had IEPs. Students' disabilities were learning disabilities and/or other health impairments (ADHD). The teacher and all the students were native Spanish speakers.

Once IRB approval was received, I obtained informed consent. I also asked the teacher to send informational letters (provided by researcher) home with students to inform parents that a researcher was observing the class and studying how e-portfolio was being used. Since this research was about e-portfolio assessment use and the teacher's perceptions and instructional practices, students were not participants. Students were not interviewed and their responses to the use of e-portfolio assessment were not solicited.

Researcher as Instrument

My experiences being a special education teacher have given me conflicting points of view about inclusion. I started my teaching experiences in a special education preschool in Puerto Rico. Some of the students on my class list were able to be included in a regular preschool and could have succeeded in this type of setting. However, because most general education teachers had not been prepared to work with students with disabilities, my students were not served in inclusive settings. Instead they received their educations in my segregated special education classroom. Although I regretted the fact that they were unable to be in classes with their nondisabled peers, I believed they received a better education in my classroom than they would have in non-receptive and nonresponsive general education classrooms. This belief was reinforced by what I saw while working as a resource teacher.

As a resource teacher, I was in charge of a resource classroom where students would receive some of their instruction, typically around an hour a day. At other times, I was in general education classrooms, getting first had experience with how inclusion was being implemented. I saw that some students with behavioral or attention problems were the students that general educators had the most difficulty including. I also witnessed problems related to assessment of these students. It was clear that teacher found classroom and assessment modifications and accommodations difficult to. Teachers felt stressed out because they were responsible for making changes in their instruction or assessment methods for few students. Furthermore, they believed they could not adequately meet the needs of students without disabilities at the same time they were working with the students with behavioral or attention problems. Although I tried to help the teachers, there was little I could do. Inclusion in Puerto Rico is the exclusive province of the general education teachers. Only they determined how they would instruct and assess students in their classrooms.

I moved from Puerto Rico and had the opportunity to work in an inclusive setting in USA as a special education teacher who co-taught and assisted general education teachers. Having these opportunities was an eye-opening experience. During this time, I was able to assist students and their teachers in general education classrooms, being involved in the instructional planning and programming, and co-teaching. Additionally, I worked with the general educators of modify class activities and assessment methods to benefit students with and without disabilities. My experiences led me to believe that the inclusion process is more effective when there is a special education teacher co-teaching, assisting or collaborating with the general education teacher. These experiences laid the

foundation for my interested in identifying better ways to include students with disabilities in general education, including improving assessments for students with disabilities.

I also believe that when students with disabilities are integrated in a regular classroom, proper assessment methods are key to ensuring their success. Frequently, assessments methods need to be modified because they do not respond to students' strength and abilities. Additionally, inadequate measures often result in student frustration. When students observe that no matter how much they study they will not succeed in the exam or test, they loose interest in the class and lose their confidence in their ability to succeed. Giving students' assessment opportunities in which they can feel successful and confident is an important as offering a class that are designed to address students' differences.

My interests in inclusion and assessment gave rise to my focus in this study. As can be seen from the above, I am a special education teacher that supports the inclusion of students with disabilities in the regular classroom. To me an ideal inclusive setting would have two teachers, general and special education teachers that co-teach and collaborate to create the best learning environment. However, in Puerto Rico, this is not occurring. Because general education teachers are solely responsible for educating students with and without disabilities in an inclusive setting, I am concerned about the education students with disabilities are receiving in inclusive setting. To better understand the effectiveness of instruction in these inclusive settings, I have to examine assessment practices and results related to students with disabilities. My experiences with portfolio assessment as special education preschool teacher, led me to wonder if this

approach might be effective in inclusive educational settings in Puerto Rico. As a result, I began to explore how portfolio assessment might be used with other age groups and in other settings than a special education preschool setting.

As I was considering the potential of portfolio assessment, I was also aware that today's students frequently use technology to gather information and to communicate their thoughts and their learning. For example, when students are seeking information "google it" is a phrase that I hear constantly in and outside the school setting. Seeing these trends resulted in my realization that education, including education related assessment, should evolve too. Consequently, I started looking at e-portfolio assessment as a way to highlight the assets and address the needs of students with and without disabilities and their teachers in inclusive classrooms in Puerto Rico.

Beyond the experiences that led to my interest in e-portfolio assessment, I also understand that it is important for me to expose my own epistemological assumptions (Huberman & Miles, 1998). I approach knowledge through dialectic thinking, because I think action can change knowledge (Bredo, 2006). I believe that the "primary function of inquiry is to help change the world in desirable ways and not merely to describe it or appreciate it" (Bredo, 2006, p. 21). Therefore, I take an activist view of inquiry, and focus on the "practical uses and consequences of research" (Bredo, 2006, p. 21), as well as improving practice. It is equally important to reflect on how my role as researcher may affect the research's products or outcomes (Hanley-Maxwell, Al Hano, & Skivington, 2007). As a reflexive researcher, I reflected continuously during the research process in order to present the participant's point of view and avoid presenting my own perspectives.

This research aimed to construct practical knowledge about the use of e-portfolio assessment with students with and without disabilities. At the same time, I hope that this study helped my participant teacher think about and improve his use of e-portfolio assessment and his instruction, in general, as well as share how other teachers might use it. The specific epistemology that coincides with my ideas about knowledge is *pragmatism*. Pragmatism "rebelled against the notion that there is any ultimate end to natural or social evolution" (Bredo, 2006, p. 25), but emphasized traditional habits, conventions, and beliefs. The main focus for pragmatists is the uniqueness of events, in which every situation requires its own interpretation using a particular point of view (Bredo, 2006). As a result, pragmatic inquiry "is primarily a matter of an idea's usefulness in guiding action" (Bredo, 2006, p. 25). In the end, my goal is that this case may guide teachers to implement and use e-portfolio adequately to assess students with and without disabilities.

Instrumentation

Describing the possible development of the interviews and the topics of the observational form is part of the instrumentation of this research. In this section I describe the interview protocol and what was included in the observation forms.

Although the interview protocol in some instances changed a little bit as I addressed questions across the course of the study, the primary questions remained essentially the same. All the questions used are included in the questions listed below. These questions do not include follow-up questions asked in relation to observations.

1. What is included in your students' e-portfolios?

2. How do you and your students construct their portfolios?, (c) How do you use e-portfolio in assessment? Why?

3. What are the benefits of e-portfolio as assessment?, For you? For your students?

4. What are the barriers to/problems with using e-portfolio as assessment? For you? For your students?

5. Do the benefits or barriers change when the student has an IEP?

6. How do you think that e-portfolios interact or relate with instructional content or delivery?

In addition to interviews, I observed in the participant's classroom. I used an observation form to structure these observations. This form included the date and time of the observation, duration of the class, and total number of students; descriptions of the instructional strategies used and their timing (if relevant), how of the teacher or students used the e-portfolio, the physical environment, the teacher's interactions with students with and without disabilities, and the instructional and assessment activities, needed to further describe the classroom context.

Data Collection

Yin (1994) describes three principles of data collection: the use of various sources of evidence, the creation of a database, and the conservation of the evidence. Using a single source to collect data is not appropriate for a case study; instead, the researcher should collect and analyze diverse sources of evidence. The most common types of evidence are documentation, archival records, interviews, direct observations, participant observations, and physical artifacts. To understand the case, I used different methods to *triangulate* the evidence. The data was collected during a four-month period using semi-

structured interviews, participant and passive observation, document analysis/physical artifacts, and field notes. As a native Spanish speaker, I translated the observation notes, documents, artifacts, and some interviews. Two other native Spanish speakers translated the remaining interviews.

Interviews

Interviewing is "inextricably and unavoidably historically, politically, and contextually bound" (Fontana & Frey, 2005, p. 695), a reality that the researcher must continuously keep in mind. Fontana and Frey (2005) define the interview as a creative collaborative effort resulting from the exchanges of two or more people involved in this process. They describe what they call the three main types of interviews: structured, group, and unstructured. Fontana and Frey (2005) also recognize new trends, such as postmodern interviewing and gendered interviewing. I used a semi-structured interview approach, however, in the semi-structured type, the interviewer uses a guide or protocol that identifies specific topics of interest (Mason, 2002). According to Fontana and Frey (2005), the researcher should follow a specific format and steps; this ensures a semi-structured approach to an interview, even when the researcher is using a guide rather than specific questions.

I interviewed the teacher during and after school hours to learn about his perceptions, ideas (Yin, 2003), interpretations, and descriptions of the use of e-portfolios (Stake, 1995). These interviews took approximately 30 minutes each depending on what was done. Interviews were audio-recorded. The first interview was after a week of class observation. As per Mason's recommendations (2002) for interviewing, I maintained a topic-centered approach. The focus of the interviews gathered information about

teacher's perception of how e-portfolios affect instructional programming, and the benefits and challenges of using electronic portfolios. I started by reminding the teacher that his participation is voluntary. Then, to establish rapport, and created a more comfortable environment as we talked about what was happening in the classroom, in general. Last, I asked more specific questions based on the topics of interest. I used a list of topics to facilitate the interviewing process. I also included more specific questions that arose during my class observations.

Observations

To obtain a better understanding of the case in question, I observed entire class periods even though e-portfolios were not used and wrote field notes (Stake, 1995). I observed during the entire class period on Monday, Wednesday, and Friday (classes were usually hour and a half long).

The role of the researcher in direct observation varies on a continuum from detached observed to observer as full participant. I was a passive observer two times per week and participant observer once a week. My role was passive observer when e-portfolio was not used. Passive observation helped me to focus on classroom dynamic without the commitment of helping in the classroom. Participant observation refers to observation on the full-participant end of the continuum. When a researcher uses a participant observation method, he or she assumes an active role in the ongoing activities during the observation. Mason (2002) defines participant observation as one that includes "methods of generating data which entail the researcher immersing her or himself in a research 'setting' so that they can experience and observe at first hand a range of dimensions in and of that setting" (p. 84). Participant observation is time

consuming. Furthermore, being a participant observer may result in bias; as a participant, the researcher is part of the events, which could possibly change his or her perceptions of the "reality" of the events (Yin, 2003). This bias is not an important issue for some researchers, however, because they view reality as an interpretation based on an understanding of the people and the events that take place in their socio-cultural context (Angrosino, 2005). In addition, I took field notes in which I described classroom activities, issues, and events related with the implementation of e-portfolios.

Document Review

During the semester, I collected and analyzed permanent documents and physical artifacts (Hanley-Maxwell et al., 2007), including a teacher's diary, lesson plans, students' IEPs, and e-portfolios to add an important perspective on instructional development when using e-portfolio (Yin, 2003). I asked the teacher to write a diary. The teacher's dairy contained his reflections on the creation and use of e-portfolio, as well as his reflections about the class. The teacher included what was working, what was not working, for whom it was working or not working, and what should the next steps be based on the efficacy of the instruction. As well, I looked for IEPs just to identify students participating on the SE program. I did this because the SE teacher in the resource classroom uses the IEP goals and the regular teacher does not use them for lesson planning. I did not look at the IEP goals and how these goals interacted with lesson planning or classroom activities. According to Yin (1994), reviewing documents is an important process, since documents are written for a specific purpose and audience and therefore may reveal important information for the case study. Reviewing

documents or physical artifacts helped me triangulate, confirming and expanding data/findings.

Physical artifacts are documents, objects, media products, artwork, academic work or other physical products made by the participant or participants. For example, asking the participant to write a journal is one way of obtaining a physical artifact. These are a useful way to gather evidence and to better know participants. Through artifacts, a researcher can learn more about what participants are thinking or doing, as well as what they like, prefer, or dislike. Unfortunately, issues of selectivity and availability can complicate the use of artifacts and their accessibility (Yin, 1994; Creswell, 2007). Participants may lose track of their work or they may provide only those physical artifacts that express what they want the researcher to know about them or their experiences and not the total picture, creating misrepresentations. The researcher can reduce the chance that these misrepresentations will occur by using strategies to enhance the trustworthiness of her or his interpretations. These strategies include carefully scrutinizing physical artifacts and documents, identifying any biases they may contain (Yin, 1994).

When reviewing documents, I carefully scrutinized the documents. First, I identified the elements that I observed in previous interviews, observations, or documents. I coded the documents using new codes or codes previously used in the interviews or observations. Weekly, I did this process with the lesson plans, teacher's diary, e-portfolios, so I could notice any modification or pattern in instructional changes, e-portfolio implementation or any other element.

Field Notes

I used an observation form while observing the class that was previously described. However, I also took detailed notes of the classroom's setting, including technological materials, instructional materials, and any other event or issue that was not contemplated in the observation form. The coded field notes and their constant review helped me to understand the case (Fontana & Frey, 2005).

Summary

In summary, several data collection methods helped me answer my specific research questions. To address the question about the teacher's perceptions of e-portfolio as an assessment tool, I used semi-structured interviews and diaries. I answered the questions of how the teacher created and used e-portfolio assessment, how the e-portfolio affected instructional content or delivery, and how disability did or did not influence the content or use of e-portfolio assessment by what I learned through passive and participant observation, examination of physical artifacts (the teacher's daily plan and diary), review my field notes, and the interviews.

Data Analysis

Data collection and data analysis occurred simultaneously (Yin, 2006). This helped me to avoid a common problem that occurs often with inexperienced researchers, when they collect data without having planned how it will be used. Researchers should organize data from the beginning of the collection process (Merriam, 1998; Wolcott, 1994). This allows a researcher to analyze and triangulate data more efficiently, and avoid errors that may arise from his or her failure to recall the specifics of relevant observations and when they occurred in time (Wolcott, 1994). To establish validity I

used triangulation (Lincoln & Guba, 1985). Triangulation is a mode of inquiry (Huberman & Miles, 1998) that ensures a thorough and accurate understanding of a phenomenon through the use of multiple methods (Fontana & Frey, 2005). In qualitative research, triangulation is used to clarify or verify interpretations and meanings (Skate, 1994).

I used a coding system to generate and analyze data and any emerging categories (Glaser & Strauss, 1967; Strauss, 1987). To find patterns, I coded the data gathered through interviews, participant observations, and my analysis of lesson plans and the teacher's diary. Specifically, I coded by hand using a coding scheme that includes open, axial, and selective coding.

Open Coding

Open coding is the process by which "the data are broken down into discrete parts, closely examined, compared for similarities and differences, and questions are asked about the phenomena reflected in the data" (Strauss & Corbin, 1998, p. 102). In this first stage, the researcher codes each incident and compares the differences and similarities. During this step, the researcher may develop some theoretical ideas about the data "after coding for a category perhaps three to four times" (p. 107). The researcher develops these theoretical ideas by recognizing indicators--words or fragments of the data in question--and concepts, or labels that are associated with one or more indicators (Glaser & Strauss, 1967; Strauss, 1987; Strauss & Corbin, 1998).

For my process, I based preliminary themes or categories on initial interview topics and what I observed in the classroom. Early in the research, after each interview, observation, or document/artifacts revision, I used any transcriptions, field notes, or

relevant documents to compare incidents and events and create categories. I audiotaped all interviews and transcribed them immediately following each session or as soon as possible. Likewise in order to guarantee the quality of the study, I coded the data prior to the next interview, observation or document review (Miles & Huberman, 1994). In addition, I continuously compared new indicators to those previously coded. Known as constant comparison, this process requires that a researcher continue to compare indicators throughout the data analysis process in order to understand their relationships to the identified concepts.

Theoretical saturation plays an important role in this stage. Theoretical saturation refers to the point at which the researcher codes events in the same category enough times to delimit, or decide, whether or not that specific data will be used. It can also be used to identify when to stop taking on new subjects or more data because no new information is being added.

Axial Coding

In the second stage, axial coding, the researcher relates categories with subcategories. This process helps the researcher unify the data and make sense of the relationships between categories and subcategories. Reduction is an important process in this stage. When data is "reduced", the researcher discovers and delimits similarities among categories allowing him or her to formulate a focused theory.

Selective Coding

Selective coding is the last step. In this stage, the researcher codes all data and summarizes and analyzes the resulting memos. Selective coding involves selecting the focal categories and relating them with other categories in order to make the story, line

story, or scheme. These focal categories have been reduced and are theoretically saturated. The researcher can develop diagrams (or other visual representations) and story lines to validate focal category relationships (Strauss & Corbin, 1998). The result is greater depth and complexity in the researcher's overall understanding of the data. Finally, if the supporting data are convincing, the researcher begins to write (Glaser & Strauss, 1967).

Trustworthiness

Lincoln and Guba (1985) describe three criteria to establish trustworthiness in a qualitative research project: credibility, transferability, and dependability.

Credibility

Credibility represents the "truth-value" of the findings. To guarantee credibility, I considered and be sure that the findings of the study are reasonable not only to me, but also to the participants and readers. Triangulation made this possible. Triangulation is a qualitative procedure used to reduce the misinterpretation of the events, or the case (Stake, 2005). To triangulate, researchers need to provide substantial evidence and thick descriptions of the events so as to allow the readers to triangulate by themselves (Stake 1998).

The most frequently used form of triangulation is methodological triangulation (Stake, 1998), which refers to using different approaches when collecting data (Fontana & Frey, 2005). To that end, I used the data collection methods previously presented (observation, field notes, interviews, document and physical artifacts). In addition, I used another technique, member checking, as suggested by Stake (1995). In member checking, participants determine if the findings and interpretations are credible. When

member checking, the researcher should present the original data and/or analyses to participants so that they can provide insight into the findings (Creswell, 2007; Stake, 1995). Right after analyzing the data, I shared the findings with the teacher so he could give me feedback about what was constructed. As a researcher, I valued the participant's insight to what happened and what was understood. The member checking allowed me to construct knowledge accurately or truly understand how e-portfolio was being used. These two methods helped me to ensure the credibility of my research, to avoid misrepresentation of the events or write from my point of view rather than to construct the participant's realities.

Transferability

The second criterion, transferability--sometimes called external validity-- refers to how the findings could be applied in other contexts or with additional participants. In a qualitative approach researchers must provide a thick description of the data collection and analysis; this helps readers gain a thorough understanding of and perhaps replicate the study. I ensured transferability by providing extensive and thick description of the specific processes and protocols by which data was collected (Ghesquière et al., 2004). In the findings section, I provided the readers with clear information about the context from which the categories emerged, including the corresponding protocols, field notes, observations, and interview transcripts.

Dependability

The third criterion, dependability, refers to a study's consistency. The findings should be "stable over time and across researchers and methods" (Miles & Huberman, 1994, p. 278). The analysis and any conclusions found thereby should not be a matter of

the researcher's biased interpretation. I ensured dependability through the use of memos, member checking, and methodological triangulation by using multiple data collection techniques. Those techniques included field notes, memos, and interviews of a well-informed participant (Denzin, 1994). Readers are able to see that the findings and conclusions are related to the data, not based on my opinions or any personal or ideological bias.

Reporting Results

I used a traditional writing genre that Graue (2006) calls "writing as reporting" (p. 518) to report the results of this study. I chose this style of reporting, as it is most suitable for an academic audience (Graue, 2006). As this form of writing has more universal appeal, I hope to reach a broader audience of researchers. This method allowed me to articulate clearly the reality of the field or environment in which the study took place through the written text (Graue, 2006). In addition, Yin (2006) suggests that case study research "follow the classic way of presenting evidence" (p. 117). I presented the evidence using realistic tales with narrow quotes (Eisenhart, 2006) to describe the classroom. I included quotations from interviews, field notes, and fragments of physical artifacts to enhance the construction and representation of the events in their context.

Ethics

Ethics are always a concern when studying an event, process, a case, or a culture. For this reason, universities have a human subject review process designed to protect participants in a study. I submitted my proposal to and obtained approval from the two Institutional Review Boards (IRB) required to assure that my research protected the participant and would not cause harm. As Stake (1994) states, "researchers are guests in

the private spaces of the world" (p. 244). Participants invite researchers to understand their points of view and life experiences, and therefore researchers must be respectful at all times. As such, when creating reports or publications, I have maintained and will continue to maintain the participant teacher's confidentiality (e.g., I will not reveal his real name or other identifying information). Additionally, I respected his perceptions and understanding of what was happening in her classroom. I have not portrayed the teacher in ways that could impact his social or professional status or standing (Stake, 1994). The purpose of this research was not to analyze the participant, but rather to describe e-portfolio assessment and the interactions, events, and learning experiences that resulted from its use, all while preserving the integrity of the data with strict fidelity.

Limitations

This intrinsic case study extrapolated learning from a specific case, one inner-city high school regular education classroom that included students with disabilities. My research, therefore, describes how one specific teacher used e-portfolio assessment in the classroom, and how this teacher integrated e-portfolio assessment into her/his teaching practices. As my sample was limited to one participant, further research is needed to generalize about broader, related issues, such as how e-portfolio assessment is used to assess students with disabilities in other general education classrooms.

Another issue that may be a limitation is the absence of the students' voices. Since my research is focused on the teacher's perspective, I did not analyze or compare students' e-portfolios. Although my interests extend to how students perceive and use e-portfolios and their outcomes when e-portfolio is used, it is important to limit the scope of my current research in order to provide a thick description about this particular case.

My hope is that this intrinsic case study will be the first of many efforts to understand e-portfolios as a tool for assessing students with and without disabilities, and meeting their other educational needs.

CHAPTER IV

RESULTS

This chapter presents the findings of four months of data collection and data analysis examining the use of electronic portfolio (e-portfolio) in a regular classroom to assess students with and without disabilities. This case study describes how one mathematics teacher used e-portfolio as an assessment tool. More specifically, this case study describes one teacher's perceptions about the use of e-portfolios, the type of e-portfolio used, and its implementation in the classroom, and addresses four research questions:

1. How does a high school teacher create and use e-portfolios to assess students with and without disabilities in an inclusive classroom?
2. How does the teacher perceive the use of e-portfolios as an assessment tool?
3. What are the relationships among the use of e-portfolio assessment, curricular content, and instruction?
4. How do the relationships among the use of e-portfolio assessment, curricular content, and instruction vary for students who do and do not have IEPs?

E-Portfolio Assessment: Empowering Students to Be Reflective

The story of using e-portfolio assessment in this teacher's classroom is, in part, the story of how this type of assessment matched the teaching and learning approach used by the participating teacher. It is also a story of how this type of assessment interacts with how this teacher constructed his whole job. As a result, I begin the story by introducing Mathew, his approach to teaching and learning, and multiple aspects that make up his professional life. This information provides the context needed to

understand e-portfolio assessment in this setting. After introducing Mathew, each of the research questions will be answered.

Mathew

Mathew has been working for more than 15 years as a mathematics teacher. He is an outstanding teacher, as noted by his selection as a finalist for the Presidential Awards for Excellence in Mathematics and Science Teaching. Mathew plays a variety of roles in and out of school.

At the high school he teaches courses in geometry, algebra, and advanced math. He also serves on a variety of committees: the COEL, "Comité Organizador Experiencias Laboratorio" (Laboratory Experience Organizing Committee), which orients new teachers to the secondary school; the track and field committee; the secondary school emergency committee; and a "committee that is working with the school's curriculum" (interview). As part of his COEL responsibilities, he provides workshops on a variety of topics, including "working with discipline, the use of assessment in the classroom, efficient test design strategies, and the use of the Smart Board (intelligent blackboards)" (interview).

In addition to his "in school" responsibilities, Mathew has collaborated for the past 12 years with the Programa de Servicios Académicos Especiales (Special Academic Services Program) by teaching a course at the local university. This course is designed for youth who are first generation college students and who come from low-income families. He also instructs teachers in Math and Science for the Mathematics and Science Partnership. This program is designed to improve the content knowledge of teachers and the performance of students in the areas of mathematics and science, and is called Master

Mathematics Teacher. It is a very selective project in Puerto Rico [which identified] … 10 intermediate and high school level math teachers … to obtain a license that is given out in the United States that's called master teacher, MMT (…Master Math Teacher)" (interview). Within the scope of this project Mathew gives "workshops to those teachers on three components: … methodology, … math content and … technology use … [more specifically,] calculators, computers, and virtual manipulatives, a CD" (interview). At the time of this study, the participants in this project were "on the phase where they have to build activities because first I was modeling the activities for them and now they have to build the activities" (interview). At the time of this study, the participants in this project were building learning activities based on the activities that Mathew modeled for the students. The active engagement of Mathew in these activities is important to note because many of these activities intersect with the way he teaches, what he thinks about teaching, and the time he has to devote to new learning on his own. They also reflect his skill in incorporating a variety of technologies in his own teaching (e.g., the graphing calculator TI-84^{+} silver Edition, Blackboard, Smart board) which may facilitate incorporating e-portfolio assessment.

Mathew believes in learning by construction. He thinks that providing students the opportunity to do, discover, connect, and reflect is extremely important. He likes to use questions that allow for a deeper understanding of concepts. "The use of activities with good questions is the most important assessment. … It also allows the teacher to have access to student's thought processes as you develop important concepts. …The answers to questions provided by the apprentice allow me to assess student learning. …

[T]he activity allows me to bring the topic of geometry from a perspective that students construct their own learning" (Participant Diary).

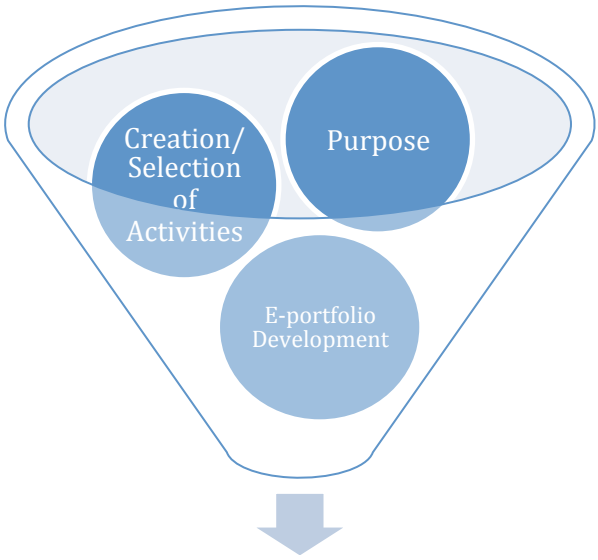
His commitment to constructivist learning principles were also evident in the criticisms Mathew leveled at what he called the traditional way of teaching, which is more teacher's centered. As Mathew said,

> … in traditional teaching all is said by the teacher, and when all is said by the teacher there is very little what you have to reflect on. If you want to make a constructive activity, that requires that you go get it if it's already been done, dive into it, understand it well, understand each one of its parts, how they connect with the material. … what you want [to do is] obtain a reflective student with conceptual knowledge, that they can connect it to several aspects of their daily lives. (Interview)

He acknowledges the workload and time commitment associated with this type of teaching, but remains committed to it.

Research Question 1: Creating and Using E-portfolio Assessment

The first question of this case study examines how a teacher created and used e-portfolio assessment with students with and without disabilities in an inclusive classroom. The following graphic illustrates how the purpose of e-portfolio assessment, the creation and selection of activities, and the development of e-portfolio were fundamental aspects in the use of e-portfolio assessment.



Three elements influenced the use of e-portfolio assessment. E-portfolio use was defined by the fusion of purpose, creation and selection of activities, and work-in-progress or development. The purpose includes teacher's beliefs and perceptions, which are the foundation of how the teacher creates the e-portfolio assessment and what the teachers chooses to include in the e-portfolio. At the same time, this purpose was guided by the teacher's reflections, changing perceptions, and continued learning. Selection/creation of activities was a critical part of using e-portfolios for assessment. Since the e-portfolios needed to include an activity with its reflection for each section of /concept taught, selecting the best activity was an issue for the teacher. However, activity selection was more than just finding an activity that could reveal the extent of student learning. Although, the teacher could assign weekly reflections to students, requiring them to reflect on what they learned, it was harder to identify appropriate learning activities. He looked for or created activities that were easily digitalized and brought

together more than a Mathematic important concept. This process of selection and creation took time since the teacher constantly reflected and analyzed which activities met his goals or purposes. Moreover, e-portfolio assessment development impacted how it was used. At the same time, its development was framed by the teacher's perception of students' work. The teacher regularly observed how students with and without disabilities were developing their e-portfolios (working pace and work quality), this also influenced how e-portfolio assessment was used in the classroom. Each of these aspects are explained in this section.

Creation

Mathew had never worked with students to create e-portfolios for assessment purposes. As a result, he had to start at the beginning, finding a platform with which he could be comfortable and getting to know that platform. To this end, Mathew downloaded a guide to learn how to use Google Sites, "GOOGLE SITES: GUÍA RÁPIDA DE USO" López Caparrós (2009). This guide provided step-by-step instructions on how to create an e-portfolio using the Google platform. Using what he learned in this guide, Mathew created a one-page handout to help students to create their own portfolios (See Appendix A). This one-page handout provides students with explicit directions on how to create their portfolios, including how to create their site with their presentation page, customize their sites, add pages, insert pictures and tables, change templates, and configure the sites.

In addition of creating portfolios, a content rubric (component list) needed to be created. Although, he is a constructivist teacher, he used two structured aspects while using e-portfolio assessment: the rubric and the e-portfolio structure itself. Mathew

modified a rubric that I gave him (a Word document downloaded from the internet and adapted by Frida Diaz Barriga from www.essdack.org, 2003). This rubric included title, auto-presentation, language, buttons, reflections and reactions to their work (See Appendix B), the components of the e-portfolios. He changed the numbers of tabs that students should include, eliminated the requirements for sound and technological resources, and eliminated a part in which students needed to answer few questions, e.g., about the electronic tools they used. The presence and quality of the components were assessed; as well, mathematics learning was assessed through their reflections and reactions to their work. This rubric was used on October (self-evaluation by students) and December (final evaluation by teacher). During the self-evaluation, students used the rubric to score their work per component. To make this process easier for students, a brief description of the expectations and their related points were included. Once their self-evaluation was complete, they totaled the points that awarded themselves and divided it by 102 (total score) to arrive at a final percent.

Prior to creating the individual portfolios, Mathew decided to create Gmail accounts for the students, individually. This took a considerable amount of time because Mathew experienced difficulty in creating the accounts, despite the fact he had assistance from his student teacher. They were trying to create individual, portfolio-only related accounts for the students, so as to maintain their privacy. They were adamant that they did not want the students using their personal accounts. Unfortunately, it was difficult to establish a sufficient number of accounts on the Google site. They started by creating at least two accounts per day because Google did not allow creating so many accounts from the same computer. Although this process was time consuming, eventually they created

the accounts. In addition to the Google account challenges, Mathew had to contend with the arrival of Tropical Storm Irene, which resulted in the cancellation of classes before, during, and after the storm. Consequently, the first semester lost approximately one week of classes. As a result, Mathew had to work fast to get the students prepared for their first exam and then helped them to begin creating their portfolios.

On September 21, I had a role as participant observer. I talked to students about e-portfolios and how to create them. The teacher explained how he would use it as an assessment tool for the Geometry course. This originated the beginning of e-portfolio assessment for students. I gave an explanation about how to create e-portfolios using Mathew's Smart Board. Mathew said that the bonus for the next exam would be having the e-portfolio ready. This motivated students to create their portfolios. Students were receptive and understood what they needed to do. The professor explained how e-portfolio would be used as an assessment tool. During the rest of the class, I talked with every student, gave email accounts, and passwords, which they must change.

This was the first time that the teacher and students used Google Sites to create e-portfolios. For both, it was a learning experience. In the beginning, Mathew indicated that he needed to learn and become fully familiar with the Google platform. However, he said that learning about how to use Google platform was easy. Moreover, He felt so comfortable that he would use it again.

> "…I would tell you that I would use it again… because it helped in an exceptional way to gather assessment,… analyze it, evaluate it electronically and it helped me with the decision making…" (Final interview, December 29th, 2011).

The e-portfolio development process was slow. Some aspects affecting the pace in which e-portfolio assessment was used were the process of learning about e-portfolio and Google Site, and establishing e-portfolio assessment purpose.

> "…I believe that at the beginning [it] was a little slow… and it was because I had not structured well the instructions, what was what expected of them in that e-portfolio. This is going well now because you help me to structure it, I am going to share this with them and I think that is going to give me the structure to let them know what I expect from them…" (Interview, October 6th, 2011)

Purpose and Uses

Mathew's conceptualization of e-portfolio assessment purposes was exceptionally important since these perceptions lead its use as an assessment tool in the classroom. The teacher believed that the e-portfolio assessment should enable students to (1) construct and connect knowledge, (2) communicate ideas/learning, (3) expand and develop the use of vocabulary words, and (4) reflect on mathematic topics.

Constructing and connecting knowledge included building new learning on prior knowledge. To assist his students in making these connecting, he would begin each class with a review of the "concepts from the day before" and help the students make the connections between the previous lessons and the lessons of the day. He used the portfolio as "a mechanism that allows the student to connect these aspects." (Final Interview, December 29th, 2011). Students were able to use and develop mathematical vocabulary thought the use of e-portfolio assessment. Mathew said, "another thing I've noticed is the appropriate use of mathematical vocabulary" (Interview, October 25th, 2011). E-portfolio assessment also "aims to include… those activities in which the

student can communicate knowledge and can communicate something they discovered and those activities are done in the classroom…" (Interview, September 29th, 2011).

In addition to the functions already discussed, e-portfolio assessment was used to inform what needed to be taught/retaught. The e-portfolio submissions helped the teacher explore the extent of students' knowledge and identify conceptual errors. Mathew stated that when he read the e-portfolios, the students' words and the depth of their reflections allowed him to determine if they did or did not grasp the concepts taught, and/or previously taught concepts. As well, he wrote comments in students' e-portfolios to have a better understanding of students learning processes.

For Mathew, this was one of the primary benefits derived from using portfolio evaluation. The portfolios provided him with deep insight into every student's learning. As Mathew put it,

> The portfolios became a way to explore the level of knowledge the student exhibited in relation to the material. See what ideas they brought. See conceptual errors. ... to give an example[:] The area formula and the perimeter formula are two well-known formulas ... I knew [if they understood] it because [of what they tell me] – if I multiply the length by the width - wait, you are talking about perimeter and you are multiplying the length by the width you are mixing the formulas.(Final interview, December 29th, 2011)

Creation and Selection of Activities

As the teacher thought about activities and questions that would work in the portfolio, he also had to think about activities and questions to help them develop the mathematical concepts he was teaching. For the teacher, digitalization played an

important role in terms of what activities could be used in the e-portfolio assessment since some of the learning activities in the geometry curriculum were not digitalized. In cases where the activities were not digitalized, Mathew created or modified them in order to use them in the e-portfolio assessment. He also spent a lot of time analyzing, selecting, developing, and creating activities that were formatted so that students could add them to their e-portfolios. Mathew did not mind spending time looking for the best activity to develop a topic. He liked to look for activities that can help students to understand and deepen their learning of a mathematical concept, so the teacher did not change his work patterns. However, looking for or creating suitable activities was time consuming.

Time is a recurrent subject when designing and implementing activities that were included in the e-portfolios. Mathew spent time looking for activities that not only focused on helping student remember concepts, formulae, etc., but also focused on developing higher order thinking: analysis, comprehension, synthesis, and evaluation. According to Mathew, selecting activities that allow students to reflect about mathematical concepts and their complexities promotes and creates a richer learning environment and a better learner. Choosing and creating activities is a task that Mathew carried out carefully, so it was time consuming.

> Designing activities is a part that consumes time, because the textbooks I'm using … have lots of activities. [I have to identify] which of those activities will help me discover the most important concepts of the course. In general I try to find the most significant concepts. (Interview, October 6th, 2011)

As described above, in addition to selecting, finding, or creating learning activities that stretched student thinking, Mathew considered whether or not an activity could be digitalized. Digitalization plays an important role when using e-portfolio assessment. Because scanners were not available to all students were not available so, he tried to find or create activities that he could digitalize easily and allow students to respond in digital formats. The professor spent time looking for daily activities using the Smart Board and other technological materials and activities that could be incorporated in the e-portfolios. Activities on the Smart Board were digital-friendly because Mathew could save it using many formats (such as PDF or PowerPoint).

Using technology was not difficult for Mathew. He frequently used technology because he thinks it is a great way to teach mathematics. This technology included graphing calculators, computers, interactive whiteboard, manipulatives, and, newly, e-portfolio assessment. Mathew liked to create virtual learning spaces that provided the students with diverse opportunities for learning. Mathew explained his use of technology saying,

> The second instructional approach I used to help students understand the topic is the graphing calculator. A graphing calculator will help students find approximate values for the exercises. I tell the students to use the same steps to graph quadratic functions as they use the graph to graph any other function. I use computers and interactive whiteboard to create virtual learning environments to address the same goals. The use of activities and manipulatives allows me to challenge students with stronger knowledge while ensuring learning for less accomplished students. (Journal, September 2011)

However, the use of e-portfolio assessment was limited to certain activities that the teacher designed with the e-portfolio in mind. As a result, not every classroom activity was incorporated in the e-portfolio. Mathew's activity selection process was laborious because he selected activities twice, once because they met daily learning goals and second because they could be used as e-portfolios activities. He reflected on and analyzed every activity before he decided to use it in the classroom, not only considering whether or not the activity supported his students learning and were appropriate for the e-portfolio assessment, but also considering how technology would enhance the learning. This was an extremely time consuming process. Mathew talked about how difficult all of this was in the context of his broader responsibilities:

> In terms of time, I feel, honestly, real tight. Because the thing is, I'm incorporating several new technologies. Among them is the one I mentioned in the last class, the one about System Response. In fact, yesterday I was reading about how to install it, how to work with it. So since I have a lot of little things, you know, I'm dividing myself up, so that's why I feel... but I can get it out because what I have to make the most of is the days I have, like tomorrow which is a holiday. (Interview, October 11, 2011)

Research Question 2: E-portfolio Use as An Assessment Tool

The second research question seeks to understand the teacher's perceptions of the use of e-portfolio: how does the teacher perceive the use of e-portfolios as an assessment tool? Mathew's perceptions about barriers and limitations, benefits or positive aspects, and e-portfolio product are described below.

Barriers and Limitations

As indicated above, the principal limitation related to using e-portfolio assessment was time. However, accessibility, digitalization, and situations delaying the process were also barriers. Furthermore, in addition to the time spent in creating/finding/selecting learning activities, Mathew thought that reading e-portfolio was time consuming because he needed to reflect on what students were learning and how the learning process was taking place. However, he thought that this time was well spent because of the amount of student specific information he was able to access. What he learned in this process helped him identify who needed additional assistance, addressing the need either individually or as a group during the next class.

> It is not like when one corrects an exam [with] multiple-choice [questions]. … grading [a] multiple-choice exam is easy because you look: A, B, C, D, is true or false, you know, and that's it. Using e-portfolios requires time to try to think what was [the student] thinking. You know that is, I would tell you that is an important aspect of the e-portfolio that requires higher levels of thought than only writing a definition. Notice, that I am not asking them to write me a definition. Reflect about this, what did you learn here? How do you connect with other things? So, [it] requires time, teacher's time … (Interview, October 19, 2011)

Mathew also spent time learning how to use Google Site properly. For example, he had to learn how to write comments on students' e-portfolio. Therefore, e-portfolio assessment related tasks consumed more of Mathew's time than he expected: choosing suitable activities, reading all students e-portfolios, writing comments on e-portfolios, and learning about how to use Google Sites properly.

Digitalization was also a barrier. Some activities that the teacher planned to use were not digitalized. He used to have more activities digitized when he used the Blackboard platform. However, because he stopped using Blackboard, he had to digitalize activities again. Fortunately, because these activities had previously been digitized, they were easier to change to a digital format. He also planned to use activities from the Smart Board. However, most of Smart Board activities were used to present topics and discuss exercises and did not display student work. As a result they were not appropriate for inclusion in the students' portfolios.

Another barrier Mathew identified was accessibility. In the classroom there was one computer, which is used by the teacher. Consequently, students worked on their e-portfolio outside the classroom, in the library or at home. As a result, the e-portfolio was always used as an outside classroom assessment tool.

Since the e-portfolio assessment was not used as a real-time interaction technology (such as video conference or interactive Google docs) in which the teacher could assess students' work as they complete it, Mathew felt uncertainty about whether or not her really understood the students' learning processes. He was not confident about how he should interpret students' reflections. For example, the teacher was not sure if the reason a reflection was "superficial" (interview) was because the student did not understand the concept or he was in a hurry to complete the reflection. Mathew thought that extensive communication was needed via personal interaction (questioning) or digital interaction (comments) to make this type of determination.

Benefits

Mathew identified many benefits derived from using e-portfolio assessment. Two positive aspects mentioned were that e-portfolio was free of charge and easy to use. He felt that today's students manage technology easily. As a result, this was a straightforward process for both the teacher and students.

Mathew also thought that using e-portfolio assessment benefited the learning/teaching process. Some of the benefits included fostering students' reflection and communication, facilitating teacher exploration of the students' learning processes, and providing students with space/time to reflect and communicate thoughts, while receiving feedback. Furthermore, he felt that using e-portfolio assessments helped students to remember what they learned. Students could review and reconsider what they wrote in light of a comment that the teacher wrote on their e-portfolios, images posted in the e-portfolio related to the concept that were learned, or just remembering how their drafts or written reflections were developed or revised.

Mathew felt that students reflecting on what they are learning is a very important and empowering process because students develop higher order thinking skills while improving their writing and communication skills. He observed that students analyzed more of the concept or problem when they needed to reflect on it. More specifically, Mathew felt that the reflection aspects of e-portfolio assessment facilitate students' expression of ideas, concepts, and learned skills. Moreover, students' reflections helped inform Mathew's teaching, indicating when he needed to modify his teaching strategies, stress important concepts, or ask better questions in order to extend students' learning. As a result, the reflections were not just written documents but an effective way of communicating knowledge and continuing learning needs.

Student communication of knowledge through e-portfolio assessment entries is consistent with the Puerto Rican education goals. These goals include students communicating efficiently. E-portfolio assessment provided a space in which students can develop this lifelong skill. Furthermore, Mathew was confident that if a student is capable of communicating what was being learned then s/he really learned it.

E-portfolio assessment facilitated Mathew's exploration and understanding of his students' learning processes. "It's also a medium for exploring if what one wanted to be developed was developed… portfolio in this area are important as it allows to students to express thoughts after deep reflection in an open space" (Teacher diary, November 14, 2011). Students' portfolio entries provided him with the information he needed to determine who learned, who had doubts, what mistakes students were making, what conceptual errors were common across the students, and which students needed additional help to clarify a concept. As Mathew described it, "portfolios became a medium for exploring the student's mastery of the topic. See what ideas they brought to bear, to see conceptual errors. You see, the portfolio also helps you see conceptual errors." (Final interview, December 29, 2011). Mathew also observed that "many times one does an activity in class and the one that's mastered it is always the one that answers. You don't know what the one that's silent took away in his mind… the only place you have to see what each one thought, is the electronic portfolio". (Final interview, December 29, 2011). Mathew also understood that

> ...Identifying conceptual errors, that's real important to addressing them. If it's a minor conceptual error, it can be brought up in the group, right? Say, "Listen, folks, you framed this in this way, that's not correct... without naming the person.

> If on the other hand the conceptual error is very big, that one can see will cause [the student] problems in the future, then it would be necessary to spend time with that student and give him/her space to then correct it, and reflect upon it. (Interview, September 22, 2011)

Clearly, e-portfolio assessment resulted in enhanced communication. Mathew was glad that he had the opportunity to read what his students were thinking about mathematics. He said that in the classroom, most of the time he can know only what few students were thinking but when using e-portfolio assessment he knew what all students thought about what they were learning. This contributed to foster individual relationships with students and to help the teacher to have some considerations based on students learning processes.

The use of e-portfolio assessment offered flexibility to students to finish their work. Using e-portfolio assessment, students had space and time to reflect (think and write about what was thought). In Mathew's words, "when it comes to looking at these assessment techniques, one of the benefits is the capacity to offer spaces for reflection". Students could work at home, in a relaxed, quieter, and disturbance-free environment, they can "go back in and write and reflect… think more deeply". For example, "there are times you start working on a concept, and I don't know if this has happened to you, but suddenly several things come to your mind, but later on something else occurs to you, and wait a minute, I could have done this this other way, too" (Interview, December 29, 2011). Therefore, they had the opportunity to add information to their reflection any time they grasped or clarified a concept.

E-portfolio Product

When talking about the e-portfolio product, the teacher stated that asking good questions was essential. He felt that good teacher questions led to improved student work. More specifically, Mathew believed that the quality of the questions helped the students to write deep reflections, build on prior knowledge, and make connections, giving the students a framework to guide their work. The teacher was proud of students' e-portfolios. He noticed that most students linked prior and new knowledge, and that only a few wrote short reflections. He was pleased with students' e-portfolio, however, he thought there is always room to improve, for example "they could reflect a little more deeply" and define patterns clearly.

Research Question 3: Relationship Between E-portfolio Assessment and Curricular Content and Delivery

The third research question sought to understand the relationship between e-portfolio assessment and instructional content or delivery. This question was answered analyzing documents such as the curriculum, daily plans, and the syllabus of the course; observations, and interviews. The curriculum that Mathew used, *Marco Curricular del Programa de Matemáticas* (Departamento de Educación de Puerto Rico, 2003), was created and published by the Department of Education of Puerto Rico.

Mathew's beliefs and practices overlapped with the curriculum, particularly in the ways to assess; the importance of communication, connections, and reflection; and the importance of teaching Math in context. In addition to the curriculum, Mathew created activities aligned with the Mathematics standards in Puerto Rico. Compatibility between the curriculum, standards, and teacher's beliefs about how Math should be taught was

observed. These consonances are related to importance of communication, reflection, connections, and learning, which were also reflected in how Mathew constructed and used e-portfolio assessment.

The Curriculum established that students should be able to communicate effectively. "The fundamental purpose that direct the teaching of math is to develop the capacity to think, to reason, to communicate, to apply, and to value relations between ideas and real phenomena" (Departamento de Educación de Puerto Rico, 2003). Mathew believed that when students communicate their ideas they pass through a reflective process, which takes time, but allows them to develop deeper understanding of mathematical content.

Making connections played an important role in the learning process. According to the teacher and the curriculum, it is important to connect prior and new knowledge. "In that process of restructuring, the student should have the opportunity to do connections among what learns and what already knows. In this way, the creation of extensive mental structures is facilitated, allowing the student to build new knowledge" (Departamento de Educación de Puerto Rico, 2003). Mathew thinks "making the connection to the mathematical ideas and skills is critical". Consequently, he spent time during class helping the students make connections with previous learning, daily life activity, and real world situations. For example, he used Google earth to discuss postulates and made them pertinent to real life.

The curricular content emphasizes the importance of reflection. "Students learns math when reflect around [his/her] own reasoning and around their peers. Moreover, a student learns math when reflecting on [her/his] own mistakes and on his unsuccessful

reasoning in the intent to solve some problems" (Departamento de Educación de Puerto Rico, 2003). Mathew agrees with this curricular focus, believing that reflecting on Mathematics' concepts is the most important process in learning math. E-portfolio assessment matches both the curricular focus and Mathew's beliefs. He believes that "the brain learns when you reflect on what they tell you and this aspect is fundamental in the portfolio because the portfolio gives the student a means to reflect on what he/she did. And that's where the key is...". As a result, he created activities in which students needed to write reflections. He was pleased with the results, stating that the e-portfolio assessment provided him with " much more information about what the person is thinking, what prior experiences s/he is bringing to his/her learning" (Interview, October 25, 2011). Furthermore, the activities Mathew created also reflected both his beliefs and the curricular focus on the construction of knowledge. Both Mathew and the curriculum focused on creating a learning environment that is constructivist and learning activities should allow students to create their own learning, helping them to deepen their reflections.

Teaching Math in context and being problem-centered are important features in the curriculum. "Teaching and learning processes of the mathematics should focus on the solution of problems concerning students' real lives, emphasizing the process that begins from the consideration of the problem to the evaluation of the implications and their solutions in a real world scenario (Departamento de Educación de Puerto Rico, 2003). At the same time, Mathew's beliefs and the curriculum grounded the instructional content and delivery, including the use of e-portfolio assessment. The use of e-portfolio assessment did not change curricular content. Instructional content was based on the

curriculum, using the book as the foundational of the design of the syllabus (Appendix C) and to steer daily class content. Students brought the book to every class so they could follow the content of the instruction. However, e-portfolio assessment did affect the detail of his instruction (when re-teaching or clarifying) and the instructional activities. In addition to the changes made when re-teaching or clarifying, Mathew also worked to create, select or adapt activities that could be digitalized. In addition to using the book, instruction included other activities, many of which could be created digitally or were adapted to that they could digitalized. The activities that were useful in communicating students' conceptual understandings were included in the e-portfolio.

As said before, the use of e-portfolio as an assessment method fitted well with the curriculum, standards, and teacher's beliefs. The emphasis of the curriculum on assessment being a process in which students organized and interpreted qualitative and quantitative information in order to make good decisions was consistent with the structure of the e-portfolio assessment. Furthermore, the curriculum indicates that assessment is an important process in documenting learning and fostering learning through communication and reflection (Departamento de Educación de Puerto Rico, 2003). The e-portfolio as an assessment method also provided space to increase communication between students and teacher and relied on reflection as part of the assessment process.

Although the curricular content did not change, instructional content and delivery changed based on the students' e-portfolios. Since students were able to communicate what they had and had not learned, the teacher was able to identify what needed to be retaught or clarified for the group or individual students. Because Mathew had the

opportunity to read students reflections, he was able to identify conceptual errors and correct them through subsequent class discussions. As Mathew said, "E-portfolio [assessment] was not only an instrument for students to express themselves but [was] mechanism for the teacher to identify conceptual errors."

Use of technology was a theme that goes beyond a mere teaching strategy used in the classroom or an instructional delivery tool. Mathew used technology so frequently that was enmeshed in his classes, via his teaching and his learning activities and tools. He used Graphic Calculators with the Cabri Jr. App, TV, Smart Board, virtual manipulatives, videos, and e-portfolio assessment. Additionally, he was willing to try different types of technology that would help students to understand a concept or improve his teaching. The curriculum he used also promotes and encourages the use of technology in education. Technology used in e-portfolio assessment was consistent with both Mathew's beliefs and practices and the curricular emphasis. However, it also required Mathew to learn new skills, extend his thinking, and be more creative in the use of technology in his everyday teaching so as to create and use learning and performance activities that could be digitalized.

Research Question 4: Influence of IEP Status and E-portfolio Assessment

The fourth research question seeks to understand how the students' IEP status (IEP or no IEP) and potential IEP-related variations in instructional content and delivery influence the use of the e-portfolio assessment and teacher perception of the process of creating the e-portfolio. First, I describe how IEP status affected e-portfolio assessment use and provide some examples of the activities that students included in their portfolios. Then, I discuss the teacher's perception about students' IEP status. Finally, I explore

how IEP status affects the influence e-portfolio assessment has on instructional content and delivery.

Students with IEPs and e-portfolio assessment. Mathew's geometry class consisted of 29 students, 8 of which had IEPs. Students with or without IEPs were responsible for meeting course requirements, including for completing their e-portfolio reflections. In the beginning, Mathew gave all students the same deadline for the reflections. However, he noticed that most of the students with IEPs were not able to finish on time. Therefore, he decided to give these students more time to complete this requirement. With the extra time accommodation, the students with IEPs were able to complete the requirement obtaining grades similar to their peers who did not have IEPs. Although extended time was an IEP listed accommodation, the teacher further extended the amount of time allowed by this accommodation, giving them all the time they needed to finish this requirement. Mathew thought that this was a successful accommodation, believing that these students had a better product because they had more time to comprehend and grasp the concepts. His belief was verified by the quality of the portfolios produced, with students with and without IEPS producing good quality e-portfolios.

Although students with and without IEPs both produced good final products, the students with IEPs needed additional support and guidance related to editing. While reading the students' portfolios, as they were creating their entries, Mathew noticed that some of the students with IEPs had writing difficulties and were not able to use or incorporate the content-related vocabulary words adequately. Appendix D provides an example of a first draft of a portfolio reflection created by a student with an IEP. This

reflection had many misspelled words and missed some accents. In the appendix, the misspelled words are underlined. Errors like these were common for students with IEPs. Fortunately, Mathew noticed this early and spent more time and provided constant feedback in an effort to guide the work of these students. Appendix E exemplifies how he worked with the student to correct his errors. Mathew supported students with IEPs by providing constant feedback using the comments tool on Google Sites, talking with the Special Education teacher to support students, and assisting students individually to improve their writing skills, corrected some accents, and helped to paraphrase some sentences.

Mathew was aware of individual students' needs and what they were missing. When I asked about a student with an IEP, that had trouble meeting the deadline he said: "Well, he owes me many [assignments]…" but he was coordinating with the Special Education teacher so the student could submit all the requirements needed to complete the class. In addition to giving the students with IEP more time to complete their work, additional support related to their writing, and carefully coordinating with the special educator, Mathew also allowed students with IEPs to use a reader, as needed. These supports result in good outcomes for students with IEPs. By the end of the semester, they had edited their e-portfolio and were able to present a well-written work, like their peers without IEPs.

Teacher perception of working with students with IEPs. Mathew found that teaching students with disabilities/IEPs is a challenge that he faces everyday in the classroom. However, he was not afraid to try different ways to meet these learners' needs. He wrote in his diary how he uses different techniques and strategies to better

teach these students. Interestingly, he also used a variety of instructional approaches and activities with all of his students, not just those with IEPs. Because he used different instructional and delivery approaches and all observations were in an inclusive classroom, I couldn't determine whether or not the variety of strategies used to deliver content, the activities used, or content were related, exclusively, to the students' IEP status. The data, in its entirety, suggest that Mathew used the variety of strategies, activities, and content, irrespective of students' IEP status. This would be consistent with his beliefs about teaching and learning, and would be consistent with what was observed in the classroom and heard in the interviews and diary entries. As mentioned before, the only change based on disability status was related to deadlines and the provision of extra support for written expression.

IEP status and e-portfolio assessment influence on instructional content and delivery. IEP status also did not influence Mathew's perception of e-portfolio assessment's benefits or barriers. Moreover, he stated in the last interview that the benefits or barriers did not change. However, based on my observations and previous interviews, I learned that Mathew perceived that the use of e-portfolio assessment had two additional benefits for students with IEPs. According to him in these earlier interviews, e-portfolio assessment was a motivator for some students with IEPs and did not change how e-portfolio assessment was used. He also believed that the e-portfolio assessment allowed for flexibility that enabled him to give his students with IEPs the time they needed to reflect on and deeply understand the mathematical concepts they were learning. Students with disabilities also made more conceptual errors. Using the e-portfolio assessment as a tool and foundation for understanding these students' learning,

Mathew incorporated more prompts and provided the support they needed to deepen their conceptual understandings. Students with disabilities received additional supports. They went to the Resource Room to get help in writing their reflections.

For him, other benefits and barriers about the use of e-portfolio assessment for students were a constant, whether the student had an IEP or not. E-portfolio assessment gave each student the space and time to reflect on mathematical concepts. They were easy to use and they facilitate communication between the students and the teacher. Unfortunately, some students did not have full access to the Internet. As a result, these students faced additional challenges when trying to construct their e-portfolios or receive the feedback they were given by the teacher.

CHAPTER V

DISCUSSION AND IMPLICATIONS

The purpose of this single case study is to understand how one general education teacher uses e-portfolio assessment in an inclusive high school classroom. More specifically, this study addresses four research questions:

1. How does a high school teacher create and use e-portfolios to assess students with and without disabilities in an inclusive classroom?
2. How does the teacher perceive the use of e-portfolios as an assessment tool?
3. What are the relationships among the use of e-portfolio assessments, curricular content, and instruction?
4. How do the relationships among the use of e-portfolio assessments, curricular content, and instruction vary for students who do and do not have IEPs?

E-portfolio assessment, as described in the literature and as seen in this case study, is a digital tool that supports a learner-centric approach to learning in which students are required to both think critically about and reflect on their learning experiences (Batson, 2002). Unlike traditional testing, this space gives students flexibility to analyze, reflect, and change their work as needed (Acosta & Liu, 2006). In addition to the students' reflection on their learning, the e-portfolio assessment also provides a space for interactions between teacher and students. As a result, the e-portfolio assessment also provides an interactive environment that nurtures students' critical thinking in ways paper-pencil assessments cannot. This allows e-portfolios to enact the use of assessment as a part of instruction (Bartell et al., 1998).

In an environment that uses e-portfolio assessment, e-portfolios are stored and shared with the teacher in electronic format so that e-portfolios are accessible to both students and the teacher in a virtually unlimited work collection space (Batson, 2002). In this case study, the e-portfolio assessment was used as an interactive, formative assessment, since it offered both the teacher and students ongoing information about students' thinking processes as they relate to learning activities completed in the classroom. The use of e-portfolios in formative assessments resulted in the portfolios being what literature refers to as learning or formative e-portfolios. Typically, learning or formative portfolios are evaluated using predetermined benchmarks that show students' progress across learning experiences (Carmean & Christie, 2006; e-portfolio Portal, 2004). In this study, the teacher created portfolio content rubrics but did not use learning benchmarks to evaluate the content of students' artifacts. However, Mathew evaluated students' understanding of the concepts and processes that were the focus of their reflections. As a result, Mathew not only got a sense of students' learning progress, he was able to use these reflections to determine the efficacy of his teaching in relation to individual students as well as the group. This ongoing assessment provided him with the feedback needed to know what topics needed further explanation, or needed to be taught differently. Additionally, as suggested in the literature, Mathew found that e-portfolio assessment opened up new opportunities for him to reflect on his teaching practices (Acosta & Lui, 2006; McLeod & Vasinda, 2009), including his teaching activities and beliefs.

Despite the benefits derived, due to both external and internal factors, using e-portfolio as an assessment tool was a slow process that required continuous work. The

external reasons were related to time, which included postponement of the start of school and a delay in creating the e-mail accounts for using the e-portfolios. These delays affected how quickly e-portfolios became part of the assessment milieu. Furthermore, Mathew felt that integrating e-portfolio assessment into his instructional milieu required him to be creative in developing meaningful learning and assessment activities that were also appropriate for the electronic environment. According to Brandt (1992), this process always takes a considerable amount of time. Not only was time needed to seek or create suitable activities, time also needed to be dedicated to students' completion of their portfolios. Students were given extended time to work on their reflections. Both of these factors affected the speed of implementation of the e-portfolio as an assessment tool.

In sum, using e-portfolio assessment challenged the teacher and his students. This chapter synthesizes the principal findings of the study. The findings are followed by research limitations. It concludes with implications for practice and future research.

Principal Findings

The principal findings of this study are issues related to the creation and use of e-portfolio assessment; teacher perceptions of e-portfolio assessment; and the relationships among the use of e-portfolio assessment, curricular content, and instruction, particularly how these vary for students who do and do not have IEPs. Each of these are described below.

Creation and Use of E-portfolio Assessment

One of the most obvious findings of this study related to time: time to learn how to create e-portfolios (teacher and students), time to set-up the e-portfolio environment (teacher), time to create the e-portfolio (students), and time to reflect, evaluate, and

respond to artifacts and comments (teacher and students). The second most obvious finding, integrated within time, is the difficulty of simultaneously learning about the mechanical aspects of portfolio creation and trying to create and use e-portfolios as part of assessment. A third finding related to creation and use of e-portfolio assessment focuses on the interaction between creation and use as applied to assessment rubrics. The last finding related to construction and use is how e- portfolio assessment if complicated by lack of access to computers in the classroom. Each of these are discussed in this section, starting with the mechanical aspects, moving onto rubrics, and ending with discussions of time, accessibility, and paper versus e-portfolio assessment.

Mechanics: Learning to create and use. Mathew began the study with knowledge of a variety of technological tools, but no knowledge of e-portfolio assessment. As a result, he had to educate himself about e-portfolio assessment and decided to implement them with little guidance from the researcher. As a result, as found in research (Skinner, 2004), Mathew had to spend significant time in preparation, both before and during implementation of e-portfolio assessment. In the initial days of implementation, Mathew downloaded a guide about how to use e-portfolios, prepared a how-to handout for his students, and modified a researcher-provided content rubric. Since I have knowledge about using Google sites to create e-portfolios, I answered teacher and student questions and explained to students how to create their e-portfolios.

Lack of familiarity with the e-portfolio assessment among first time users, insufficient guidance, and technical problems (including problems encountered setting up Google accounts and internet access) delayed e-portfolio creation and use. These factors also resulted in Mathew being so focused on the mechanics of the portfolio that he had

difficulty seeing the “whole" and imagining the potential uses and content of the e-portfolio. This led him to making novice mistakes, e.g., not identifying the purpose of an activity (in this case the e-portfolio assessment) and not establishing evaluative criteria related to the content of students' artifacts (reflections). He also had a limited understanding of how it interacted with his classroom practices. In this research, as well in other studies (Johnson & Arnold, 2004; Pimentel, 2010), lack of knowledge in how to use portfolios was a disadvantage. Like Pimentel (2010) suggests, Mathew would have benefited from more guidance or formal training on how to create e-portfolios, how to use Google sites, and how to use e-portfolios as a regular assessment tool. Lack of training might have influenced the expended time working on e-portfolio assessment (Kampfer et al., 2001).

In addition to learning about the construction of e-portfolio assessment and the various resources that can support the use of e-portfolio, it is critical to define the e-portfolio’s purpose before using it (Strudler & Wetzel, 2011). Identifying its purpose from the outset is challenging but important because it can lead to either a successful or ineffective e-portfolio process (Carpenter et al., 1995; Johnson & Arnold, 2004).

Similar to other research findings, at first the Mathew did not use e-portfolios as a regular assessment tool because he was not clear about their purpose. However, after observing how e-portfolios could be created, and how they could be used to extend classroom learning, Mathew was able to envision its general use in assessment and instruction. This general vision included helping students build on their prior knowledge, expand and develop their use of vocabulary words, and foster their communication and reflection about mathematic topics. Additionally, he used the e-portfolio assessment as a

way to identify students' conceptual and procedural errors. These purposes are parallel to what Barret (2007) refers to as assessment *for* learning.

Mathew's use of e-portfolio assessment for learning was not unique to the electronic environment. How he constructed this assessment could have been done using a paper-based portfolio. This may have happened because he was new to e-portfolio assessment and had not had the time or experience to think about the assessment possibilities in the electronic environment. However, despite the fact this assessment activity could have been paper-based, Mathew felt there were benefits that the students and he derived from the more collaborative environment created by the electronic format. He saw the e-portfolio as a more interactive space for his constant feedback and comments to students and their responding. Unfortunately, he was not at the point where he could see that this benefit could have extended to collaborative learning among peers. As a result, Mathew did not use the e-portfolio assessment as a space for collaboration between peers, as recommended by other researchers (Barrett, 2007b; Barrett & Carney, 2005).

Assessment rubrics. To meet the purposes Mathew envisioned for e-portfolio assessment, he constructed e-portfolio assessment using broad learning expectations related to reflection and technology. As a result, assessment criteria related to portfolio construction rather than math learning.

Other researchers recommend that rubrics be constructed to avoid misinterpretations about grading system (Choate & Evans, 1992; Cole & Struyk, 1997; Taylor, 2006) associated with the e-portfolio assessment. Mathew's focus on the mechanics was revealed in the rubrics he created for the e-portfolios. The rubric Mathew

decided to use was a requirements checklist that students used to construct their e-portfolios. Without a set of content learning benchmarks, portfolio entries could result in a waste of time producing an accumulation of work that is not suitable to be assessed (Carpenter et al., 1995; Johnson & Arnold, 2004). Although, e-portfolio assessment is generally a valuable tool to document and assess students' growth and learning (Ezell et al., 1999; Jardine, 1996; Kleiner & Thurlow, 2001), defining specific goals or establishing Math standards to be achieved may have enriched the use of the e-portfolio assessment. With specific goals, standards, and benchmarks, e-portfolio assessment may have been a more effective measure of students' learning. If Mathew wants to use e-portfolio assessment more effectively, he needed support on how to develop e-portfolio entries that exhibit students' growth and learning based on academic standards.

Finally, Mathew's lack of familiarity with e-portfolio assessment led to Mathew's choices in determining the content of the e-portfolio. Instead of collaborating with the students to identify the content, which would have increased student control and ownership, Mathew made content decisions. More specifically, students were not involved in the creation, development, and decision-making during e-portfolio use in this study, nor did they have an active/interactive role in determining the objectives of their learning experiences. E-portfolio assessment provides students with an environment in which they have the opportunity to re-work constantly on their e-portfolio and make sense of what they learned (Mason, Pegler, & Weller, 2004). According to Mason et al. (2004), through the e-portfolio process (which includes the selection of what is include) students can recognize and reflect about their own competencies (strengths and weaknesses) and demonstrate their growth. For Rhodes (2011), this process itself is a

"learning exercise." Perhaps, for e-portfolio assessment to be relevant for each student, s/he should decide what should be included based on his/her own e-portfolio.

Time. As described above, in addition to needing time to learn about and create e-portfolios, Mathew needed time to learn about how assessment is conducted within this milieu, including how to create or select activities that would be suitable for the e-portfolio assessment. Mathew tried to use e-portfolio as an authentic assessment tool in which students constructed their own knowledge through their reflections on their learning. Unfortunately, during any authentic assessment process, a common challenge is the amount of time needed to create and set-up an effective assessment process (Brandt, 1992; Dysthe & Engelsen, 2004). Mathew's efforts echo that fact. He reported that not only did he spend a lot of time selecting and developing meaningful activities, by which students could demonstrate learning, he also had to seek and created activities that were easily digitized. However, based on what was observed in this research, the activities used in the classroom did not have to be digitized for students to complete e-portfolio reflections. Students were required only to write their reflections in the e-portfolio along with some illustrations. As stated before, this could have been done using a paper-based portfolio.

The contradiction between what Mathew said and did was not the result of Mathew being technologically naïve. In fact, he had a positive attitude toward technology and spent time digitizing activities to integrate technology such as Smart Boards, graphing calculators, etc. What may have happened was that because Mathew did not start with a clear purpose and concept of what could be included in the portfolio, he may not have realized that the way he constructed the e-portfolio assessment did not

require digitizing most of the activities he used. As a result, the use of a variety of technological resources in the classroom had a minor impact on students' e-portfolios, especially since e-portfolios were used as an outside of school tool (computers for students were not available in the classroom). However, Mathew's recognition that he needed to create digital-ready learning activities may also have reflected his emerging understanding of the potential of e-portfolio assessment.

Technical problems and digitization of activities were time consuming and delayed the use of e-portfolio assessment. Designing and implementing e-portfolios as an assessment tool was not an easy task. Defining the purpose, creating the rubric, and developing activities were tasks that consumed the Mathew's time during the semester. Additionally, he was simultaneously learning about, creating, and using the e-portfolio assessment. In future semesters, with these activities done, Mathew could focus on reading and providing feedback to students, or expanding the use of e-portfolio assessment and their content.

The second time-related aspect was reading and commenting on student work. These activities required Mathew to rethink, react, and provide specific comment on students' work that led to enhancing student learning. For the Mathew, this was a multifaceted process that demanded a great deal of time. The findings of the current study parallel those identified in earlier research. That research also indicates that using and implementing e-portfolio assessment requires a considerable amount of working time for both the teacher and students (Linn & Baker, 1992; Cole, Ryan, Kick, & Mathies, 2000), with students (undergraduates) also reporting that creating e-portfolio assessment is a time consuming process (Hung and Huang, 2010) and other researchers (Gardner &

Aleksejuniene, 2008; Hung & Huang, 2010; Kokoglu, 2009; Qiuyun, 2009). Learners' perception in the present study is unknown because this data was not collected.

Accessibility. Accessibility also plays an important role when using e-portfolios to assess students. Teachers and students must have access to computers in order to utilize e-portfolio assessment (Jones & Shelton, 2006; Lambert et al., 2007). In this case study, accessibility was a challenge. The e-portfolio work was done outside the classroom because the classroom did not have computers for student use; therefore, students worked on their e-portfolios at different sites including their homes, the computer lab, or the library. This prevented Mathew from doing as Cole and Struyk (1997) recommend, set time during the instructional period to allow students to work on their e-portfolios. However, Mathew made no attempt to overcome this challenge and may not have seen it as a challenge. He did not consider coordinating with the librarian or the teacher in charge of the computer laboratory to gain computer access for the students.

Paper versus e-portfolios. The main differences between paper-based portfolios and e-portfolios are related to form, storage, publication, accessibility, and dialogic function. Mathew's use of e-portfolio assessment was very similar to how traditional paper-based portfolio could be used. Even though e-portfolios are created in a digital form, allowing students to add multiple technologic media (e.g., videos, graphics), the only media Mathew required students to use was word processed documents and pictures that were digitized. Both of these activities could have been done in paper-based portfolios. However, in addition to the benefits described above, unlike paper-based portfolios, digital portfolios were accessible to Mathew almost anywhere/anytime. As a

result, he could read and reflect on students' understandings of math concepts without the needing to transport an unmanageable amount of binders or papers (Batson, 2002). Furthermore, the electronic environment allowed students to more easily modify their work based on the teacher's comments. This virtual space allowed Mathew and his students to maintain an interactive communication around their learning. Mathew identified this dialogic function of e-portfolio as an important benefit associated with e-portfolio assessment. On the other hand, as discussed in another section, the dialogic communication could be more inclusive, adding interaction and promoting collaboration between peers (Blair & Takayoshi, 1997; Hawisher & Selfe, 1997) and family members.

Teacher's Perceptions of E-portfolio Assessment

Broadly speaking, Mathew believed e-portfolio assessment consumed a large amount of his time. However, he believed that the problems posed by time were outweighed by ease of use and what he saw as the benefits of e-portfolio assessment.

Despite the complications Mathew encountered setting up his students' e-portfolio accounts and the time investment in learning to use e-portfolios in assessment, Mathew liked the resources at Google sites. He felt they were suitable tools to use in building the e-portfolios because they are free and easy to use.

In addition to ease of use of the Google sites' tools, Mathew believed that e-portfolio assessment benefited both his teaching and his students' learning. Through reading students' reflections, teachers can come to know students better, and help them to reach academic goals (Demchak & Greenfield, 2000; Hicks et al., 2007). Students' reflections in this study helped Mathew identify misconceptions, while also exploring and

understanding individual students' learning processes. He used this information to adjust his subsequent teaching.

Mathew was a constructivist teacher; he believed that students construct their own learning. The role of a constructivist teacher/believer is guiding and helping students to rework their interpretations. Constructivism theory supports the idea that learners construct their own knowledge based on their own past experiences; therefore, rather the being imparters of knowledge, teachers' roles are to guide learners through their own learning process or knowledge construction (Al-Huneidi & Schreurs, 2012). For Buzzetto-More (2010) the e-portfolios are models of constructivist theory. They are efficient in connecting students to learning, and at the same time, providing virtual space to students to construct their own meaning and understanding through reflection and sharing their learning with others (Buzzetto-More, 2010). As a result, Mathew's constructivist approach to education was a good match to the reflective processes used in e-portfolio assessment. Embracing e-portfolio assessment did not require this teacher to alter his beliefs.

Mathew believed the student reflections not only served as the foundation to enhancing their learning, the reflections also provided valuable feedback to him. As suggested in the literature (Acosta & Lui, 2006; Henry, 2006; McLeod & Vasinda, 2009), e-portfolio assessment provided Mathew with an opportunity to reflect on his teaching practices and the curriculum. "Teachers must be able to think systematically about their practice and learn from experience. They must be able to critically examine their practice, seek the advice of others, and draw on educational research to deepen their knowledge, sharpen their judgment, and adapt their teaching to new findings and ideas"

(National Commission on Teaching and America's Future, 1996). Reflection should evolve from experiences in meaning and usefulness (Rodgers, 2002). Information about how students are learning can be utilized to adjust the teaching process or content (Bigge et al., 1999; Pierangelo & Giuliani, 2006). As a result, e-portfolios assessment can be used as an ongoing learning vehicle to both improve student performance and revise teaching strategies (Beck et al., 2005; Carmean & Christie, 2006). Mathew believed e-portfolio assessment enabled him to gain information needed to make decisions about changing instructional delivery subsequent learning activities. Specifically, students' e-portfolios gave the Mathew important information about what and how students were learning in Math.

Mathew also believed the use of the e-portfolio assessment promoted communication between him and his students. However, Mathew only used the e-portfolio assessment as a dyadic communication tool. This was a very limited use of the e-portfolio assessment. Boerum (2000) found that e-portfolios could also improve communication and collaboration among parents, teachers, and students. To effectively use the e-portfolio assessment in this manner, Englund (2009) developed guidelines for teachers to use as they share information and improve communication with parents. Collaboration between peers is also recommended (Barrett, 2007b; Barret & Carney, 2005). Within this collaborative environment, e-portfolio assessment can improve students' communication skills (Carothers & Taylor, 2003; Ezell et al., 1999). In this case, Mathew had not consciously chosen to use the e-portfolio assessment in this manner or to monitor communication skill development. As a result, while it did foster

communication between him and his students, improvements in students' communication skills are unknown.

Effect of E-portfolio Assessment on Instruction and Curriculum

Mathew used the curriculum as the basis for his decisions about instructional content and delivery. As he incorporated e-portfolio assessment into the learning process, he returned to the curriculum to make decisions about the content and structure of the e-portfolio assessment. Classroom activities were created for students to connect, reflect, and communicate curricular content learning. The reflection and connection opportunities afforded by the e-portfolio assessment were particularly attractive to Mathew.

Mathew believed that creating the artifacts for their e-portfolios empowered students to be reflective on their Math learning, to better remember what they were learning, and to build on prior knowledge by connecting new learning to previously learned concepts, algorithms, and applications. The curriculum and Mathew emphasized the importance of reflection as a medium for student learning. He believed that "students learn math when they reflected around [their] own reasoning [of what is studied] and around their peers". Moreover, "a student learns math when he/she reflects on [his/her] own errors and on his/her failed reasoning…" For the teacher, it is more important that students reflect on what they learn and how that can be used than accumulating information that has no meaning for them. Therefore, e-portfolio assessment provided a space in which Mathew could learn about what students were understanding and what they were thinking about the content they were learning in class by reading their reflections. Mathew found that through the use of formative assessment (e-portfolio

reviews), teachers can understand and challenge students and their misconceptions while guiding them through a "process of conceptual change" (Keeley, 2010). Using the e-portfolio assessment, Mathew was able to reflect on students' learning and help them to refine their understanding by addressing misconceptions.

E-portfolio assessment had no overt effect on the curricular content because it complemented one of the curricular goals, reflection. It also had limited effect on the curricular content because of how Mathew used it. This assessment promote the students learning of the curricular content by providing the space in which Mathew could discover conceptual errors, identify where he needed to clarify or emphasize concepts, and determine when he need to discuss and expand certain topics in class. He also used what he learned in reading the e-portfolios to alter how he taught and the learning activities he used. Furthermore, he became increasingly interested in finding or creating learning activities that could be digitized. In these ways, e-portfolio assessment subtly altered or enhanced the day to day lesson content and the learning activities used in class.

E-portfolio Assessment for Students With and Without IEPs

In this study, there was no difference in the structure or content of the e-portfolio, or in the grading criteria used for students with or without IEPs. However, accommodations related to work time and writing support were provided.

Frequently extended time for assessment is provided to students with disabilities. Providing extended time for assessment is intended to allow learners to fully demonstrate their knowledge without the obstruction of a disability (Pariseau, Fabiano, Massetti, Hart, & Pelham, 2010). Debates about this reasonable accommodation for assessment, especially during formal testing, are common in educational venues (Lovett, 2010).

However, this accommodation is commonly used. In this study, the need for extra time arose in relation to e-portfolio assessment in this study. Students without IEPs did not need accommodations to complete their e-portfolios. On the other hand, students with IEPs did not finish their reflections on time. As a result, they needed extended time to work on the reflections and submit their e-portfolios. Therefore, Mathew provided these students with the extended time accommodation to complete their e-portfolio work. This accommodation allowed students with IEPs to write better reflections and obtain satisfactory grades in their e-portfolios. Fortunately, Mathew did not believe that this accommodation created undue hardship for him or unfair conditions for students without IEPs.

In addition to extra time, and unlike their peers without IEPs, students with IEPs needed more prompts, guidance, and support in writing and editing and to deepen a conceptual understanding, since they presented more conceptual errors on their reflections. So, the teacher helped students with IEPS with their writing and addressed their conceptual errors. This is consistent with the findings of Glor-Scheib and Telthorster (2006) in their investigation of the development and implementation of e-portfolio assessment as part of the IEP process. Students presented their e-portfolios at their IEP meeting, demonstrating authentic participation, self-determination, self-advocacy, decision-making, and better understanding of themselves (e.g., interests and strengths). Some of the students benefited from having a portfolio advisor to help them complete their e-portfolio (Glor-Scheib & Telthorster, 2006). In the case of students in the present study, "portfolio advisors" ended up being both the general and special educators. Both provided guidance to students with IEPs as they wrote and edited their

reflections. The collaboration of these two educators in relation to e-portfolios emphasizes the importance of teacher-teacher collaboration in inclusive settings, generally (Burstein, Sears, Wilcoxen, Cabello, & Spagna, 2004) and more specifically as it relates to e- portfolios.

Collaboration in this classroom was even more important because Mathew considered teaching students with IEPs a challenge. The challenges they presented him arose from their ongoing need for more time, attention, and support; their need for more or different techniques and teaching strategies; and their need for multiple representations during the learning process. Despite this, Mathew was committed to his students with IEPs. Frequently, general education teachers perceive inclusion to be a challenging (Weller & McLeskey, 2000). Berry (2010) uses three categories to describe teacher approaches to inclusion: beginners, positive doers, and resisters. Beginners are teachers who worry about their effectiveness, have little experience, but desire to effectively include students with special needs. According to Berry, positive doers are teachers that "[seem] committed to the idea of inclusion and confident they have the tools to be effective inclusion teachers" (p. 87). Lastly, the resisters struggle to make reasonable accommodations, believing an inclusive setting is detrimental to students without disabilities and that accommodations for grading are unfair. Using Berry's (2010) classifications, Mathew would be identified as a positive doer. As a positive doer, Mathew believed that, although he struggled from time to time, his instructional approaches benefit students with and without IEPs. Furthermore, he was constantly looking for better ways to teach all of his students while attending to the needs of individual students in class or in reading their e-portfolios.

Limitations

As with all research, there are limitations. This case study has four principal limitations: duration of the study, access to computers, sampling, and student voice. All of the limitations may have affected the impact of e-portfolio assessment on the curriculum, classroom activities, teacher perceptions, the quality of student work, or the need for accommodations for students with disabilities.

Duration

The first limitation is the duration of the case study. Because the duration was a single semester, the study did not accommodate the teacher's need to learn about e-portfolio assessment and how he could use them with his students as part of his assessment. Mathew needed more time than anticipated to become familiar with all aspects of e-portfolios as an assessment. As a result, it was unreasonable to expect Mathew to fully use e-portfolios as an assessment tool. Additional time was required to learn how to use e-portfolio assessment. Furthermore, the teacher needed extra time to create student accounts, and to learn how to comment on the e-portfolio artifacts.

As a result, how Mathew use and his perceptions of e-portfolio assessment in this study may not reflect how he would use it or what he would think about it if he had a longer time to learn and implement. Supplementary training or constant professional development on starting and using e-portfolio assessment could address this concern. As suggested by others, the teacher should probably have mastered the use of the e-portfolio system prior to implementation (Meyer et al., 2010). It may be unfair to expect a teacher to fully incorporate e-portfolio assessment when he/she is still learning to create and use e-portfolios. I offered technological support to the teacher; however, it may not have

been enough or not the right kind of support. Perhaps studying e-portfolio assessment for a longer time would have allowed for the initial difficulties related to development and use to be addressed before full implementation, providing a greater understanding of e-portfolio assessment in this environment. Amount of time was also a limitation for me as the researcher. If I could have studied Mathew's use of e-portfolio assessment for a longer time, I may have seen different content and uses, and Mathew may have communicated different experiences/perceptions.

Furthermore, as a new tool to be used in the classroom, students needed to become familiarized with Google Sites. They did not have time to explore this platform in the classroom. Although they were taught about how to construct their e-portfolio, and received individualized help when they needed, they were still working on the mechanical aspects alas they constructed content. This could have influenced the quality of their work and/or affected the accommodations students with disabilities needed. More time in the classroom to familiarize themselves may be desirable to support students in creating their e-portfolios.

Taken together, it is possible that if the teacher and students had been more proficient in e-portfolio creation and its use as an assessment, the outcomes of this study might have been different. In particular, the interaction with the curriculum and classroom practices might have been different. Additionally, teacher perceptions would probably have differed slightly from those identified in this study.

Access

A second limitation relates to the fact that student did not have access to their e-portfolio in the classroom. E-portfolio assessment can be used more frequently if

students have more access to computers (Fiedler, Mullen, & Finnegan, 2009). Classroom access is important because access allows students to work on their e-portfolios enhancing the connection of the e-portfolio with classroom activities and enables using the e-portfolio as part of in-classroom assessment so that students can receive immediate feedback and the teacher can identify concepts or skills that can be immediately re-taught. Furthermore, when students work on the e-portfolio in the classroom, the teacher can observe and give support to all students as they create their artifacts. In this study, students worked on their e-portfolio outside of the classroom as homework assignments, which may have been a challenge for them since they needed to look for and possibly struggled to find available computers. Not only is it possible that lack of access to computers in the classroom may have affected student support needs or the quality of initial reflections, it could have limited Mathew's perception about the potential uses of e-portfolio assessment.

Sampling

Another limitation is a result of the sampling process. Mathew voluntarily participated in the research and was interested in technology, regularly using it in his classroom. Furthermore, Mathew was firmly committed to using constructivist practices because of his belief that they produced the highest quality learning. These characteristics may explain his feelings about e-portfolio assessment, his teaching practices, and his commitment to try new strategies. On the other hand, the Mathew had many responsibilities that took considerable amounts of time to accomplish. As a result, he had less time to devote to e-portfolio assessment. Selecting a teacher with fewer responsibilities could accelerate the implementation process or allow e-portfolio

assessment to be used more frequently as an assessment tool. However, selecting a teacher like Mathew, that enjoys integrating technology, is ideal since the use of e-portfolio assessment requires commitment and feeling comfortable using of technological materials for education. Overall, the results of this study are undoubtedly significantly connected to Mathew's practices, beliefs, skills, interests, and constraints.

Student Voice

The last limitation is absence of students' voices. The focus of this case study was how a teacher implemented e-portfolios assessment, so students' voices were not sought. However, understanding students' opinions and perceptions' toward the class, learning activities, and especially, e-portfolio assessment may be needed to have a better understanding of e-portfolio assessment use.

Implications for Practice

The results of this case study help others to better understand the use of e-portfolios as an assessment tool. Moreover, it advances the e-portfolio literature by describing its use in an inclusive general education classroom. Implications for practice emerged from the results and analysis. These implications relate to readiness and technical issues.

Readiness to Use

The first suggestion concerns readiness to use. The teacher and his students were using e-portfolio assessment for the first time. Introducing new technology is a complex task that requires identifying the challenges and limitations related to its implementation before using a new technology. Practitioners should reflect, identify, and analyze these challenges and decide how they will be overcome and weigh the possible benefits against

the challenges. Other implications related to readiness include teachers' training and understanding/comprehending the use of e-portfolio assessment. Before using e-portfolio as an assessment tool, the teacher should be trained about the construction and uses of e-portfolios. In this case study, as in Groißböck (2012), it is clear that a preparation process is needed to enhance the implementation of e-portfolios assessment.

Training. Training must include the purposes of e-portfolio assessment/how e-portfolios (including using it as an assessment tool) and how to address learning goals using e-portfolios. When the teacher knows the e-portfolio assessment basics, he or she may be more prepared to develop it as an assessment tool. Also, teachers need to be trained or familiarize themselves with common platforms and the available e-portfolio tools on each platform, as well as how to use the tools. Mathew selected Google Sites because of its open access platform and his perception that the tools were easily to use. However, Mathew was a Google Sites beginner-user who found out that he needed time to learn about the online tools. His struggled to implement at the same time he was learning makes it clear that if teachers are using specific software or online applications, such as Google Apps, they need to learn how to create an e-portfolio using the given tools before implementing with students. When teachers do not master the program used, this may result in unnecessary challenges; greater uncertainty about its efficacy as a teaching, learning or assessment tool; and/or limited outcomes (Tuttle, 2007).

Training can come in the form of training programs, formal or informal coaching, or self-training. If self-training is used, there must be a way to ensure the teacher feels confident in her/his knowledge when using it in the classroom. Mathew was self-educated in using e-portfolio assessment and did not feel confident about implementing it

when starting the process. As a result, he spent a lot of time learning about how to use Google site and integrating e-portfolio as an assessment tool. Coaching would be ideal because of the technical difficulties a teacher may encounter or continued teacher need to improve his/her familiarity with the processes and tools. Indeed, even trained teachers may experience difficulties while using e-portfolio assessment. Finally, teachers who are learning to create e-portfolio assessment may benefit from creating their own portfolios prior to working with students on their portfolios. Doing so may result in the teacher feeling more knowledgeable and better prepared to answer student questions. Additionally, it may help teachers to envision the possibilities associated with e-portfolio assessment.

E-portfolio uses. A second element regarding readiness to implement is the understanding and comprehension of the use, importance, and purpose of e-portfolio assessment. Establishing a clear purpose is essential in the beginning of e-portfolio implementation (Shao-Ting & Heng-Tsung, 2010). In this research, the teacher struggled with the purpose of e-portfolio assessment, and expectations for their use during the first stage of e-portfolio implementation. Having clear expectations may reduce the delay in implementing e-portfolio assessment. Yet, comprehending the importance, use, and purpose of e-portfolio assessment is not possible if technical issues are not scrutinized.

Technical Issues

Addressing technical issues before e-portfolio assessment implementation is the second practical recommendation that emerged from this study. Technical issues that aroused from this research contain five interrelated properties: (1) purpose/function, (2) design, (3) frequency, (4) setting, and (5) facilities.

Purpose/Function. E-portfolio assessment can be used in many ways. They can be used for such things as learning or assessment, or may serve as a showcase for student work. They also serve a variety of other sub-purposes. Regardless of the purpose or function, the teacher or the teacher and students together, should decide on the purpose/function of the e-portfolio assessment prior to design and implementation.

Potential purposes within the broader category of learning include enhancing communication, construction of knowledge and deepening student learning, development of metacognitive skills, and pedagogy. Communication functions may enhance exchanges between the teacher and families, teacher and students, and students and their peers, all for the purpose of improving student learning. Enhanced communication may also improve relationships. Improved relationships could create environments that are more conducive to student learning and teacher practice. Additionally, improved communication can positively affect collaboration. Collaboration between teachers and the students and students and their peers in the creation and use of e-portfolio assessment may also facilitate student construction of knowledge and to deepen student learning.

E-portfolio assessment may also be used to improve students' writing or other representational strategies, teacher understanding of his/her students' learning and the efficacy of her/his teaching strategies and activities, and teacher knowledge of what students think about classroom and school policies and practices. Furthermore, the reflection aspects of e-portfolio assessment may result in teachers gaining insight into their students' thinking processes, strengths, and needs. This information can be used to create more effective learning activities that are matched to individual students and groups of students.

Furthermore, using e-portfolio assessment as learning tools opens up possibilities to enhance students' development and/or improvement of meta-cognitive skills and a host of other skills. The communication requirements of the e-portfolio assessment could enhance students' metacognitive skills through the reflection process associated with selecting, creating artifacts, and justifying/explaining their thinking. Students could have increased opportunities to employ a variety of memory and application strategies when creating e-portfolio artifacts. Additionally, portfolios may enhance student self-assessment and self-monitoring as students work to recognize errors in their thinking (either as they create their reflections or other artifacts, or in response to feedback they receive from their teacher or peers) and repair their thinking or make adjustments in their learning as they create and share their e-portfolios. These processes also can serve to enhance student construction of knowledge and deepen student learning. Furthermore, e-portfolio assessment also have the potential to enhance higher order thinking skills related to organization, problem solving and decision making as students choose what to include and what to say about their learning and their artifacts. Moreover, collaborating with their teacher or peers helps students is likely to help refine students' critical thinking and social skills. Finally, the e-portfolio assessment can be used as a pedagogical tool. As such, it can be used to clarify students' thinking, extend students' learning, provide the setting for initial learning, or reinforce newly acquired knowledge or skills.

Design. The e-portfolio assessment should be designed after delineating its use(s). For example, if the e-portfolio assessment will be used to increase school and family communication, the designer should establish what will be allowed, what guidelines will be employed to guide its use, who will be allowed access to the e-

portfolios, and so on. On the other hand, if e-portfolios will be used as a pedagogical tool, the purpose of the portfolio, the objectives associated with the portfolio, and tools used to assess the content of students' artifacts or the extent of their learning must be aligned with the curriculum and district or state learning standards (Pimentel, 2010). Creating a syllabus incorporating the content and goals of e-portfolio assessment will help the teachers and students to build them more efficiently (Shao-Ting & Heng-Tsung, 2010).

When designing e-portfolios for assessment purposes, teachers must determine which skills will be assessed and if these skills can be assessed within groups of students or must be assessed in relation to individual students. The latter decision will help the teacher or designer decide if the creating e-portfolio artifacts should be an individual or collaborative group process. Determine whether to use individual or group assessment is critical in the design of the e-portfolio assessment and its implementation. While individual assessment seems to be straight forward, group assessment is more complex because in collaborative e-portfolios, students give feedback and interact with one another throughout the creation of their individual portfolios or group portfolios. This collaboration makes it more difficult to assess individual contributions.

Frequency of use. The third technical issue is frequency of use. Daily, weekly, or other schedules for creation of artifacts and use should be clearly set and adhered to in an effort to remain true to the selected purpose(s) for the e-portfolio assessment (Shao-Ting & Heng-Tsung, 2010). However, the schedule may be intentionally revised if such a revision would improve the portfolio's relationship to its purpose and objectives. In this research, Mathew did not institute a routine for e-portfolio use. The lack of routine may

be a reflection of how he struggled during the semester to specifically identify the purpose and the subsequent design of the e-portfolio assessment. An e-portfolio assessment schedule may have helped him use e-portfolios as a regular assessment tool. Routine use also helps students manage time, especially if the teacher uses e-portfolios during class periods (Shao-Ting & Heng-Tsung, 2010). If Mathew would establish a schedule that work for e-portfolios purposes, this may help him to integrate the use of e-portfolio as a regular assessment tool.

Setting. Setting is the fourth technical issue that should be considered. The logistics behind where and how the teacher and students will create and use the e-portfolios should be analyzed before their implementation: will e-portfolio assessment be worked on in the classroom, outside the classroom, or both? The scenario or setting where e-portfolio assessment will be developed and used will depend on the resources or facilities available.

Facilities/Resources. Internet access, number of available computers, and type and extent of digital resources available are components of the fifth technical issue: facilities or resources. Teachers and administrators must consider these three aspects before selecting an e-portfolio platform or program and the associated tools. Facilities, as a technical issue, are some of the most important elements to analyze, since acquiring these resources may take time. Consequently, teachers and designers need to try to work on the e-portfolios within existing resources. In this study, these elements were not taken into consideration before, or even during e-portfolio implementation. Consequently, it was students' responsibility to create and work on the e-portfolio outside the classroom. If Internet access is limited, the e-portfolio's designer should select a program that can be

used off-line, such as Power Point, iMovie or Movie Maker. In this case, if there are not enough computers available in the classroom, students can work on the e-portfolio from home or other sites only if they have access to the off-line programs. If students have full Internet access, they can use Google Applications or any other Internet, web-based platform and tools. If students do not have scanners, digital cameras, video cameras, or other digital resource, the e-portfolios' outcomes may be based on what students can write, draw, or otherwise compose in a document or reflection. As a result, the type and amount of artifacts will be limited. As a result, available resources may define the nature of the e-portfolio assessment.

Analyzing the resources available is an early step when designing e-portfolio as an assessment method. In this study, students did not have enough technological resources. Consequently, they wrote their reflections and inserted some pictures that could be downloaded, because having pictures was required in the structural rubric. However, they did not insert any videos, scan pictures, or include other types of artifacts. The lack of digital resources also affected the interaction and presentation or publication of the e-portfolios. Posting feedback and comments on other students' work is difficult to impossible to do if students do not have the Internet access needed to see one another's work. As a result, Mathew did not require the students to interact with each other through their e-portfolios. There are ways to share and publish e-portfolios if students have limited Internet access. These include using a DVD or CD. However, even with these options, student interaction in the process of reflection is not possible. When Internet access is not an issue, using more applications (such as Picasa Web Albums, Google Video, or You Tube) or more publishing mediums (html servers, Dreamweaver,

or any other virtual formats) are options that may enrich the type of and amount of artifacts included in e-portfolios. Internet access could also allow the teacher to design a website or blog to record and share students' e-portfolios and the teaching and learning processes. This website or blog may help avoid the problems of getting students individual accounts in a program or website, as was the case in this study.

In conclusion, when educators incorporate e-portfolio assessment into their students' education, training related to e-portfolio systems, software, or programs is imperative. Moreover, understanding and comprehending the potential functions of e-portfolios, selecting the purpose(s) and goals for the e-portfolio assessment, addressing considerations related to assessment of the portfolio and the frequency of use, and identifying the challenges and benefits associated with the e-portfolio assessment are critical considerations in the successful creation and use of e-portfolios, particularly as it related to e-portfolio assessment. Technical issues regarding e-portfolio assessment are interrelated, and should be considered before designing an e-portfolio assessment system. The facilities/resources available will affect the technical issues and how e-portfolio system can be used. Therefore, in countries (e.g., Puerto Rico), districts, or schools with limited resources, analyzing all technical issues is crucial to guaranteeing an effective integration of e-portfolio assessment.

Implications for Future Research

Research about the use of e-portfolio assessment in K-12 schools is limited. This case study is based one teacher's first attempt to learn and build e-portfolios for teaching and learning. This study highlighted some areas of learning that can help the development of e-portfolio use, but also offered many questions that must be addressed to

understand fully and support the evolution of e-portfolio use.

The first question that is important to address is how teachers' characteristics or beliefs interact with e-portfolio development and implementation. The participant in this study had knowledge and positive feelings toward technology and a belief in the importance of reflection as a learning tool. He also had a constructivist approach to the use of diverse teaching approaches and e-portfolio assessment. However, more research is needed to learn which of these and other teacher characteristics (e.g., the teacher's years of experience teaching, preparation, technology proficiency, school support) are important to e-portfolio implementation. For example, it is not known if a new teacher will have a different perception on the use of e-portfolio assessment. Also, it is not known if personal ability or characteristics of the teacher, such as the use of technology in the classroom, may affect his/her willingness to explore and implement e-portfolio assessment. In sum, more research is needed to understand the role that teachers' characteristics, such as experience, beliefs, preparation, technological knowledge or confidence, play in creating or implementing e-portfolio assessment for the first time or if these factors effect portfolio use by a proficient e-portfolio user.

Second, stronger evidence about the effects of e-portfolio assessment in students' learning and teaching/assessment processes is needed. Research in this area could focus on several different aspects. In this study, it was unclear whether e-portfolio assessment improved students' math skills, writing skills, or any other skill sets. Studies about the impact of e-portfolios on specific skills or skill domains are important. Additionally, it is important to know if, as I suggested in the implications for practice, e-portfolio assessment improve students' metacognitive skills, self-determination, and self-efficacy,

as well as motivation in students with and without disabilities. Furthermore, more research in which teachers rigorously grade students' artifacts or when students' work is connected to standards based assessments is needed. In addition, classroom and school variables should be explored in relation to how e-portfolio assessment and their use vary based on the content of school courses; whether there are differences when courses are electives or core classes; how they differ based on different curricula, levels (e.g., elementary, middle, and high schools), or school location (inner cities or suburban schools); and how their use is affected by differing types and amounts of resources. Finally, research should focus on the relationship between IEPs and e-portfolio assessment.

Third, future research focus on teams implementing this type of assessment, exploring how team members coordinate and support each other during the process. E-portfolio group support could be observed through a multiple case study. Such a study could analyze the preparation processes before e-portfolio implementation (e.g., training) and the interactions, cooperation/collaboration, and learning through its use among teachers. Collaboration between special education teachers and general education teachers should be studied while e-portfolio implementation is taking place.

Finally, students' voices should be studied to fully understand the implications of e-portfolio assessment. Students' perceptions, attitudes, and skills should be examined, in addition to the reasonable accommodations, resources, and support needed by students during the development and implementation processes. Knowing if e-portfolio assessment enhances student motivation or engagement is important. Furthermore, it is essential to know how students adjust to or excel in technology-based assessment in order

to improve how educators assess and teach in inclusive settings. It is particularly critical to understand the perceptions, challenges, benefits, and learning for students with IEPs so that teachers can help them to be successful in inclusive school settings.

Conclusion

The use of e-portfolio assessment has been slowly adopted in post-secondary environments, and even more slowly in K-12 classrooms. This case study elucidates the process of development and use of e-portfolio assessment in an inclusive general education classroom. During this research, the teacher used e-portfolios as an assessment tool for a geometry class. Three elements influenced the use of e-portfolio assessment, which is defined by the fusion of purpose/creation, selection of activities, and its development.

The principals limitations related to the use of e-portfolio assessment were time, for learning and implementation, and sampling. However, accessibility, digitization, and situations delaying the process were also created limitations for this study.

Benefits of e-portfolio assessment identified by the teacher-participant include fostering students' reflections and communication, facilitating teacher exploration of the students' learning processes, and providing students with space/time to reflect and communicate thoughts while receiving feedback. Student communication of knowledge through e-portfolio entries is consistent with Puerto Rican education goals, and helped the teacher to make decisions about teaching and learning processes based on what he learned about the students as he read their reflections. The use of e-portfolio assessment offered motivation and flexibility to students to finish their work. Therefore, they had the opportunity to add information to their reflection any time they grasped or clarified a

concept. While the e-portfolio assessment was used to improve student's skills, it also improved teacher reasoning/thinking and practices. Student reflections on their learning in their e-portfolios provided the teacher with deep insight into each student's learning which helped the teacher determine what steps he should take to enhance or support student learning.

The results showed that both students with or without IEPs produced good final products, but the students with IEPs needed additional support and guidance related to editing. This support was especially needed in incorporating the content-related vocabulary words adequately.

To establish successful use of e-portfolio assessment, teachers must have adequate resources, training, and support during their creation and implementation. Learning new ways to assess all students is a task that teachers and administrators should take seriously, constantly seeking improved, meaningful and useful assessments. However, using e-portfolio assessment as part of this process could be challenging without essential resources. Analyzing available resources and knowledge before e-portfolio use is imperative, especially when resources are limited in a particular school. Moreover, providing more time for teachers' training/capacitation and providing spaces and additional time to work together may move e-portfolio assessment beyond expectations as an assessment tool.

E-portfolio assessment use is still a subject of study in the process of improving education for all students, with and without IEPs, in the worldwide education community. In addition to the need to explore its efficacy, unresolved questions about e-portfolios assessment remain. Beyond consideration of implementation challenges for school

administrators, teachers, and students, ethical issues such as those related to privacy rights and ownership, and disputes about what should or should not be disclosed in e-portfolios need to be addressed. Furthermore, issues related how religious rights or bullying remain as yet to be interrogated aspects.

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Appendix A

Steps to create your electronic portfolio using Google Sites

1. Access to this service at the following address: http://sites.google.com
2. Create the name of the site: My portfolio electronic or other name
3. Write the description: Reflection on my learning.
4. This page is not public. In the section on advanced permissions should uncheck the box below: Anyone can view this site (make public). Finally, write the code that presents you and press Create to finish site.

5. Create homepage

This page is called "Home", because it is the first to appear to enter the site. Special care shall put in its design and content by the importance, as it can be the point of entry and departure for the entire site. Place welcome or presentation, those contents that may be more useful to visitors when he entered it.

To build this and any other page you add, make use of the editing tools that appear when you click Edit Page.

To set it up properly, click More Actions.

To edit the page

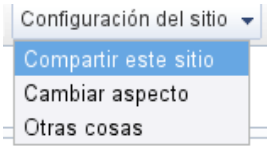
1. Getting Started writing some text as a greeting or presentation and apply some formatting.
2. You also have four menus that provide many elements to include, and configuration options, some already on the previous bar

Insert menu: To insert any element
Format Menu: Change sizes and put some special text formats
Menu table: To insert tables
Menu Design: Choice of 1 or 2 pages to columns
Any changes you make must be accepted with Save.
Canceled by clicking Cancel.

Para añadir páginas nuevas

1. Write the page name (for example, Tasks or reflections) that you create and eleges one of the 5 types available.
2. *Select: Website and press: Place the page at the top level.*
3. In the blank page structure the contents you want or you can add the first task here: the relationship between perimeter and area. Do not forget that you have a fast edit menu and other menus that provide four things. It's the kind of site that fits every need and we can set combining and including all the elements.

Configuring your site



El acceso o como se comparte con los demás

Access or sharing with others

Site Settings> Share this site

A site can be shared with everyone (public) or users you specify.

There are three possibilities to interact:

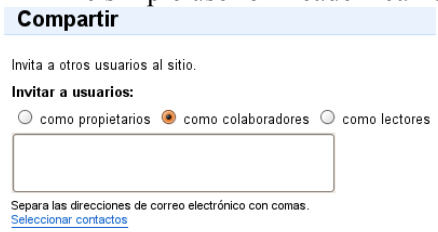
1. As owner
2. As a contributor
3. As a single user or reader

The "owner" is the one that has all the privileges to manage the site.

The "partner" can:

- Create, edit, move and delete pages
- Add attachments
- Add comments
- Add and delete pages from the navigation sidebar
- Subscribing to the changes that occur at the site

The simple user or "reader" can only view pages.



You must add the teacher and Janette as collaborators.

In the section on advanced permissions should uncheck the box below: Anyone can view this site (make public).

Appendix B

Rubric to evaluate electronic portfolios

Achievement level / Criteria	**Below the expected level: 5 points**	**Near the expected level: 10 points**	**Well located in the purpose of the task: 15 points**	**Excellent work: 17 points**
Title	The design is inappropriate.	While it is appropriate to the student's project, the design should be more careful and relevant.	The design is appropriate, attractive and colorful.	The design is appropriate, attractive, colorful and creative displays.
Self-presentation	Include his/her name.	Include name and purpose	Include name, a brief description and purpose.	Include name, purpose, and describes and use some image.
Language	Many errors in spelling, syntax and punctuation.	There are obvious errors in spelling, syntax or punctuation.	The spelling and punctuation errors are minor and few.	No spelling or punctuation errors, excellent management of language.
Tabs	Describes a research project developed by the student has 2 or fewer buttons link to their specific projects or papers.	The project by the student containing 3 or 4 tabs linking their projects or specific jobs.	The student's project contains 5 tabs link to your projects or specific jobs.	The student's project contains 6 tabs link to specific projects or jobs.
Contents of the reflections on the project	Few reflections about the work, the use of portfolio and major skills learned.	Some thoughts about his work, the use of the portfolio and the main skills learned.	Includes a variety of relevant reflections on their work, the use of the portfolio and the main skills learned.	It includes a range of relevant considerations, detailed and well argued about their work, the use of the portfolio and the main skills learned.
Personal reactions or work on projects	Few reflections include personal reactions are vague, repetitive.	Reflections include personal reactions. Reactions tend to be vague or repetitive. Few reactions include personal reflections.	Reflections include personal reactions that clearly reflect the feelings of the students.	All reactions include personal reflections descriptive, witty and lucid that includes skills learned

Total:

Overall assessment of portfolios:

Excellent ( ) Good ( ) Average ( ) Poor ( )

Appendix C

Geometry Syllabus

Course:
Professor:
Days: _____
_____
Room:
Text: Geometry; ISBN: 0-618-25023-9
Autors: Larson, Boswell, Staff
Duration: Semester

I. Introduction

This course is directed to students that have completed satisfactory in the courses of Algebra I and II. The geometry course will be covering Euclid's Geometry. Geometry is a fundamental part of our daily lives. Without the knowledge of Euclidean Geometry our society will not be able to solve Chemistry, Physics, and Engineering Problems. The Geometry that is based on the Euclid's Postulates is what it helps understand the majority of the world issues. The changes that our society experienced in economy and technology are part of the Euclid's Geometry. The teaching strategies based on memorization of the axioms/postulates demonstrate that is not the best way of teaching Mathematics. It has been proofed that by memorizing concepts the students will not create a well-balanced reasoning to acquire the result expected.

During the course the students will experience different learning skills using the Postulates of Euclidean Geometry. The system planned to use will start with the basics up to a higher level to develop skills to master the course. The students will have the opportunities to explore, research, examine, and reflect about the postulates, axiom, theorems and conjectures that are part of the Euclidean Geometry.

The activities will include the use of a ti-84 plus silver edition calculator and the latest technology possible. Some of the applications that will be part of

this course are CD rooms, Cabri Jr, Geometry Sketch Board, TI Inter Active, SMART MATH NOTEBOOK, and virtual mathematics. The course also includes algebraic concepts and processes. The mathematical language, vocabulary, and symbolism will be the main part of the course to promote and encourage the students to use the right words and terms every time they want to explain a geometric problem.

II. Content Outline

Unit I: Basic Concepts of Geometry

I. Formal Mathematical System

- A. ¿What is a formal mathematical system?
- B. Define and Undefined Objects
- C. Postulates, Axioms, Theorems
- D. Inductive Reasoning and Patterns

II. Lines, Points, and Planes

- A. Basics concepts of the planes, exploring properties of the Cabri Jr. Program as tools to study geometry
- B. Activities with TI-84 graphic calculator plus silver edition and activities Smart Board “Animated Math” to emphasize on:
  1. Construction of Geometrical Shapes
  2. Points, lines, and planes
  3. Segments and its measurements
  4. Measure angles
  5. Activity: Angles and Intersecting Lines
  6. Activity: Angles Bisecting Angles
- C. Exploring Angles
  1. Knowing the right tools to measure angles
     a. Activities
        i. Smart Board: Estimating Angles
        ii. The use of the Protractor
  2. Method to find the bisector of an angle
  3. Linear pair angles
     a. Activities with calculator to explore the properties of a linear pair
- D. Introduction to perimeter and area

Unit II: Reasoning and Tests

I. Exploring previous knowledge of enunciated

A. What is a conditional enunciated?
B. Conditional enunciated activities
C. Biconditional enunciated
    1. Activity: “Deductive and inductive reasoning”
    2. Reflections of different types of reasoning
D. Properties of Algebra
    1. Activities
E. Demonstration of segments
F. Demonstration of angles
G. Solving equations and inequations using a TI-84 calculator
    1. Activity: Resolution for literal equations
    2. Reflections for the learning activity

Unit III: Parallel and perpendicular lines

I. Lines and angles
A. Motivation: Explore the relation between parallel lines and perpendicular
B. Activity: Procedures to construct a perpendicular line
C. Parallels and transversal lines
    1. Activity: Parallel Lines and angles (Pg. 142 text book)
        1. Constructivists components of the activity
            a. Construction
            b. Investigation
            c. Realize conjecture
D. Demonstrations of parallels lines
E. Uses of the properties of parallels lines
F. Parallel lines in a rectangular coordinate plane
G. Perpendicular lines on a rectangular coordinate

Unit IV: Congruent triangles

Properties of Triangles

A. Activity: Building different angles and explore their properties
B. Explore the congruency of the triangles

Apply the congruency of the triangles

E. Use a TI-84 calculator and the Cabri Jr. Program as a tool to study the congruency of the triangles

F. Use TI-84 plus silver edition and Smart Board "Animated Math" to emphasize:
   1. Construction of congruent geometrical shapes
   2. Develop a definition of congruency

G. Demonstrations of congruent triangles
   1. Knowledge of tools to create demonstrations
      a. Activities
         i. LLL
         ii. LAL
         iii. Hypotenuse-Leg
   2. Test congruent Triangles
      a. Technology: Research Congruency of Triangles:

H. Demonstrations of congruent triangles
   1. Knowledge of tools to test congruent triangles
      a. Activities
         i. ALA
         ii. AAL
   2. Create test of congruent triangles

I. The uses of congruent triangles

J. Applications of congruent triangles

K. Study of properties of isosceles and equilateral triangles and their transformation

Evaluation:

During the course the students will be assess each semester using the following criteria:

1. Quizzes (10)
2. Partial Exams (4)
3. Homework (assignments)
   a. Execution (5)
   b. Assessment (6)
4. Electronic Portfolio (Reflections of the most significant assignment or lessons) (1)
5. Daily work (participation, behavior, punctuality, responsibility, and group work) (1)
6. Final Exam

Parent/Guardian Report

Name: _____ Student ID Number: _____

Test, Quiz, Exam or Homework	Date	Percentage	Grade	Parent signature	Observation

Revised August 11/2011
Any students who needs a special accommodation will discuss the requirement confidentialy with the professor. Offices hours will be used for research and tutoring for High School studnets, and students in the student-teaching program. Parents and guardians will be seen by appointment.

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Appendix D

First Draft of E-portfolio Entry (student with IEP)

tabajo #1

Este tabajo trata aserca de ario y perimetro aprendi la formula de aria largo por ancho utilisamos varias formas de ver porimeto y aria utilisamos papel cuadriculado y un tipo de tablas de plastico en la vida diaria vemos que los injenieros utilisan estas formulas para ver que o cuento espasio cubre un edifiso o sotano. fue una actividad vastante facil lo unico que fue mas dificil fue las tablas de aria que avia que acer si fuera por mi no daria este trabojo porque era un poco aburido en el salon pero fue entre tenido buscar las mutiplicaciones de aria.

Note: Misspelled words are underlined.

Appendix E

Example of Editing Process (Student with IEP)

This reflection had many misspelled word and missed some accent. For students with disabilities editing process required more time and constant feedback. The teacher was able to notice these needs early on this process and to work with the students to finish a nice e-portfolio. The following is an example of how the teacher and student work together to edit a reflection.

~~Erestoteles era un director de la Bibloteca de la ciudad de Alejandria en Egipto para la tercera centuria. Comonzó~~ ~~Erastoteles~~ Eratósteles era el director de la Biblioteca de la ciudad de Alejandría en Egipto para la tercera centuria. ~~Comonzó~~ Comenzó a estudiar y leer un libro sobre P~~itagoras~~ Pitágoras y comenzó a observar lo que para o~~rtas personas no era importante. Realizo un experimento el dia mas largo del ano (21 de junio) puso un paloen la cuidad de Alejandria (en el norte) ytros~~ otras personas no era importante. Realizó un experimento el ~~dia~~ día más largo del año (21 de junio), puso un palo en la cuidad de Alejandría (en el norte) y otro en la ciudad de Sain (al sur). Observó ~~que~~ qué palo tenía sombra, era el de Alejandría y el palo que estaba en la ciudad de Sain no tenía sombra.

El científico concluyó que si la tierra ~~fuse~~ fuse plana no ~~habria~~ habría sombra en ninguno de los dos sitios. Por lo que concluyó que la tierra era curva por la diferencia de las sombras y que son ~~la diferetes~~ los ángulos. ~~y que estos se interecan en la profundidad de la tierra.~~

Lo importante de este científico es que con ~~solo~~ sólo heramientas tan elemetales como palos, ojos, piernas y celebro (observación, conocimiento) pudo descubrir 2,200 años ~~atras~~ atrás que la tierra es redonda.